Appendix C

Tribal Agency Position Supporting Materials

C1 INTRODUCTION

Appendix C contains Tribal Cooperating Agencies' comments and supporting documentation that represent major differences of opinion with the analyses as presented in the SDEIS. The information was submitted by the Bois Forte, Grand Portage, Fond du Lac, Great Lakes Indian Fish & Wildlife Commission, and the 1854 Treaty Authority. All materials in this appendix are Tribal views provided verbatim and have not been validated or approved by the Co-lead Agencies.

See Chapter 8, Major Differences of Opinion, in the SDEIS for a complete listing of the 18 Tribal issues and summaries, and the Co-lead Agency responses.

Hydrology Section:

The hydrology section of the Tribal SDEIS Appendix consists of documents and reports related to three topics:

1. **Baseflow predictions by XPSWMM vs. measurements of baseflow in the upper Partridge River.**
   The data reported and analysis contained in the five letters and memos in this sub-section highlight the lack of agreement between the low baseflow predicted by the surface water model XPSWMM and the baseflows measured in the field and by continuous stream gauging. Estimates of impacts to the Partridge River and estimates to other surface and groundwaters in the mine site area are dependent on accurate information on river baseflow.

2. **The inability of the GoldSim model to accurately predict current water quality at the mine site or the plant site.**
   The results of the Goldsim modeling highlighted in the email and figure of this sub-section demonstrate that Goldsim does a poor job in predicting current ground and surface water quality. In some cases GoldSim mis-predicts water quality by more than 400%. Accurate prediction of current water quality by a model such as GoldSim is an easier task than predicting future water quality, given the uncertainty of input variables in the future. GoldSim's inability to accurately predict current water quality indicates it is poorly suited for predicting future water quality.

3. **The lack of inclusion of reasonably foreseeable events in the SDEIS No-Action Alternative modeling.**
   The documents and email in this sub-section highlight the CEQ requirement that "where a choice of "no action" by the agency would result in predictable actions by others, this consequence of the "no action" alternative should be included in the analysis." The no-action alternative analysis of future water quality used in the SDEIS includes nothing except continuation of the current water quality. This SDEIS No-Action alternative is so extremely unrealistic so as to not even include the dilution effects of precipitation on existing tailings basin water when predicting future water quality.

Sub-section 1

Baseflow predictions by XPSWMM vs. measurements of baseflow in the upper Partridge River.

Subject:	Partridge River baseflow, draft analysis of new data suggest XP-SWMM estimate inaccurate
From:	"john.coleman" <jcoleman@glifwc.org>
Date:	7/2/2013 11:56 AM
Attachments:	Baseflow_calibration_v2012-03-02.pdf (32.2 KB), 2012-06-12_baseflow info re NorthMet EIS Mine Site Hydrology Teleconference.eml (2.8 KB), 2012-06-18_watershed ratio predicts baseflow of 1.2cfs at SW-004 Re Model Calibration, NorthMet EIS.eml (3.1 KB), 2008-09-28_further comments on RS22 AppenB Draft-03.htm (4.5 KB)
CC:	"Sedlacek.Michael@epamail.epa.gov" <Sedlacek.Michael@epamail.epa.gov>, "Grimes.James@epamail.epa.gov" <Grimes.James@epamail.epa.gov>
To:	thomas hingsberger <thomas.j.hingsberger@usace.army.mil>, Ross Vellacott <Ross.Vellacott@erm.com>, "Shirley Frank (USFS)" <safrank@fs.fed.us>, "Bill Johnson (MN-DNR)" <Bill.Johnson@state.mn.us>, "Lisa Fay (MN-DNR)" <lisa.fay@state.mn.us>

To: Polymet EIS Co-leads 2013-07-02

From: John Coleman, GLIFWC

Re: Partridge River baseflow, draft analysis of new data suggest XP-SWMM estimate inaccurate

We remain concerned that the basic hydrology of the mine site is mis-characterized as being very non-conductive. The baseflow in the Partridge is a fundamental parameter to which many flow and contaminant transport models are calibrated. Unfortunate the baseflow at the site used in impact prediction is an estimate make by XP-SWMM. XP-SWMM appears to do a poor job of predicting baseflow at the mine site, possibly because it is based on a data set collected 17 miles downstream.

As we note in our recently submitted PSDEIS comments, the MDNR winter flow measurements in the PSDEIS (Table 4.2.2-9) indicate substantially higher baseflow in the Partridge than predicted by XP-SWMM. This is true even when the flow data is corrected for any possible Northshore (NS) discharge to the Partridge by subtracting the farthest upstream measurement from measurements taken farther downstream.

Even more compelling than the winter MDNR flow measurements is the flow data that has been recorded at the Dunka Road gage over the last 2 years. I have again calculated some statistics on the flow measurements taken at the Partridge River & Dunka Road, also known as monitoring site SW003. (http://www.dnr.state.mn.us/waters/csg/site_report.html?mode=get_site_report&site=03155002)
Earlier comments on this topic are attached and previous analysis was submitted to the lead agencies by email on 2012-06-12, 2012-06-18, and on 2008-09-28 (attached).

The stage and flow values measured by stream gage are available at 15 minute intervals. Based on 66,581 stage records collected between May 2011 and April 2013 and the DNR rating curve, I found:

Q90 at SW003 = 2.32 cfs (90% of the time flow was greater than 2.32 cfs) Q90 is sometimes used as an indicator of baseflow

Using 586 daily average flows from 2011-05-26 to 2012-12-31 calculated by the DNR and accounting for winter ice conditions, I found:
Q90 at SW003 = 1.9 cfs

Given that Northshore Peter Mitchel (PM) pit intermittently discharges to the Partridge River, I also analyzed 3 months in 2011 (Jul,Aug,Sep) and 3 months in 2012 (Feb,Mar,Apr) **when Northshore (NS) discharged zero (0) gallons** into the Partridge River.
Based on average daily flows calculated by the DNR:
In the 3 months of no NS pit discharge in 2011 Q90 at SW003 = 1.8 cfs
In the 3 months of no NS pit discharge in 2012 Q90 at SW003 = 1.1 cfs

Given that both these 3-month periods are typically low flow times, it seems that a baseflow estimate for site SW003 of 1 - 2 cfs would be reasonable.
While analysis based on only 6 months of flow data is not ideal, it should be noted that the XP-SWMM model is calibrated to only 2 months when Northshore did not discharge to the Partridge in 1985 (PSDEIS page 4.2.2-44, 1st paragraph).

Neither the direct field observations (minimum of 3.4 cfs) nor the values calculated from the DNR rating curve, support the **baseflow predicted by XP-SWMM at SW003 of 0.51 cfs** (Water Modeling Data package Vol.1-Mine Site, ver12, p.130 and PSDEIS Table 4.2.2-8). XP-SWMM's low estimates of baseflow are used in calibration of the MODFLOW model and thus influence many aspects of the site characterization and impact prediction, including pit inflow, dewatering impacts to the Partridge River, water treatment needs, groundwater flow rates, contaminant transport times and concentrations, and contaminant dilution in the Partridge watershed.

Although it is now an unfortunate time in the NEPA process to try to adequately characterize basic site hydrology, if appears that predictions of effects of the project may be far from accurate. It is not easy to say how the mis-characterization of river baseflow would affect compliance predictions because, although more baseflow might mean more dilution of contaminants, it could also mean transport of greater quantities of pollutants to the river and more drawdown of the Partridge River. We have repeatedly asked that the data at the Dunka Road gage be formally analyzed for baseflow as a check of the accuracy of the XP-SWMM modeling. If that analysis indicates that the XP-SWMM predictions under-represents baseflow, as our draft analysis suggests, that result should be incorporated into all project model calibration and prediction.

Thank you in considering this issue when revising the SDEIS.

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Subject: watershed ratio predicts baseflow of 1.2cfs at SW-004 Re: Model Calibration, NorthMet EIS
From: john coleman <jcolema1@wisc.edu>
Date: 6/18/2012 9:09 AM
To: thomas.j.hingsberger@usace.army.mil, "JMohr@barr.com" <JMohr@barr.com>, David Blaha <David.Blaha@erm.com>, "fmarinelli@interralogic.com" <fmarinelli@interralogic.com>, "John.Adams2@erm.com" <John.Adams2@erm.com>, "Poleck.Thomas@epamail.epa.gov" <Poleck.Thomas@epamail.epa.gov>, "erik.carlson@state.mn.us" <erik.carlson@state.mn.us>, Michael Sedlacek <Sedlacek.Michael@epamail.epa.gov>, James Grimes <Grimes.James@epamail.epa.gov>, Tina Pint <TPint@barr.com>, Greg Williams <GWilliams@barr.com>, 'Marty E Rye' <mrye@fs.fed.us>, "Liljegren,Michael W (DNR)" <Michael.Liljegren@state.mn.us>, "'Nancy Schuldt (nancyschuldt@fdlrez.com)'" <nancyschuldt@fdlrez.com>, "Margaret Watkins (watkins@boreal.org)" <watkins@boreal.org>, "wagener.christine@epa.gov" <wagener.christine@epa.gov>, "'Darren Vogt (DVogt@1854treatyauthority.org)'" <DVogt@1854treatyauthority.org>, Rose Berens <rberens@boisforte-NSN.gov>, Esteban Chiriboga <edchirib@wisc.edu>, Ann McCammon_Soltis <amsoltis@glifwc.org>, Neil Kmiecik <nkmiecik@glifwc.org>

The watershed upstream of SW-004 makes up 22% of the SW-006 watershed (23 of 103 sq.miles), yet XP-SWMM predicts that the watershed contributes only 17% (0.92 of 5.3 cfs) of the baseflow.

Using a ratio of watershed areas to extrapolate baseflow up from the USGS gage (SW-006) would suggest that baseflow at SW-004 is 1.2 cfs (5.3 X .22).

While using the watershed ratio technique is uncomplicated compared to XP-SWMM, it appears to give a prediction of baseflow at SW-004 closer to the flows actually observed at the site.

It seems that the Partridge River may be over-modeled with the use of XP-SWMM. Such a parameter-heavy model as XP-SWMM needs substantially more data from near the mine site in order to be justified. A more parsimonious approach appears to be a better fit.

Notes:
watershed areas from Table 1 of RS73B Sept. 2008
SP-SWMM predicted baseflows from Table 5-10 of CDF012
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Subject: baseflow info re:: NorthMet EIS: Mine Site Hydrology Teleconference
From: john coleman <jcolema1@wisc.edu>
Date: 6/12/2012 3:23 PM
CC: "JMohr@barr.com" <JMohr@barr.com>, David Blaha <David.Blaha@erm.com>, "fmarinelli@interralogic.com" <fmarinelli@interralogic.com>, "John.Adams2@erm.com" <John.Adams2@erm.com>, "Poleck.Thomas@epamail.epa.gov" <Poleck.Thomas@epamail.epa.gov>, "erik.carlson@state.mn.us" <erik.carlson@state.mn.us>, Michael Sedlacek <Sedlacek.Michael@epamail.epa.gov>, James Grimes <Grimes.James@epamail.epa.gov>, Tina Pint <TPint@barr.com>, Greg Williams <GWilliams@barr.com>, 'Marty E Rye' <mrye@fs.fed.us>, "Liljegren, Michael W (DNR)" <Michael.Liljegren@state.mn.us>, "'Nancy Schuldt (nancyschuldt@fdlrez.com)'" <nancyschuldt@fdlrez.com>, "Margaret Watkins (watkins@boreal.org)" <watkins@boreal.org>, "wagener.christine@epa.gov" <wagener.christine@epa.gov>, "'Darren Vogt (DVogt@1854treatyauthority.org)'" <DVogt@1854treatyauthority.org>, Rose Berens <rberens@boisforte-NSN.gov>, Esteban Chiriboga <edchirib@wisc.edu>
To: "Hingsberger, Thomas J MVP" <thomas.j.hingsberger@usace.army.mil>

As a contribution to the discussion tomorrow, I calculated some statistics on the flow measurements taken so far at the the Partridge River & Dunka Road. (http://www.dnr.state.mn.us/waters/csg/site_report.html?mode=get_site_report&site=03155002)

The stage and flow values are available at 15 minute intervals starting in February of 2012. Based on 10,300 records I found Flow stats of:
Q70 = 6.9 cfs (70% of the time flow was greater than 6.9 cfs) Q70 is sometimes used as an indicator of baseflow
Q90 = 2.8 cfs (90% of the time flow was greater than 2.8 cfs) Q90 is sometimes used as an indicator of baseflow
Q10 = 28.3 cfs (10% of the time flow was greater than 28.3 cfs)

Q99 = 0.4 cfs (99% of the time flow was greater than 0.4 cfs)

minimum 7day average flow was 2.37 cfs (this is sometime also used as an indicator of baseflow)

These flow values are based on a rating curve that is still being developed and cover less than a year, but neither the direct observations (minimum of 3.8 cfs) nor the values calculated from the rating curve support the XP-SWMM predicted baseflow 4 miles downstream of the gage (i.e. 0.76 cfs) and used in modeling.

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● MEMBER TRIBES ●

MICHIGAN	WISCONSIN		MINNESOTA
Bay Mills Community	Bad River Band	Red Cliff Band	Fond du Lac Band
Keweenaw Bay Community	Lac Courte Oreilles Band	St. Croix Chippewa	Mille Lacs Band
Lac Vieux Desert Band	Lac du Flambeau Band	Sokaogon Chippewa	

Via Electronic Mail / Original by Mail

March 2, 2012

Memorandum

To: Thomas Hingsberger USACE
Erik Carlson Minnesota DNR

From: John Coleman, Environmental Section Leader

Re: Polymet model calibration to Partridge River low flows

The hydrologic models for the Polymet mine site have been calibrated to targets that under-represent true baseflow. Models should be calibrated to a strong set of observational data. Construction of the site's basic hydrologic model to unrealistically low baseflows has ramifications for all the flow and contaminant modeling at the site.

Under-representation of Partridge River baseflow.

Review of the winter baseflow measurements and comparison to predictions made by XP-SWMM indicate that XP-SWMM substantially underpredicts baseflow (Barr June 9, 2011, Comparison of MDNR winter flow gauging to Partridge River XP-SWMM model). This has ramifications throughout the parameter sets being used in models characterizing hydrology at the Polymet mine site.

In the above referenced memo, Barr points out that the average measured baseflow at Dunka Rd. was 5.0 cfs while the XP-SWMM predicted baseflow is 0.4 cfs. Even when discharge from Northshore Mining was taken into account, the average baseflow measured at Dunka is 4.3 cfs while XP-SWMM predicts 0.42 cfs.

In its memo, Barr correctly points out that: "At all locations along the main stem of the Partridge River, the XP-SWMM-estimated baseflow is less than the MDNR-measured baseflow. The XP-SWMM model provides a conservative estimate of Partridge River baseflow for the purposes of modeling water quality impacts (e.g., less dilution of loads from the Mine Site)." What is not acknowledged in the Barr memo is that calibration of hydrologic models to an underestimate of baseflow produces models that characterize the groundwater hydrologic system as moving an unrealistically small quantity of water.

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Additional flow measures over the last 9 months on the Partridge River at the Dunka Road (site SW-003) further support the position that baseflow predicted by XP-SWMM under-represents true baseflow. The least flow measured at the Dunka Road site was 3.8 cfs. While there have so far been only 7 measurements taken at that site, the flow measured and the stage recorded by the gauge do not appear to support XP-SWMM's low baseflow predictions for the upper Partridge River.

Mis-calibration of groundwater flow models.

The calibration of the Modflow model to a Partridge River baseflow of 0.76 cfs predicted by XP-SWMM results in a model that moves very little water through the groundwater system. This can result in low predicted rates of inflow to the mine pit and slow movement of contaminants from sources (stockpiles or reflooded pits) to points of evaluation. More generally, an incorrect baseflow calibration target results in excessively low estimates of recharge and likely incorrect estimates of horizontal and vertical conductivity. These hydrologic parameters are interrelated and getting one wrong, as appears to be the case with baseflow, will almost certainly result in the other parameters being incorrectly estimated. Although there has been little sensitivity analysis conducted in the Polymet modeling efforts, flow models tend to be sensitive to these interrelated parameters.

Based on Modflow model calibration to a baseflow of 0.76 cfs and recharge values set at 0.3 and 1.5 in/yr (see page 61 of Water Modeling Data Package Vol 1-Mine Site v9 DEC2011.pdf and page 11 of RS22, Appendix B), some horizontal and vertical conductivities (K) were calculated by Barr using PEST (see Table 1 of Attachment B of Water Modeling Data Package Vol 1-Mine Site v9 DEC2011.pdf). These K values are likely to be inaccurate since they are calculated with a model that is calibrated to a baseflow that appears to be almost an order of magnitude too low. It is unlikely that any accurate predictions of water movement, transport of contaminant mass, or contaminant levels can be made when the characterization of the hydrologic system is so out-of-kilter.

Unusually low recharge and vertical K:

The low values used for recharge (0.3 and 1.5 in/yr) and the low wetland and till vertical K (0.0000033 ft/day [$1.16X10^{-9}$ cm/s]) used in the Modflow model are a reflection of a model constructed and calibrated to move an unrealistically small amount of water through the hydrologic system. For context, note that engineered clay liners in landfills typically aim for $1.0X10^{-7}$ cm/s hydraulic conductivity. I was unable to find any reference in the literature to wetland soil vertical conductivity as low as is used in the Modflow model. The lower end of the spectrum I found for wetland soil vertical conductivity was $1X10^{-6}$ cm/s.

Our long standing concern that the mine site hydrologic models incorporate incorrect assumptions about recharge are supported by Fred Marinelli's comment on line 39 and elsewhere of: "Agency Responses MS and PS WP and Waste Characterization Data package V7 2-7-12.xls". His comment states that "A net infiltration (recharge) range of 0.3 to 1.5 in/yr represents 1.1 to 5.4 percent of mean annual precipitation (MAP). This range for local net infiltration is unrealistically low for this area of the US." These low recharge values and the low

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vertical K values are related to calibration of the Modflow model to low baseflow. Until Modflow, and by extension the other related models XP-SWIMM and GoldSim, are calibrated to data from the site (e.g. observed baseflow and an adequate number of observed heads) and incorporate reasonable recharge rates, the results from the models are unlikely to accurately simulate current or future conditions.

Recalibration of models needed:

The Modflow model, in particular, needs to be calibrated with targets based on observed baseflow and observed well water heads. Calibration to projections by XP-SWMM, that appear to be incorrect, means that the fundamental characterization of the site hydrology is likely to be faulty. In the document referenced above (Agency Responses ...) Barr Engineering states that many hydrologic model parameters were "discussed as part of the IAP process and will not be considered further at this time." While some parameters were discussed in the groundwater IAP process, the discussion was almost exclusively concerning water quality parameters, not flow model parameters such as recharge, baseflow and Kv and Kh. The focus on water quality parameters to the near exclusion of hydrologic flow parameters is reflected in the Groundwater IAP summary memo of June 2011. Groundwater flow modeling underpins contaminant transport modeling and is interrelated to surface flow models. Without adequate vetting of flow model parameters and predictions, it is impossible to have confidence in predictions of contaminant movement and water quality.

Now that the hydrologic models have been more fully articulated by Barr and additional data are available, the models must be calibrated to observed baseflow and well water levels. This should include the new water level data from the newly installed mine site wells. PEST can then be used to more reasonably estimate values for recharge and conductivity. The observed baseflow and the PEST estimated recharge and conductivity values should then be used in the XP-SWMM and GoldSim modeling efforts. Modeling efforts that are based on faulty initial assumptions and not on field observations will not be able to reasonably predict impacts. The current Polymet modeling effort needs to be well founded on a strong base of observations of the physical conditions at the site.

Thank you for considering this issue. Please contact me at 608-263-2873 if you have questions.

cc: Mike Olson, Minnesota DNR
Fred Marinelli, Interralogic
Mike Sedlacek, USEPA
James Grimes, USEPA
Marty Rye, USFS
Nancy Schuldt, Fond du Lac Environmental Program
Neil Kmiecik, GLIFWC Biological Services Director
Ann McCammon Soltis, GLIFWC Policy Analyst

Date: Sun, 28 Sep 2008 10:24:02 -0600
To: Stuart Arkley <Stuart.Arkley@dnr.state.mn.us>
From: John Coleman <jcolema1@wisc.edu>
Subject: further comments on RS22 Appen.B Draft-03
Cc: "Ahlness, Jon K MVP" <jon.k.ahlness@usace.army.mil>, Nancy Schuldt <nancyschuldt@fdlrez.com>, Ann McCammon_Soltis <amsoltis@glifwc.org>, Esteban Chiriboga <edchirib@wisc.edu>
Bcc:
X-Attachments:
In-Reply-To:
References:

Stuart,
Here are additional issues related to RS22-Appen.B and RS73

1) The Kv of the wetland and drift materials are unrealistically low:
The Modflow model in RS22 Appen.B uses vertical conductivity values for wetland and glacial drift soils that are unrealistic to the extreme. Table 3-3 of RS22 Appen.B indicates that the hydraulic conductivity values used in the local-scale model are 0.0000033 ft/day (1.16X10-9 cm/s), for comparison, engineered clay liners in landfills typically aim for 1.0X10-7 cm/s hydraulic conductivity. I was unable to find any reference in the literature to wetland soil vertical conductivity as low as is used in the Modflow model. The lower end of the spectrum I found for wetland soil vertical conductivity was 1X10-6 cm/s. These low Kv values have effects on predicted recharge, mine pit inflow, groundwater drawdown, river baseflow impacts, and contaminant transport to the Partridge River.

2) No recharge to the Giant's Range or Biwabik Iron Formations is specified. These are material types in the Modflow layer one. Were they zero or just not reported?

3) The recharge for wetlands and drift (0.3 and 1.5 in/yr) are unusually low.
MODFLOW of Crandon project in an area of glacial drift and wetlands used 9 in/yr.
The Polymet MODFLOW mode for the plant/tailings site uses 8in/yr for wetland/drift areas.
The MODFLOW report supports the choice of 0.3 and 1.5 in/yr or recharge by citing the RS73A SWMM model "groundwater recharge coefficient". These are not equivalent parameters and the baseflow predicted by SWMM is most likely underestimated as explained below.

4) The 1.43 cfs of baseflow at SW-004 that the Modflow model is calibrated to (RS22 Appen.B, page 13) is a predicted value from the SWMM model which is calibrated to USGS gage 04015475 baseflow of 5.47 cfs, estimated from 1978-1988 flow data (RS73A). The USGS gage (near the inlet to Colby Lake) is 17 miles downstream of SW-004 and 26 miles downstream of the headwaters. Flow data collected in 2004 during 3 periods (see RS63) of low flow show significantly greater flows in the river at SW-004 and SW-003 than at the station (SW-005) 17 miles downstream near Colby Lake inlet (RS63). During these periods, SW-003 showed flows of 6 to 8.6 cfs while the downstream station (SW-005) showed flows of 2.7 to

7.6 cfs. In addition there was one measurement at SW-003 in 1978 that overlaps with the USGS gage 04015475. On 11/15/1978 flow at SW-003 was recorded as 25 cfs and at the USGS gage 23 cfs. The higher flows in the upper reaches of the Partridge River indicate that the river is gaining in its upper reaches and is loosing in its lower reaches. This is not at all surprising given the drop in elevation of 320 feet above SW-003. Below SW-003 there is only another 100 ft of drop over the 20 miles to the USGS gage.

The flow data from 2004 and 1978 appear to indicate that baseflow at SW-003 and SW-004 is approximately 1 to 2 times the baseflow in the Partridge River near the inlet to Colby Lake. Given the 1978 and 2004 data, it appears that the Modflow would more reasonably be calibrated to a baseflow of approximately 7-8 cfs at SW-003 and 4 cfs at SW-004. Calibration to higher baseflows in the Partridge River would likely produce a model with higher recharge, more flow to the pits, different contaminant transport results, and different drawdown and baseflow impact predictions.

Note: measurement stations in RS22, RS73, RS74 and RS63 have multiple names.

SW-001=PM1
SW-002=PM2=S-4
SW-003=PM3=CM126=S-1
SW-004=PM16
SW-005=PM4=CM123

Sub-section 2

The inability of the GoldSim model to accurately predict current water quality at the mine site or the plant site.

Subject:	Goldsim inaccurately predicts existing conditions, unlikely to accurately predict future project conditions
From:	"john.coleman" <jcoleman@glifwc.org>
Date:	7/2/2013 2:22 PM
Attachments:	Data_Pack_Plant_Site_Al_PM-13_Fig.I-05-02.2.pdf (271 KB)
CC:	"Sedlacek.Michael@epamail.epa.gov" <Sedlacek.Michael@epamail.epa.gov>, "Grimes.James@epamail.epa.gov" <Grimes.James@epamail.epa.gov>
To:	thomas.j.hingsberger@usace.army.mil, Ross.Vellacott@erm.com, safrank@fs.fed.us, "Bill.Johnson" <Bill.Johnson@state.mn.us>, lisa.fay@state.mn.us

To: Polymet EIS Co-leads 2013-07-02

From: John Coleman, GLIFWC

Re: Goldsim inaccurately predicts existing conditions, unlikely to accurately predict future project conditions

While we feel that modeling of the existing conditions is an inadequate substitute for a realistic No-Action Alternative model and does not follow CEQ guidelines, it appears that Goldsim does not even accurately model existing conditions. As we noted in our spreadsheet comments submitted June 25th, for many parameters at several water bodies the No-Action P50 model of annual average value is substantially different than the observed average existing conditions. Because of the inaccuracy of the Goldsim predictions of current conditions it is not clear that use of the Goldsim estimates of project impacts are adequate to ensure protection of water resources.

For example:

- -PSDEIS Table 4.2.2-18 reports Colby Lake as currently having an observed mean Arsenic of 0.78 to 1.4 ug/L (depending on the data set), whereas Figure 5.2.2-35, the No-Action (continuation of current conditions) P50 model for Colby Lake Arsenic shows annual maximum values of 0.5 ug/L.
- -PSDEIS Table 4.2.2-34 reports PM-10 (seep at the basin north toe) as having an observed mean Mn value of 100,192 ug/L, whereas Figure F-01-18.1 (Water Modeling Data Package Vol 2-Plant Site v9 MAR2013) shows the No-Action (continuation of existing conditions) P50 as an annual maximum Mn of 390 ug/L. at the north toe.
- -PSDEIS Table 4.2.2-34 reports PM-10 as having an observed mean Aluminum of 39.6 ug/L yet Figure F-01-02.1 (Water Modeling Data Package Vol 2-Plant Site v9 MAR2013) shows an annual maximum for No-Action (continuation of existing conditions) at the north toe as 11 ug/L.
- -PSDEIS Table 4.2.2-14 shows that observed average SO4 at SW-005 (9.11 mg/L) is nearly identical to the Goldsim P50 predicted current annual maximum for that site (PSDEIS Fig. 5.2.2-27, 9 mg/L). This suggests that Goldsim is under-predicting SO4 at SW-005. (The authors of the text on page 5.2.2-125 of the PSDEIS seem to misinterpret the P50 of the figure as a predicted annual average. This is not the case. The P50 of that figure is the "best" estimate of the annual maximum. The Goldsim model estimate of the annual average at SW-005 is shown as the P50 in Mine Site Data Package Attachment K Figure K-06-24.2, i.e. 6 mg/L) Again this suggests that Goldsim is underpredicting SO4 at SW-005.
- - PSDEIS Table 4.2.2-29 shows that observed average Al at PM-13 is 221 ug/L. This observed average is much higher than the modeled No-Action (continuation of existing conditions) P50 annual maximum (PSDEIS Table 5.2.2-47, 159-166 ug/L). The modeled No-Action P50 annual average for Al at PM-13 of 75 ug/L (attached Fig.I-05-02.2, Water Modeling Data Package Vol 2-Plant Site v9 MAR2013) is only 1/3 of the observed average.

The tables below compare the observed existing conditions values found in various PSDEIS tables to the P50 existing conditions predicted by Goldsim. While a very few of these model predictions are presented in the PSDEIS, many are not and therefor, the tables below refer back to the underlying data packages from which the PSDEIS was written.

Observed existing conditions in the Partridge River vs. annual average existing conditions predicted by Goldsim.

Parameter (ug/L)	Average existing water quality (PSDEIS Table 4.2.2-14)	Annual average P50 existing conditions predicted by Goldsim (Mine Site Data Package Attach.K)
Mn	SW-002 = 142	SW002 = 80 (Fig.K-01-18.2)
Tl	SW-002 = 0.6	SW002 = 0.11 (Fig.K-01-25.2)
Mn	SW-003 = 147	SW003 = 85 (Fig.K-02-18.2)
B	SW-004a = 126.5	SW004a = 30 (Fig.K-04-05.2)
K	SW-004a = 2,700	SW004a = 1,600 (Fig.K-04-16.2)
SO4	SW-004a = 15,900	SW004a = 8,000 (Fig.K-04-24.2)
Pb	SW-005 = 1.3	SW005 = 0.26 (Fig.K-06-21.2)
SO4	SW-005 = 9,110	SW005 = 6,000 (Fig.K-06-24.2)
Tl	SW-005 = 0.4	SW005 = 0.05 (Fig.K-06-25.2)

Observed mean existing conditions in Colby Lake vs. annual average existing conditions predicted by Goldsim.

Parameter (ug/L)	Colby Lake mean existing water quality (PSDEIS Table 4.2.2-18, Barr data)	Colby Lake Annual average P50 existing conditions predicted by Goldsim (Mine Site Data Package Attach.K)
Al	108	75 (Fig.K-08-02.2)
As	0.78	0.4 (Fig.K-08-04.2)
Cu	2.4	0.7 (Fig.K-08-13.2)
Ni	2.5	1.1 (Fig.K-08-20.2)
SO4	33,800	~10,000 (Fig.K-08-24.2)
Tl	0.1	0.025 (Fig.K-08-25.2)

Observed mean existing conditions at the tailings basin toe vs. annual maximum existing conditions predicted by Goldsim. (Goldsim predicted mean concentrations are not provided in Modeling Data Package Vol 2-Plant Site v9 MAR2013)

Parameter (ug/L)	Mean seep measured value at Basin Toe (Table 4.2.2-34)	Annual maximum P50 existing condition predicted by Goldsim (Plant Site Data Package Attach.F)
Al	PM-8 = 25.7	West toe = 14 (Fig.F-04-02.1)
AL	PM-9 = 29.9	NW toe = 13 (Fig.F-02-02.1)
AL	PM-10 = 39.6	North toe = 11 (Fig.F-01-02.1)
Mn	PM-8 = 3,039	West toe = 1,250 (Fig.F-04-18.1)
Mn	PM-10 = 100,192	North toe = 380 (Fig.F-01-18.1)
F	PM-8 = 2,900	West toe = 1,100 (Fig.F-04-14.1)
As	PM-8 = 3	West toe = 2 (Fig.F-04-04.1)
B	PM-10 = 379	North toe = 330 (Fig.F-01-05.1)

Pb	PM-10 = 1.3	North toe = 1 (Fig.F-01-21.1)

The above examples are not an exhaustive list of discrepancies between observed existing water quality data and the Goldsim P50 prediction of the No-Action alternative (continuation of existing conditions) but highlight some of the most notable discrepancies. What the discrepancies demonstrate is that the Goldsim model is a relatively poor predictor of current conditions. If a model is unable to accurately predict current conditions it is even less likely to accurately predict future Project conditions. The Goldsim models need to be better calibrated to existing conditions (the calibration effort reported in "Calibration of the Existing Natural Watershed at the Plant Site v4 MAR2012" only compared model output to upstream site PM-12 and apparently did a poor job of preparing the models to predict either the lower reaches of the Embarrass or the Partridge River.) and model results recalculated.

Thank you for considering this issue while revising the PSDEIS.

--
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221 ug/L average existing Al at PM-13 (PSDEIS Table 4.2.2-29)

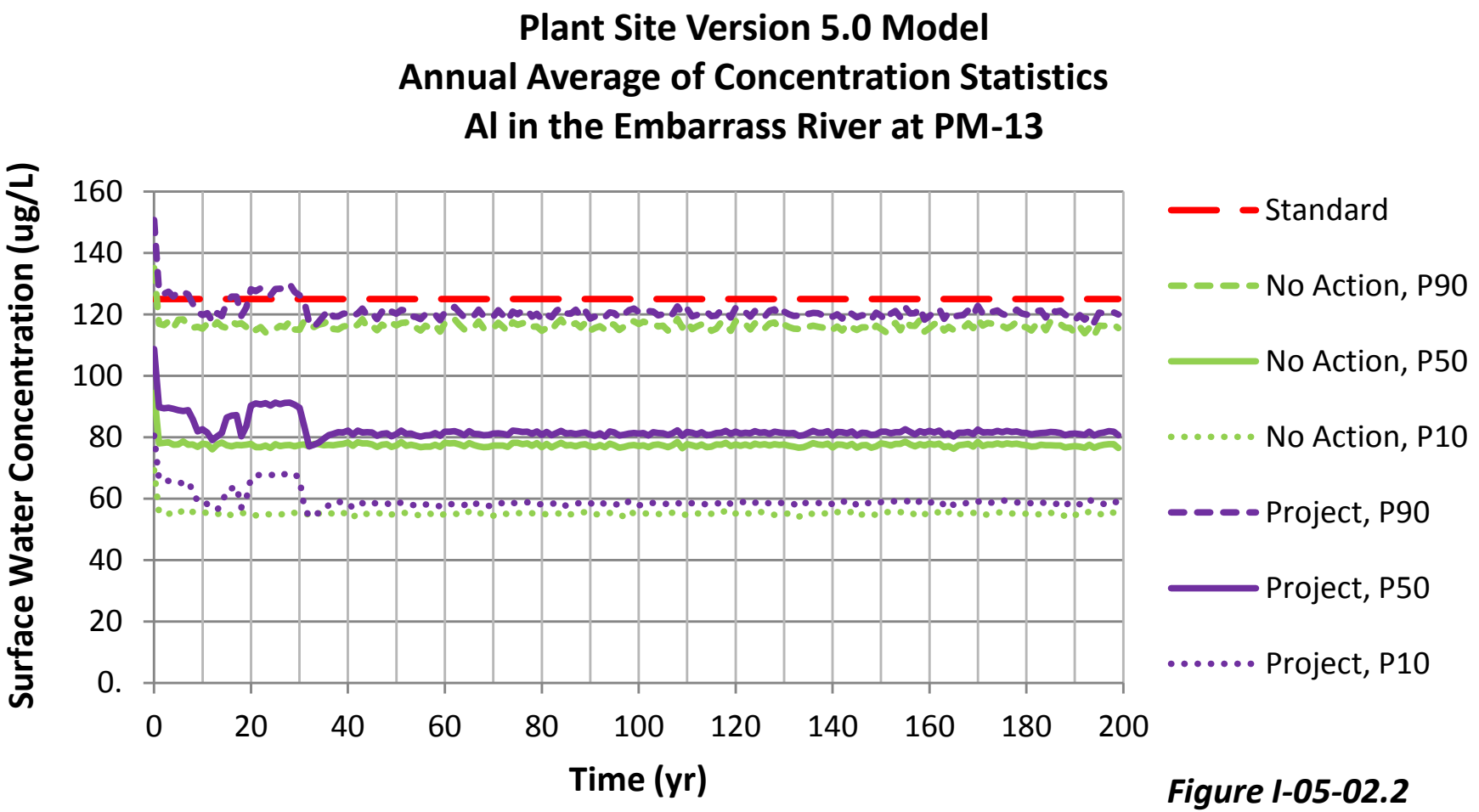


Figure I-05-02.2

Sub-section 3

The lack of inclusion of reasonably foreseeable events in the SDEIS No-Action Alternative modeling.

Subject:	Continuation of Existing Conditions an inappropriate No-Action alternative
From:	"john.coleman" <jcoleman@glifwc.org>
Date:	7/2/2013 3:15 PM
Attachments:	G-CEQ-40Questions.pdf (416 KB), Water Modeling Data Package Vol 2-Plant Site v9 MAR2013_F-01.10.1.pdf (47.5 KB)
CC:	"Sedlacek.Michael@epamail.epa.gov" <Sedlacek.Michael@epamail.epa.gov>, "Grimes.James@epamail.epa.gov" <Grimes.James@epamail.epa.gov>
To:	thomas.j.hingsberger@usace.army.mil, Ross.Vellacott@erm.com, safrank@fs.fed.us, "Bill.Johnson" <Bill.Johnson@state.mn.us>, lisa.fay@state.mn.us

To: Polymet EIS Co-leads 2013-07-02

From: John Coleman, GLIFWC

Re: Continuation of Existing Conditions an inappropriate No-Action alternative

According to CEQ guidelines (attached):

> "No action" in such cases would mean the proposed activity would not take place, and the resulting environmental effects from taking no action would be compared with the effects of permitting the proposed activity or an alternative activity to go forward.
>
> Where a choice of "no action" by the agency would result in predictable actions by others, this consequence of the "no action" alternative should be included in the analysis. For example, if denial of permission to build a railroad to a facility would lead to construction of a road and increased truck traffic, the EIS should analyze this consequence of the "no action" alternative.

Based on the above CEQ guidlines, it is clear that activities that will occur under the Cliffs Consent Decree should be included in modeling of a No Action alternative. Unfortunately not only are the consent decree activities not included, but the fact that it will be precipitating on the tailings basins for the foreseeable future has not been included in the No Action modeling. This is evident by the model results that show stable levels of Chloride coming from the basins for the next 200 years (Figure attached) when there is no ongoing source for Chloride. With no source for new Chloride, rainwater will gradually dilute the residual Chloride in the basin and levels will drop. The PSDEIS claims that the basins water quality has stabilized and that the current conditions will not change over time. The claim of chemical stability is based on basin pond water sampling for only 4 years (2001 - 2004, PSDEIS Table 4.2.2-23).

Since there has been no water quality data collected in the basin pond for 9 years it is reasonable to assume that the past 9 years of precipitation has diluted the water chemistry in the basin pond and that eventually the more dilute water will work its way though the basins and be discharged at the toe. If chemical stability is to be assumed, more recent data on basin pool water chemistry is needed. While the CEQ makes it clear that a blind "continuation of existing conditions" model is inappropriate as a No Action alternative, a "continuation of existing conditions" model that ignores simple environmental processes such as precipitation is even less appropriate.

Thank you for considering this issue.

46 Fed. Reg. 18026 (March 23, 1981)
As amended

COUNCIL ON ENVIRONMENTAL QUALITY

Executive Office of the President

Memorandum to Agencies:

Forty Most Asked Questions Concerning
CEQ's National Environmental Policy Act Regulations

SUMMARY: The Council on Environmental Quality, as part of its oversight of implementation of the National Environmental Policy Act, held meetings in the ten Federal regions with Federal, State, and local officials to discuss administration of the implementing regulations. The forty most asked questions were compiled in a memorandum to agencies for the information of relevant officials. In order efficiently to respond to public inquiries this memorandum is reprinted in this issue of the Federal Register.

Ref: 40 CFR Parts 1500 - 1508 (1987).

FOR FURTHER INFORMATION CONTACT:

General Counsel,
Council on Environmental Quality,
722 Jackson Place NW,
Washington, D.C. 20006;
(202)-395-5754.

March 16, 1981

MEMORANDUM FOR FEDERAL NEPA LIAISONS, FEDERAL, STATE, AND LOCAL OFFICIALS AND OTHER PERSONS INVOLVED IN THE NEPA PROCESS

Subject: Questions and Answers About the NEPA Regulations

During June and July of 1980 the Council on Environmental Quality, with the assistance and cooperation of EPA's EIS Coordinators from the ten EPA regions, held one-day meetings with federal, state and local officials in the ten EPA regional offices around the country. In addition, on July 10, 1980, CEQ conducted a similar meeting for the Washington, D.C. NEPA liaisons and persons involved in the NEPA process. At these meetings CEQ discussed (a) the results of its 1980 review of Draft EISs issued since the July 30, 1979 effective date of the NEPA regulations, (b) agency compliance with the Record of Decision requirements in Section 1505 of the NEPA regulations, and (c) CEQ's preliminary findings on how the scoping process is working. Participants at these meetings received copies of materials prepared by CEQ summarizing its oversight and findings.

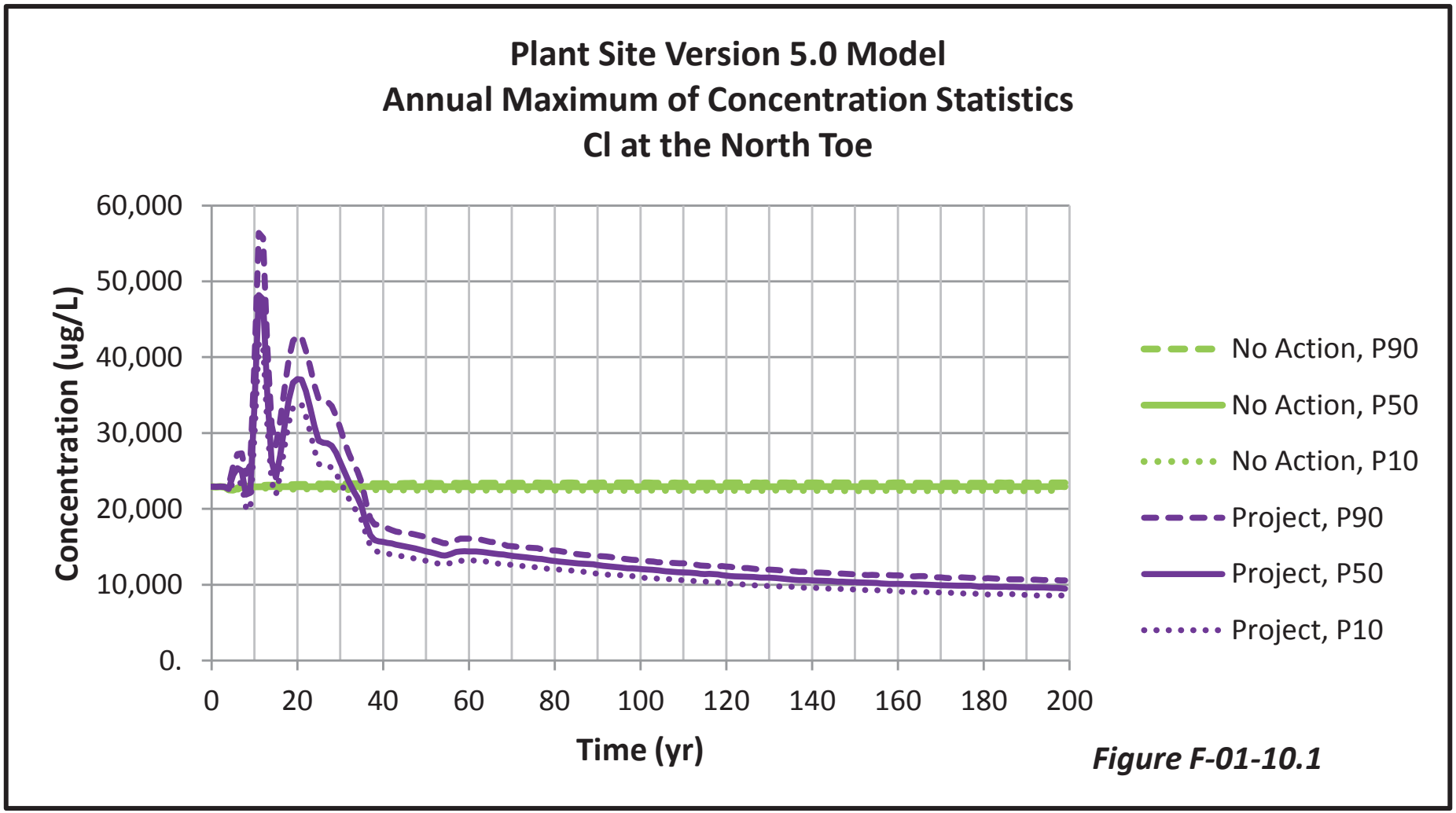


Figure F-01-10.1

Great Lakes Indian Fish and Wildlife Commission (GLIFWC) Mercury Section

Below are comments from the Great Lakes Indian Fish and Wildlife Commission (GLIFWC) related to mercury issues in the "NorthMet Mining Project and Land Exchange: Preliminary Supplemental Draft Environmental Impact Statement" (PSDEIS). Detailed rationale and comments follow the summary.

Summary

The understanding of mercury dynamics in the St. Louis River watershed is very limited and is insufficient to lead to the conclusion reached in the PSDEIS that "the NorthMet Project Proposed Action would not exceed applicable environmental evaluation criteria." This lack of scientific information is explicitly stated throughout the PSDEIS and is what led the Minnesota Pollution Control Agency (MPCA) early this year to delay the establishment of a St. Louis River TMDL until further mercury cycling data could be collected.

Further, the conclusion that "the NorthMet Project Proposed Action would not exceed applicable environmental evaluation criteria" is based on a number of flawed assumptions. Specifically, we do not agree with the following assumption in the PSDEIS (rationale provided below):

- The tailings basin will function as a mercury sink.
- Mercury methylation will not increase because the amount of sulfate being released to the environment will actually be reduced by the project.
- the NorthMet project would have minor effects on flows in the Partridge and Embarrass Rivers or their tributaries and is thus not expected to result in increases in flow fluctuations that promote mercury methylation.

Many lakes and rivers in the area are already classified as "impaired waters" by the MPCA due to elevated fish mercury. All additional increases in mercury contributions to the environment therefore constitute a risk to human and ecosystem health. The proposed project will result in increased mercury releases to the environment both via air and water, increasing human and ecosystem risk. All increases in mercury releases into the Lake Superior watershed are contrary to the goals of the 1991 "Binational Program to Restore and Protect the Lake Superior Basin" to establish a Zero Discharge Demonstration Program for nine critical pollutants, including mercury. These increased emissions are expected to have a measureable effect on mercury levels in fish and the subsequent health risk to recreational and subsistence fishers. Any additional mercury releases to the environment are exacerbating an already unacceptable risk situation in the area. Increased fish mercury levels fish will also have direct impacts on both the cultural and recreational resources of the region.

In addition, there are a several concerns related to mercury that are not addressed in the PSDEIS. These concerns are summarized here, with more detailed comments and rationale provided in the comments below. There is no discussion of the potential for the constructed wetlands over the East Pit and at the perimeter of the tailings basin to serve as a significant source of mercury methylation or as a route of mercury exposure to waterfowl and water birds that may utilize this habitat. The potential for the West Pit overflow to exceed the Great Lakes Initiative standard of 1.3 ng/L mercury is ignored. There is no consideration of the likely mercury pulse to the Partridge River resulting from placement of the stripped peat and unsaturated overburden into the unlined Overburden Storage and Laydown Area. It is not apparent whether mercury monitoring is included within the water quality monitoring of the Mine Site or Plant Site. The estimate of air emissions of mercury as a result of the project does not take into account emissions from electricity generation for the site or from the burning of fuel by mining vehicles or other equipment. Wetland monitoring following restoration is only vegetative and hydrologic in nature, but should include total and methyl mercury to collect information on mercury levels and methylation rates and identify any necessary remedial actions. The Wildlife Section does not discuss mercury contamination despite the fact that there are a number of fish- or aquatic invertebrate-eating species [such as the bald eagle (state listed and protected by federal law), otter, and wood turtle (state listed), and various amphibians] that may be impacted by increased methyl mercury in the food web. Flow to the Partridge River, Embarrass River, or their tributaries may be sufficient to impact habitat leading to alterations of species composition, food web structure, and ultimately mercury bioaccumulation.

<u>Comment 1</u>

The PSDEIS concludes that "Based on the results of the modeling and impacts analysis, the NorthMet Project Proposed Action would not exceed applicable environmental evaluation criteria." Due to a general lack of understanding of mercury dynamics, particularly in the St. Louis River (SLR) watershed, this conclusion is not defensible with regard to mercury. The PSDEIS explicitly points out this knowledge gap in a number of sections. For example:

- Section 5.2.2.1.2: indicates that even though mercury in fish tissue is relevant to water resources evaluation criteria considerations, the modeling did not attempt a numeric analysis of NorthMet Project Proposed Action-specific effects on mercury in fish tissue. In addition, the ability of numeric models to predict concentrations of mercury in fish tissue in response to changes in mercury-loading is currently inadequate due to gaps in scientific knowledge. Finally, the relationship of inorganic mercury-loading to uptake of methylmercury in fish is inherently complex and subject to numerous chemical, physical, and biological parameters, which vary geographically and are only partially understood.

- Sections 6.2.3.3.4 and 5.2.2.3.4: indicate that mercury was not included in the GoldSim model as insufficient data and a general lack of definitive understanding of mercury dynamics prevented modeling mercury like the other solutes.
- Section 5.2.2.3.4: indicates that current scientific understanding of the factors and mechanisms affecting mercury methylation and bioaccumulation is limited.

Further, the Minnesota Pollution Control Agency (MPCA) has concluded that a SLR mercury Total Maximum Daily Load (TMDL) is not feasible at this time due to a lack of understanding of mercury dynamics in the watershed. They have delayed completing the mercury TMDL process pending the collection of additional mercury data in the watershed. This brings into doubt the possibility that the PSDEIS could adequately assess mercury impacts from the proposed action to conclude there will be no exceedances of applicable environmental criteria related to mercury.

Comment 2

The conclusion that mercury will not increase in the environment or exceed applicable environmental evaluation criteria is based on several assumptions. One such assumption is that the tailings basin will function as a mercury sink (Section 5.2.2). This assumption is not justified for a number of reasons.

The assumption that the tailings basin will serve as a mercury sink is based only on a small-scale bench top study of tailings from the site of the NorthMet project, providing minimal information. Details of the study are not provided. Further, field conditions were not accurately simulated in the study. For example, the experiment used process water that was 3.3 ng/L to test the adsorption capacity of the tailings. But, the PSDEIS states that a pilot study found the process water from the project would contain an estimated 11.2 ng/L of mercury (3.4 times higher than the experimental concentration). Thus, the concentrations used in the experiment were not environmentally relevant to the anticipated conditions at the mine site. Process water with a much higher mercury concentration might not experience mercury reductions to the same degree as was seen in the small-scale bench top study.

In addition, the conclusions drawn from the bench top study are backed up in the PSDEIS by earlier Minnesota Department of Natural Resources (MDNR) research on taconite tailings. There are inherent differences in composition between taconite tailings and the tailings that would come from the NorthMet PGM type project. These differences are likely to affect metallic binding potential. Therefore it is not appropriate to apply conclusions from this research to the current project.

Also lacking from the discussion of the potential for mercury to be adsorbed by the mine tailings is a discussion of potential saturation of the tailings with mercury (or other metals) and whether the tailings could shift from a mercury sink to a source in the future. This information is not presented for the NorthMet tailings or for the taconite tailings already present on site. The time scale on which the experiments were conducted are not adequate for predicting the long-term behavior of mercury and its interactions with tailings materials. Questions that should be addressed include:

- Are there conditions under which the tailings would shift from a sink to a source (e.g., temperature or pH alterations as a result of mining activities or global climate change, oversaturation after a significant time period)?
- Is the mercury permanently and irreversibly adsorbed to the tailings?
- The PSDEIS indicates in section 5.2.7.2.5 that about 95 percent of the mercury originating in the ore is expected to remain within—or be adsorbed to—the tailings and the hydrometallurgical residue, where it would remain isolated from further transport to the environment. Has this been proven with regards to potential tailings saturation and changing environmental conditions?

Comment 3

The conclusion that mercury will not increase in the environment or exceed applicable environmental evaluation criteria is based on several assumptions. One such assumption is that mercury methylation will not increase because the amount of sulfate being released to the environment will actually be reduced by the project. This assumption is not justified. The MPCA 2006 strategy to address effects of sulfate on MeHg production focuses on avoiding discharges to "high risk" situations such as wetlands, low (<40 mg/L) sulfate waters where sulfate may be a limiting factor in the activity of sulfur-reducing bacteria, and waters that flow downstream to a lake that may stratify. As indicated in the PSDEIS (Section 5.2.2.3.4), most or all of these conditions apply to the area downstream of the tailings basin and waste water treatment facility (WWTF). As a result, sulfate releases from the mine site and subsequent impacts on mercury methylation are a critical consideration.

The assumption that mercury methylation will not increase because the amount of sulfate being released to the environment will actually be reduced by the project only holds true if water is captured and treated in perpetuity. The assumption no longer holds if this onsite water treatment ceases or is reduced. Further, there are concerns regarding the conclusion that sulfate releases will be decreased by the project. This may not be true in all instances (see GLIFWC hydrology attachment for comments related to sulfate releases). Finally, as the PSDEIS indicates (5.2.2.3.4), the current scientific understanding of the factors and mechanisms affecting mercury methylation and bioaccumulation is limited. It is known that the response of mercury

methylation to sulfate concentrations is non-linear and complex. It is not defensible to state that the mercury/sulfate cycle is not well understood and then conclude that the projected levels of sulfate releases are expected to result in a decrease on mercury methylation in the watershed. It is apparent that there is not sufficient scientific knowledge to assess the impact of any change in sulfate concentration, positive or negative, on mercury methylation and the subsequent impact on mercury levels in fish and throughout the aquatic food web.

Comment 4

The conclusion that mercury will not increase in the environment or exceed applicable environmental evaluation criteria is based on several assumptions. One such assumption is that the NorthMet project would have minor effects on flows in the Partridge and Embarrass Rivers or their tributaries and is thus not expected to result in increases in flow fluctuations that promote mercury methylation. As indicated in the PSDEIS, The methylation of environmental mercury by sulfate-reducing bacteria is also stimulated by drying and rewetting associated with hydrologic changes and water level fluctuations (Gilmour et al. 2004; Selch et al. 2007). Drying (and subsequent increase in exposure to oxygen) of substrate containing reduced sulfur species (sulfides and organic sulfur) oxidizes those species into sulfate, which is remobilized and available to sulfate-reducing bacteria upon rewetting of the substrate. The PSDEIS also indicates that this mechanism stimulates production of methylmercury in sediments exposed to wetting and drying cycles (Gilmour et al. 2004) and is likely to account for some of the elevated methylmercury concentrations seen in discharge from wetlands during high flow events (Balogh et al. 2006). Thus, hydrologic changes and water level fluctuations are known to stimulate mercury methylation and enhance its bioaccumulation.

We do not accept the conclusion that the project will not significantly impact flow and water level fluctuations. Therefore, it is possible, if not likely, that the project will lead to increased mercury methylation and bioaccumulation. GLIFWC comments regarding hydrology effects (e.g. perched vs. connected wetlands, old and inaccurate hydrology data for the Partridge River, water level fluctuations exposing riparian wetlands, and groundwater drawdown are provided in the wetlands attachment).

Comment 5

In year 21, the East Pit backfill will be completed and a mitigation wetland will be constructed over the back filled material and another wetland will be constructed at the perimeter of the tailings pond (Section 5.2.2.3.1). There is no discussion of the impact that these constructed wetlands could have on mercury methylation and bioaccumulation. Wetlands are known to promote enhanced mercury methylation. The methylation process is dependent on many factors, including the concentrations of mercury and sulfate present in the water and sediment of the

wetland. The East Pit and the tailings basin are regions of potentially elevated mercury and sulfate. Therefore, there is a reasonable potential for the constructed wetlands to be significant sources of methylmercury to the aquatic foodweb. This has not been accounted for in the assessment of mercury related impacts by the mining project.

Comment 6

There is a potential for the overflow from the West Pit (after year 40) to exceed the Great Lakes Initiative (GLI) standard for mercury of 1.3 ng/L (Section 5.2.2.3.4). This has not been considered when concluding the Proposed Action would not exceed applicable environmental evaluation criteria. The mercury concentration in the West Pit was estimated based on concentrations in other natural and mine pit lakes as well as by a mass balance approach.

Of the 16 mine pit lakes examined, two (12.5%) had average mercury concentrations >1.3 ng/L (1.61ng/L in Pit 2W and 1.87 ng/L in Pit 9S). Individual samples were as high as 2.55 ng/L, double the acceptable level. It is not stated how many of the 16 lakes had individual samples that exceeded the GLI standard. This result shows that there is a significant possibility that, based on comparisons with other similar mine pit lakes, the West Pit of the project may exceed the GLI standard for mercury of 1.3 ng/L.

The mass balance approach included an estimate that 3% of the mercury is lost via volatilization. Air emissions of mercury are known to be the primary source of mercury deposition to surface waters. This volatilized mercury then needs to be accounted for in the air emissions inventory since it will presumably primarily redeposit within the watershed.

Comment 7

There is no consideration of the likely mercury pulse to the Partridge River resulting from placement of the stripped peat and unsaturated overburden into the unlined Overburden Storage and Laydown Area. While the surface runoff will be collected, monitored and potentially routed to the WWTF, any potential water seepage into the ground below the Overburden Storage and Laydown Area will flow directly into the Partridge River. The result is a potentially unaccounted for and unquantified mercury pulse into the Partridge River.

Comment 8

It is not apparent whether mercury monitoring is included within the water quality monitoring of the Mine Site or Plant Site (Tables 5.2.2-52 and 5.2.2-53). If it is, this should be specified. If it is not, it should be added to the monitoring activities.

Comment 9

Air emissions of mercury are known to be the primary source of mercury deposition to surface waters. The estimate of air emissions of mercury as a result of the project (4.6 lbs/yr) does not take into account emissions from electricity generation for the site or from the burning of fuel by mining vehicles or other equipment (Section 5.2.7.2.5). This should be quantified and included in the analysis.

Comment 10

It appears that wetland monitoring following restoration is only vegetative and hydrologic in nature. Total and methyl mercury should be monitored pre-project through post-reclamation to collect information on mercury levels and methylation rates and identify any necessary remedial actions.

Comment 11

The Wildlife Section (5.2.5) does not discuss mercury contamination. There are a number of fish- or aquatic invertebrate-eating species [such as the bald eagle (state listed and protected by federal law), otter, and wood turtle (state listed), and various amphibians] that may be impacted by increased methyl mercury in the food web. The only fish-eating non-fish species considered in the PSDEIS is humans. Similarly the Aquatic Species Section (5.2.6) does not discuss direct health impacts to aquatic species due to mercury contamination. Presumably, these omissions are due to the fact that the PSDEIS concludes that mercury methylation in the watershed will actually be reduced due to reduced sulfate releases, mercury adsorption to tailings, and minimal resulting water level fluctuations. But, we do not accept these conclusions (see Comments 2, 3 and 4 in this document).

Comment 12

The PSDEIS dismisses the possibility of waterfowl and waterbirds utilizing the tailings basin despite the fact that common waterfowl and waterbirds have been observed at the LTVSMC tailings basin during migration (Section 5.2.5.2.3). We believe that this is a possibility and that it represents a significant potential pathway of mercury exposure to these individuals. The rationale given for the conclusion in the PSDEIS is that states this is not an issue because the tailings basin is <0.01% of the available open water in the area and because it does not contain any high quality foraging habitat. One aspect of this issue not considered is that wetlands will be constructed over the East Pit and adjacent to the tailings basin. If these wetlands are properly constructed they will represent potential waterfowl and/or waterbird habitat that is likely to result in increased mercury exposure and bioaccumulation (see Comment 5 of this document).

Comment 13

PSDEIS states there will be effects on flow in the Partridge R. and Embarrass R. tributaries, but that they are not expected to influence habitat (Section 5.2.6). We feel that the water level fluctuations may be sufficient to impact habitat (see GLIFWC hydrology attachment for comments on water fluctuations). Habitat alteration is likely to lead to changes in species composition or relative abundance. This in turn has an impact on food availability and the structure of the food web. Mercury bioaccumulation is highly influenced by the structure and length of the food web. Therefore, the project has a reasonable potential to impact mercury food web dynamics with the possibility of ultimately causing increased mercury levels in fish and exposure to fish-eating humans and wildlife.

Comment 14

Many lakes and rivers in the area are classified as "impaired waters" by the MPCA due to elevated fish mercury. All additional increases in mercury contributions to the environment therefore constitute a risk to human and ecosystem health. There are a number of aspects of the proposed action cited in the PSDEIS that will lead to increased mercury releases to the environment, increasing human and ecosystem risk. For example:

- There will be a predicted net increase in mercury loading to Embarrass River (22.3 to 22.9 g/year) due to redirection of flow and construction of east dam (Section 5.2.6.22). The PSDEIS concludes that despite this increase in mercury loading, mercury in fish would decrease because of reduced sulfate inputs. We do not agree with the conclusion that sulfate inputs would be reduced by the project in all instances (see Comment 3 of this document).
- There will be estimated air emissions of mercury of 4.6 lbs/yr from plant site (Section 5.2.7.2.5).

These increased emissions are expected to have a measureable effect on mercury levels in fish and the subsequent health risk to recreational and subsistence fishers. This will compound the facts that (1) many sport and subsistence fish species already have mercury concentrations exceeding acceptable threshold criteria, (2) background risk quotients (RQ) for all human populations analyzed already exceed 1, and (3) the mercury levels in the St. Louis River watershed have been deemed high enough that the statewide mercury TMDL will not be sufficient to remove fish consumption restrictions in this region. Therefore, any additional mercury releases to the environment are exacerbating an already unacceptable risk situation in the area.

All increases in mercury releases are contrary to the goals of the 1991 “Binational Program to Restore and Protect the Lake Superior Basin” to establish a Zero Discharge Demonstration Program for nine critical pollutants, including mercury.

Comment 15

According the PSDEIS, the MPCA conducted a review of the NorthMet Project Proposed Action mercury emissions and determined that it will not impede the reduction goals (Section 5.2.7.2.5). The mercury TMDL for the St. Louis River has not yet been established due to insufficient understanding of mercury dynamics in the watershed. It is known that the statewide TMDL is insufficient for reducing mercury to acceptable levels in fish of the SLR. Since there is no SLR mercury TMDL available, the impact of the project’s mercury emissions on reduction goals in the area cannot be adequately assessed.

Comment 16

Increased mercury, especially in fish, could negatively impact cultural resources, especially for local Native American tribes who rely on fish as a major source of subsistence food and who view fishing and fish consumption as vitally important cultural and spiritual activities. This is not acknowledge in the PSDEIS. Further, fish harvest is a treaty reserved right of these tribes. The presence of mercury in fish at levels that restrict consumption threaten the ability of the tribes to exercise this treaty right.

Wild Rice Section

Wild Rice Sulfate Standard

The State of Minnesota has promulgated a 10 mg/l sulfate standard for Wild Rice waters. There is extensive scientific support for the fact that sulfate negatively affects wild rice. Tribal cooperating agencies, the 1854 Treaty Authority, and GLIFWC have commented numerous times on this issue and provided extensive background information to support the need to protect wild rice from sulfate. Additional scientific support is available through the MPCA document *The Sulfate Standard to Protect Wild Rice Study Protocol* (MPCA 2011).

Yet, the PSDEIS, like the 2009 DEIS, continues to prevaricate on the issue of sulfate impacts to wild rice. It is puzzling that this error remains after all the information and perspectives provided to the lead agencies and their contractor.

The point is simply this. A 10 mg/l sulfate standard applies in wild rice waters. All extraneous discussion that attempt to minimize the validity or applicability of that standard should be removed from the PSDEIS.

Seasonal Application of the Sulfate Standard

The MPCA has determined that the 10 mg/l standard can be applied seasonally; essentially during winter months when the plant is not growing. We fundamentally disagree with this interpretation because there is no scientific basis for stating that seed is not affected by high sulfate levels while it lays dormant over the winter or that the effects of high sulfate water would not remain into the summer. It is GLIFWC staff position that the sulfate standard should apply all year.

The PSDEIS states the NorthMet is not seeking a seasonal application of the wild rice sulfate standard. This position is supported by an email from Bill Johnson of the MNDNR dated 6-19-2013 that states “Finally please note that PolyMet is not seeking the application of the seasonal wild rice standard at this time. They intend to meet the 10 mg/l standard year round.” We believe this statement is misleading. The PSDEIS indicates in several sections that the goal is to transition from mechanical water treatment to passive water treatment systems. These passive water treatment systems are described in the Adaptive Water Management Plan v5 (March 2013). Descriptions in the AWMP as well as page 5.5.2-200 of the PSDEIS state:

“The West Pit overflow non-mechanical treatment system would be designed to discharge only during September and October in order to comply with the seasonal sulfate discharge criterion for wild rice downstream of the Mine Site. The 2-month discharge period would result in a higher flow rate and larger treatment system than would be required for continuous discharge.”

The above statement is in contradiction of other sections of the PSDEIS and the MNDNR statements that the applicant is not seeking a seasonal application of the standard. This contradiction should be addressed.

Embarrass River Watershed

Historic Data and Information

We are aware of the MPCA determination on waters that are defined as supporting the production of wild rice. We believe that the process used to inform this determination must incorporate historic information of wild rice presence, abundance and habitat. The following section provides historic information on wild rice that, when viewed in combination with other more recent information, suggests that the Embarrass River produces or has produced wild rice in several areas upstream of the current point of compliance. Therefore, we suggest that the compliance point for the wild rice sulfate standard should be upstream of the current location at all areas where rice is growing.

Manoomin or Wild Rice can be found throughout the Great Lakes but the areas of greatest concentration are in Minnesota and Wisconsin (Figure 1) (Peter David, GLIFWC wild rice biologist, personal communication, Jenks 1901, Moyle 1944, MRC 1969). The areas of greatest concentration, which are defined as wild rice districts by Jenks, encompass lakes and streams within the region covered by glacial outwash. Jenks' description of the wild rice district is often cited in other publications that describe the range of wild rice (GLIFWC, 1999). Jenks provides additional information on wild rice distribution by stating that within the wild rice district, rice is found wherever there is suitable habitat. Specifically:

"Farther south the St. Louis River system tells the same tale – the streams all bear abundant stores of wild rice" (Jenks, 1901, page 1035)

This publication supports the accounts of tribal members from the tribes acting as cooperating agencies for this project. The draft Cultural Landscape Report prepared as part of the Polymet SDEIS dated September 15, 2011 states, "With the potential for wild rice in the shallow margins of lakes and streams, and abundant wild plant, fishing and hunting habitats, portions of the Preliminary Project APE may have been very attractive to the Ojibwe" (pg. 48). That report also includes an account from a Bois Forte tribal member indicating that harvest occurred on the Embarrass River. Another tribal member stated that she knows of a family that harvested wild rice in the vicinity of the LTV tailings dam on the Embarrass River. These specific descriptions would indicate harvest occurring upstream of Embarrass Lake and upstream of Wynne and Sabin Lakes. This supports the notion of abundant wild rice stands in areas where only smaller stands now remain.

Another corroborating piece of information is the presence of a wild rice farm straddling the Embarrass River. This wild rice farm operated from 1957 until 1993 when the operation went bankrupt (Barr, 1995). Aerial Photos taken in the spring of 1991 and 1992 show the flooded rice paddies and some ditches connecting the farm to the Embarrass River (Figure 2). The use of water from the river in the farm operation clearly defines the Embarrass River as used for the production of wild rice. Figure 2 also shows that Unnamed Creek (Labeled Rice Farm Creek in Figure 2) was likely a source of water for the farm. This creek currently originates at the northwest corner of the LTV tailings basin (Figure 3). According to the Clean Water Act (CWA) this use of water for production of wild rice is a designated use. As such, the sulfate standard applies for the Embarrass River.

Wild Rice Habitat

Field data collected by Barr Engineering (Barr, 2011) indicates that mine related sulfate effluent has already impacted the river to the point of exceeding the wild rice standard. The Draft Staff Recommendation does not provide information on how the MPCA considered the existing water quality in its recommendation and to what extent the high sulfate values have already impacted wild rice on the Embarrass River. This basic analysis should be part of describing existing conditions in the PSDEIS. A description of how the issues of wild rice habitat protection and existing elevated sulfate levels in the Embarrass River water were treated in the development of the recommendation is needed. Wild rice in this area is a degraded resource. As such, all remnant populations are in need of protection. This need is further emphasized by the designation of the Embarrass River as impaired in the 2012 draft 303d list (Figure 4)

The current wild rice standard language clearly states that wildlife use of wild rice is an important factor in protecting the plant. It is not clear how MPCA staff determined that the number of wild rice plants upstream of the current point of compliance is not enough to be used as a food source by wildlife. GLIFWC staff is not aware of research that defines the number of plants or the density of a rice bed that would make it usable to blackbirds, muskrat, geese, or other wildlife. A single plant can provide nutrition to wildlife. Furthermore, browsing by wildlife is one of the reasons that wild rice fluctuates in abundance and density from year to year (Peter David, GLIFWC wild rice biologist, personal communication). The variability that is observed in the wild rice survey data on the Embarrass River may well be the result of wildlife use. Finally, Barr Engineering field notes indicate wildlife is using the wild rice stands in the area. These observations of browsing include small stands that are classified in the lowest density and lowest abundance categories (Barr, 2013). This supports the tribal position that all locations where rice is growing should be points of compliance for the 10 mg/l sulfate standard.

Summary and Conclusion.

Based on available information the GLIFWC staff believes that productive wild rice waters on the Embarrass River are where wild rice is currently growing and is confirmed to have been present in the past. The basis for this view is:

- Wild Rice has been present at these locations during at least one of the four survey years (2009 – 2012).
- The wild rice sulfate standard is 10 mg/l. Language attempting to cast doubt of the current applicability of this standard should be removed. Further, there is no scientific support for the seasonal application of the standard.
- Wild Rice is food for wildlife regardless of its density and the observed inter annual fluctuation in abundance of wild rice in the Embarrass River is consistent with the ecology of wild rice. Barr field notes support this position.
- Historic information from tribal sources indicates past harvest in this area and non-tribal sources support the assertion that this is an area where wild rice was found.
- The existence of a rice farm in this area is consistent with the assertion that the Embarrass River water quality was supportive to wild rice prior to mining impacts.
- Wild rice in the Embarrass River endures despite degraded water quality. It is likely that the degraded water quality has decreased the abundance of wild rice in this river.

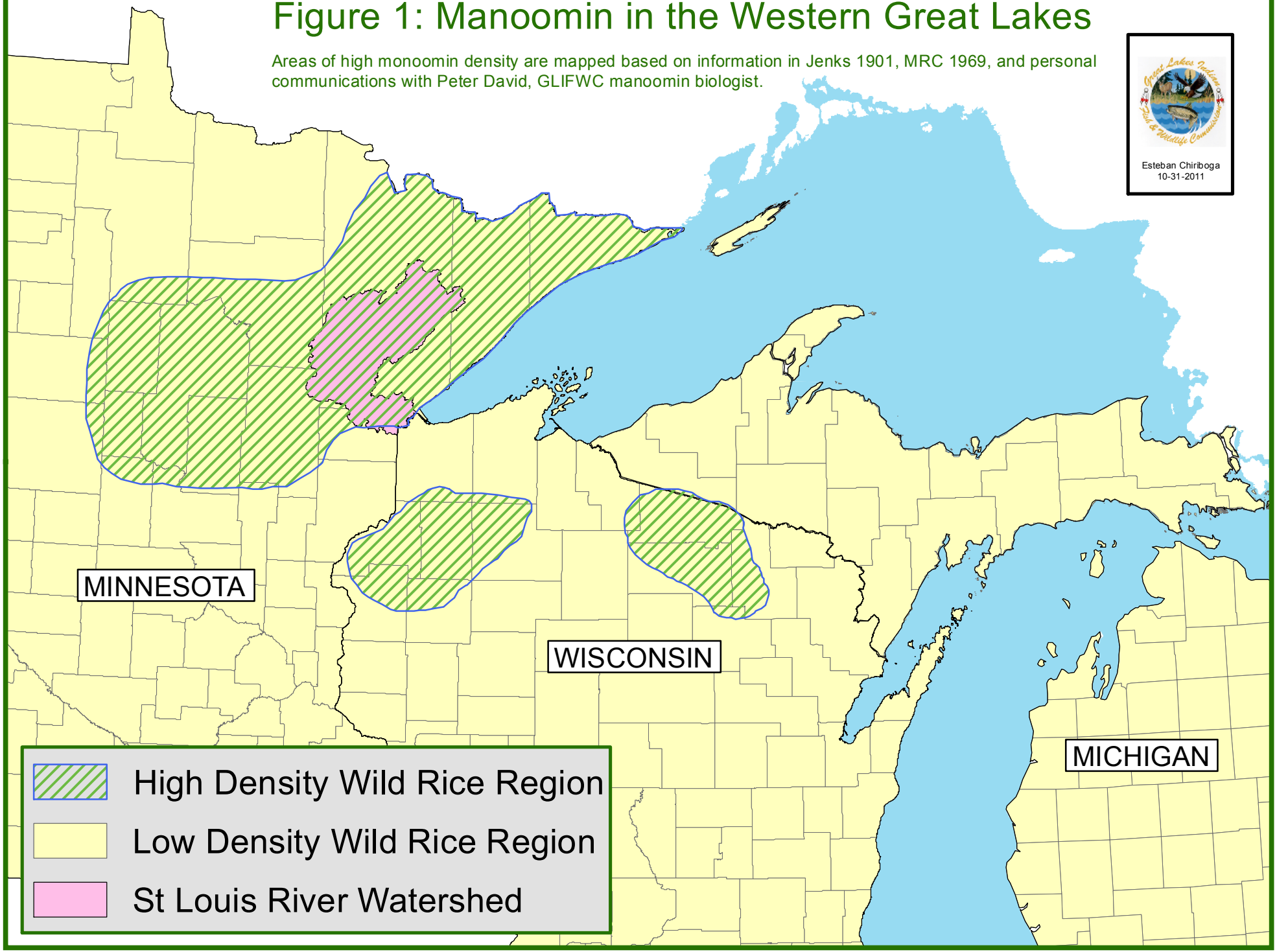
It is important to note that this view is based on current information and field data. Should new information be developed or field data be collected, this view may change.

Sources Cited

- Barr Engineering, 2010 Wild Rice and Water Quality Monitoring Report, January 2011.
- Barr Engineering, Revisions to Wetland Replacement Plan – LTV Steel Mining Company, 1995.
- Barr Engineering, 2009 to 2011 Field Note Observations of Damage to Wild Rice and List of Macrophytes, 2013.
- Draft NorthMet Project Cultural Landscape Study, Landscape Research LLC, 2011.
- GLIFWC, Proceedings of the Wild Rice Research and Management Conference, Carlton, Minnesota, 1999.
- Jenks, Albert Ernest, The Wild Rice Gatherers of the Upper Lakes, Bureau of American Ethnology, Smithsonian Institution, Washington D.C., 1901.
- Moyle, John T., Wild Rice in Minnesota, Journal of Wildlife Management, Vol. 8 No. 3, 1944.
- Minnesota Resources Commission (MRC), A Study of Wild Rice in Minnesota, Staff report by F. Robert Erdman, 1969.

Figure 1: Manoomin in the Western Great Lakes

Areas of high monoomin density are mapped based on information in Jenks 1901, MRC 1969, and personal communications with Peter David, GLIFWC manoomin biologist.



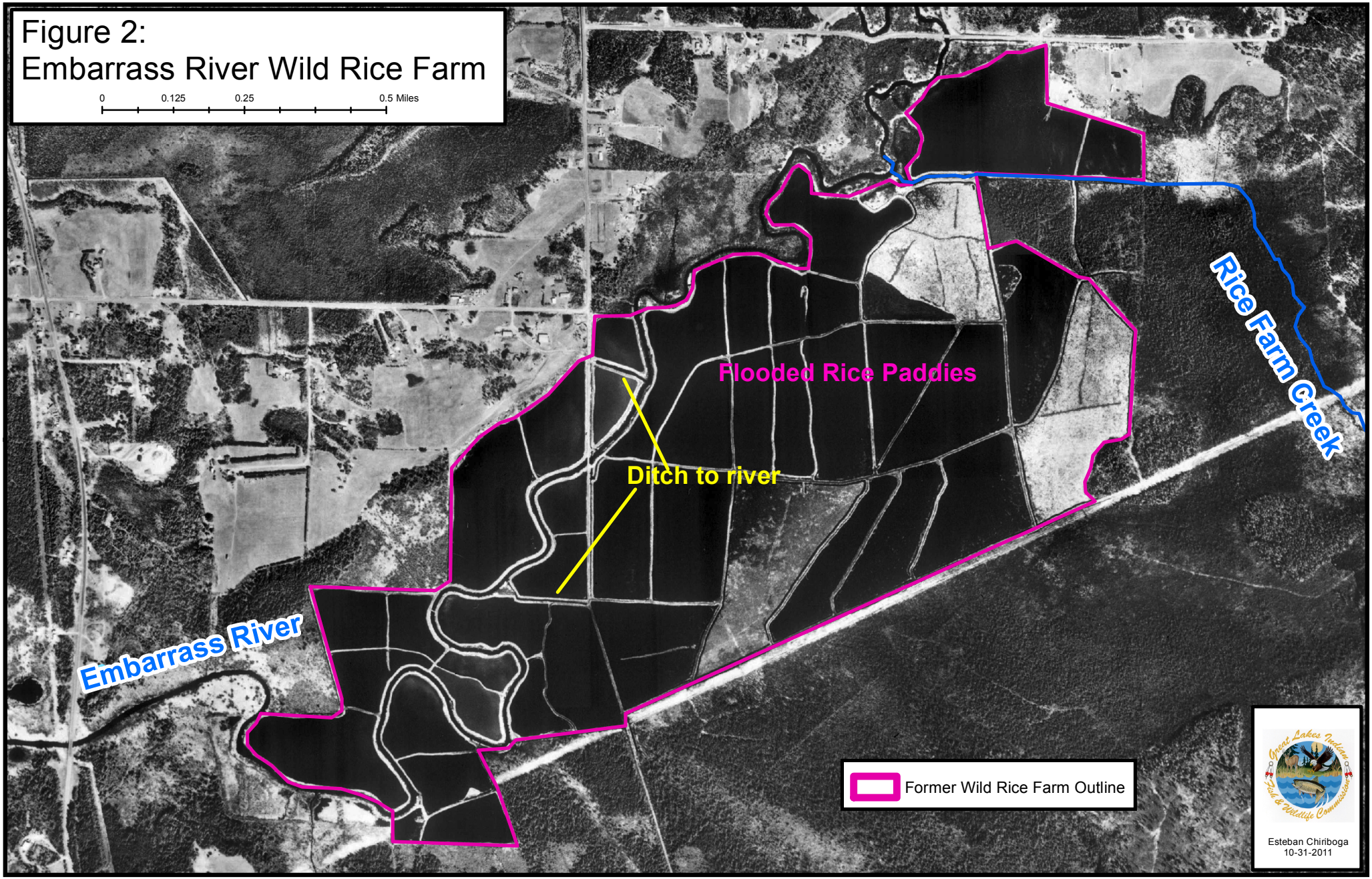


Figure 2:
Embarrass River Wild Rice Farm
0
0.125
0.25
0.5 Miles
Flooded Rice Paddies
Ditch to river
Rice Farm Creek
Embarrass River
Former Wild Rice Farm Outline
Esteban Chiriboga
10-31-2011

Fig 3: Proposed Polymet Mine: Upper Embarrass River Wild Rice

0 1 2 4 Miles

Barr Wild Rice data - 2009- 2012

Former Wild Rice Farm

Embarrass River

Trimble Creek

Unnamed Creek

Kaunonen Lake

Ridge Creek

Heikkilla Lake

Rice Farm Creek

Unnamed Creek

Spring Mine Creek

Embarrass River

Hay Lake

Sabin Lake

Wynne Lake

Embarrass Lake

Second Creek

Unnamed Creek

Unnamed Creek

First Creek

Longnos

Wetlegs Creek

Railroad

Pipeline

Public Waters - Rivers

Public Waters - Lakes

Tailings Basin Area

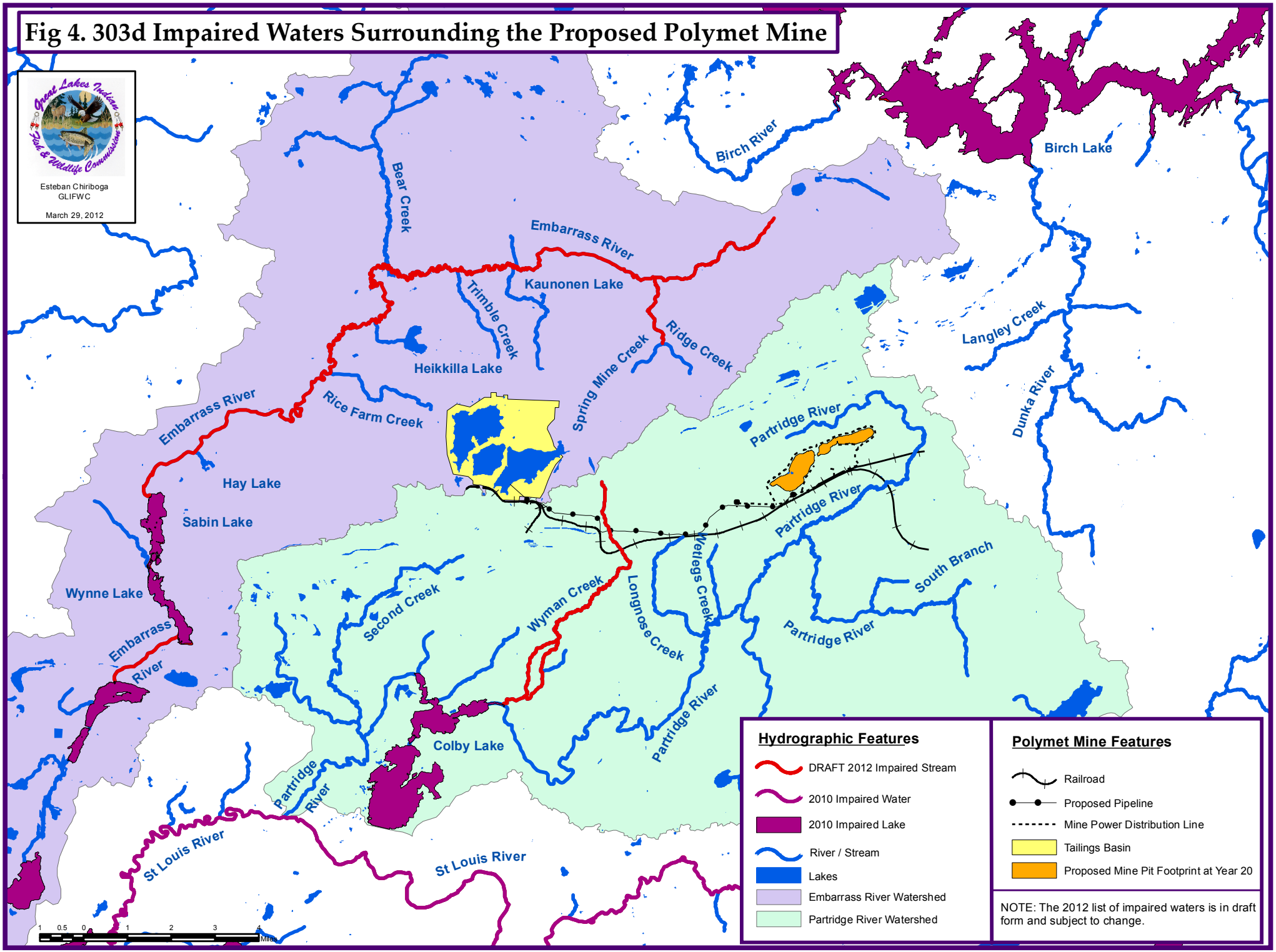
Polymet Mine Project Area

Existing Mining Features

Great Lakes Indian Fish & Wildlife Commission

Esteban Chiriboga
6-17-2013

Fig 4. 303d Impaired Waters Surrounding the Proposed Polymet Mine



Underground Mine and West Pit Backfill Alternatives

GLIFWC staff believes that the underground mine and west pit backfill alternatives have been prematurely eliminated from consideration in the PSDEIS for the NorthMet project. We believe that there is potential for significant environmental benefits to these alternatives when compared to the proposed action. This document will provide questions and discussion on each of these alternatives. However, we believe that these alternatives are related to one another in terms of the issue of inferred ore deposits at depth and foreseeable future actions at this site. This issue impacts the accuracy of information in the PSDEIS and is discussed below.

Underground Mine Alternative

The Underground Mining Alternative Assessment for the NorthMet Mining Project and Land Exchange Environmental Impact Statement document dated February 5th 2013 provides the lead agency rationale for eliminating the alternative from further analysis in the SDEIS. The document states that for an alternative to be evaluated it must meet 5 screening criteria:

1. be technically feasible
2. be available
3. offer significant environmental benefits over the proposed project
4. meet the purpose and need
5. be economically feasible

The lead agency position paper correctly states that the underground alternative would offer significant environmental benefits over the proposed action. In some areas these benefits would be substantial. The roughly 1000 acre wetland fill could be almost completely eliminated and the amount of tailings and waste rock generated by the project would be significantly reduced. The water quality and quantity impacts on surface and groundwater would be mitigated. This is particularly important given the probability that the NorthMet project will violate water quality standards and the certainty that the project would require perpetual water treatment. In addition to the environmental benefits the document correctly states that underground mining is technically feasible and available at the site. It is important to note that with underground mining the land exchange with the Superior National Forest would not be needed therefore environmentally sensitive areas like the 100 mile swamp and essential Lynx habitat would remain in the federal estate.

The only rationale that is used to eliminate the alternative is economic feasibility. All other objectives of the purpose and need statements in section 1.3.2.1 of the PSDEIS are met. Therefore, the question on further analysis is determined by the applicants' assessment of the economics of the alternative. This leads to several questions.

Section 1.2 of the Underground Mining Alternative Assessment describes the assessment as a semi-quantitative screening analysis. Section 1.2.2 of the Underground Mine Alternative Assessment states "The information provided by PolyMet was reviewed by technical staff at the MNDNR and was determined to be sufficient for a screening level review of the feasibility of underground mining at the NorthMet Deposit". What is the accuracy of a screening level review? The determination that a project is economic or not necessarily relies on rather detailed analysis. The following are some descriptions of the accuracy that can be expected for different types of analysis:

- **Conceptual Studies - Desktop/Order of Magnitude:** Conceptual/Strategic studies are conducted early in the project life cycle to assist exploration strategy and to identify fatal flaws and development opportunities. These studies are typically used to support the decision to progress to Preliminary Economic Assessment. **Order of Magnitude (+/-50%) estimating accuracy** is typical for this level of study.

- **Preliminary Economic Estimates:** The Preliminary Economic Assessment (PEA) is a scooping-level study which relies on information from disciplines such as geotechnical, environmental, infrastructure and markets in addition to the core inputs from mining, geology and metallurgy. Capital and operating cost **estimates for the project will typically be estimated to +/-30%.**

- **Preliminary Feasibility Studies:** The Preliminary Feasibility Study (PFS) develops the concepts and work completed in scooping-level studies, examines necessary trade-offs or optimizations, and may progress resources into reserves. Multi-disciplinary technical teams will improve the accuracy of capital estimates through the completion of additional engineering. Disciplines such as geotechnical, environmental, infrastructure and markets are utilized in addition to the core inputs from mining, geology and metallurgy. Capital and operating cost estimates for the project **will typically be estimated to 20-25% overall accuracy.** Engineers and geologists have experience in the completion of Pre-Feasibility Studies and can manage the resources required for such work.

A description of the error term in the economic assessment needs to be developed and clearly explained in the SDEIS.

Section 2.0 of the Underground Mining Alternative Assessment states that the project should "(provide sufficient income to cover: operating capital and other costs with an adequate return to investors). If an adequate rate of return is to be included in the economic feasibility it should be defined. What do the authors ascertain is an adequate return to investors? Is the underground mine alterative excluded because of a net negative return to investors or a positive return that is not deemed adequate? The November 2012 PolyMet power point presented by Douglas Newby projects an after tax Internal Rate of Return (IRR) of 30.6% for the open pit mine. Is the same assumption made for an underground mine?

Section 2.1 discusses the significant environmental and/or socioeconomic benefits. However, no economic data was presented related to the environmental benefits related to the underground mining alternative. For example:

- There is no mention that an underground mine would not require a $4 million land exchange with the United States Forest Service.
- No mention of the economic benefits (environmental goods and services) provided by wetlands
- No mention of the economic impact of perpetual maintenance and water treatment at the site. Of note, there is no discussion on the cost of wetland mitigation activities that are needed with an open pit mine. An underground mine would not require extensive wetlands mitigation costs for wooded swamp and bog sites that could reach between

$35,460,000-$110,205,000 (i.e. 1200 acres x 1.5 rate x $19,700/acre ACOE source and 1200 acres x 1.5 rate x $61,225/acre MN Department of Transportation – (i.e. - Mitigation of Impacts to Fish and Wildlife Habitat: Estimating Costs and Identifying Opportunities, Environmental Law Institute, October 2007, Corps District, St. Paul, Corps District Data Average $19,700 and Wetland Mitigation in Abandoned Gravel Pits, Minnesota Department of Transportation, Research Services, Office of Policy Analysis, Research & Innovation, March 2010, Final Report#2010-11, Executive Summary page 3)

The Underground Mining Alternative Assessment relied heavily on an InfoMine model to determine economic feasibility. However there is no detail on the model itself, the model assumptions or how the model calculates its results. For a complete evaluation of the alternative, a review of this model should have been done by the lead agencies.

Finally, it appears likely that the project as proposed will violate applicable water quality standards. This means that the current proposal is not likely to be permitted. Because of this, it seems reasonable that an underground alternative be considered as an additional mitigation measure.

West Pit Backfill Alternative

Based on the lead agency memorandum titled Co-lead Agencies' Consideration of a West Pit Backfill Alternative dated April 11, 2013 it is clear that this alternative meets the purpose and need, is available, is technically feasible and is economically feasible. The document argues that environmental benefits are unclear. However, because of the screening level analysis used by the lead agencies the full effect of the alternative on the environment is not known. Page 3 indicates that there is no information to determine water quality projections under this alternative. Therefore the primary potential benefit of this alternative is not addressed. Until this information is developed, GLIFWC staff maintain that backfill of the west pit may provide long term water quality benefits. Given that the current project is expected to violate water quality standards, additional mitigation is needed and this alternative should be more fully analyzed.

Inferred Ore Deposits at Depth and Reasonably Foreseeable Future Actions

The proposed NorthMet project proposes to mine a relatively small portion of the ore body. Figure 3.2-10 of the PSDEIS indicates that an upper mineralization zone and a portion of the Unit 1 mineralization are the targets. This mine plan appears to leave behind a substantial portion of ore. GLIFWC staff has argued that the remaining ore could be accessed through underground mining methods. According to the Co-lead Agencies' document "Consideration of a West Pit Backfill Alternative" dated April 11, 2013, a major reason for the development of an open pit mine plan is that there is a lease agreement between PolyMet and the owners of mineral rights immediately southwest of the toe of NorthMet's west pit. These private lease agreements apparently include using the west pit as a portal for future mining activities. In addition, tribal cooperating agencies have provided the lead agencies with power point presentations from PolyMet staff to their investors that tout the potential for future mining of these mineral resources southwest of the west pit.

If the west pit is to be used as a portal for this future mining, then that should be described in the PSDEIS and the environmental consequences assessed. The Evaluation of Backfilling the NorthMet West Pit (December 2012) states on page 2 “mineralization on the western end is much more flat laying, dipping at about 15 degrees and could be developed in the future via expansion of the proposed open pit mining operation and/or underground mining from the base of the west pit.” It appears that the PSDEIS is describing a project that is not complete in that future mining is not included. What are the implications of developing an underground mine that extends from the west pit to surface and groundwater resources of the Partridge River watershed?

Another stated reason for avoiding backfill for the west pit is the lease requirement of not encumbering the mineral resources to the southwest. The lead agencies have also noted this goal in the PSDEIS. The assertion that backfilling the west pit would encumber minerals is ludicrous. We disagree with the notion that the only way to access minerals at depth is through the bottom of the west pit. These minerals could be accessed through other standard underground mining techniques from other locations. In fact, these minerals are accessible now and would continue to be accessible even if the NorthMet project is never built. Taking advantage of an existing pit may provide economic benefits to a mining company but it is unclear why a regulatory agency would prefer this method without first conducting an analysis. If the lead agencies are taking the position that the preferred alternative of a future underground project includes a portal through the west pit, then they need to provide a scientifically defensible reason for that decision.

Finally, the titled Co-lead Agencies’ Consideration of a West Pit Backfill Alternative dated April 11, 2013 provides several reasons for the conclusion that backfill would not provide significant environmental and socioeconomic improvements over the proposed action. Page 3 of the document clearly states that there has been no analysis done to support these conclusions.

It appears that economic considerations of a future mine expansion are the only concrete reasons for not conducting an analysis of the environmental and socioeconomic benefits of backfilling the west pit. The NorthMet project as proposed is a perpetual maintenance and water treatment facility. It seems logical that every available option that might improve the long term impacts of the project should be explored regardless of the commitments that applicant may have made on their mineral lease. GLIFWC staff suggests that this alternative has been eliminated prematurely and that a full analysis is needed.

GLIFWC Wetlands Attachment

Analysis of Indirect Wetland Impacts from Groundwater Drawdown

Enclosed please find an analysis of indirect impacts to wetlands due to drawdown at the NorthMet mine site developed by the Great Lakes Indian Fish and Wildlife Commission (GLIFWC). GLIFWC is an intertribal agency exercising delegated authority from 11 federally recognized Ojibwe (or Chippewa) tribes in Wisconsin, Michigan and Minnesota.[1] Those tribes have reserved hunting, fishing and gathering rights in territories ceded in various treaties with the United States. GLIFWC's mission is to assist its member tribes in the conservation and management of natural resources and to protect habitats and ecosystems that support those resources.

As you know, the proposed Polymet mine is located within the territory ceded in the Treaty of 1854. GLIFWC member tribes have expressed concern about the potential impacts of sulfide mining, whether those impacts occur within the 1854 ceded territory, in the 1842 ceded territory, which includes portions of Lake Superior, or the 1837 ceded territory. The following analysis is submitted by GLIFWC staff with the explicit understanding that each GLIFWC member tribe or any other tribe may choose to submit analysis and information from its own perspective.

Potential impacts to wetlands due to groundwater drawdown at the NorthMet mine site are described in the NorthMet Project Wetland Data Package Version 7 dated March 1, 2013 and summarized in the 2013 PSDEIS. Potential impacts due to drawdown are assessed using an analog method where information from another site is used to provide a best guess as to how wetlands surrounding NorthMet might be affected. The data package states that this method came out of the Wetlands IAP process however it does not state that GLIFWC and other cooperating and reviewing agencies have objected to using this method. The objections are detailed in the comments that GLIFWC provided within the IAP process (Attachment A).

GLIFWC continues to believe that the analog method can be informative in the process. We also reiterate that the lead agencies' reliance on analogs as the only source of information to gauge impacts from pit dewatering is not a rigorous approach to impact estimation. However, because of the lead agencies insistence that this method be used in the SDEIS, GLIFWC is providing an independent analysis using information from other mine pits located on the Mesabi Range.

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1 GLIFWC member tribes are: in Wisconsin -- the Bad River Band of the Lake Superior Tribe of Chippewa Indians, Lac du Flambeau Band of Lake Superior Chippewa Indians, Lac Courte Oreilles Band of Lake Superior Chippewa Indians, St. Croix Chippewa Indians of Wisconsin, Sokaogon Chippewa Community of the Mole Lake Band, and Red Cliff Band of Lake Superior Chippewa Indians; in Minnesota -- Fond du Lac Chippewa Tribe, and Mille Lacs Band of Chippewa Indians; and in Michigan -- Bay Mills Indian Community, Keweenaw Bay Indian Community, and Lac Vieux Desert Band of Lake Superior Chippewa Indians.

Analog Data Used

- Randal Property Wells T3 and T4 (Source: Crotteau, 2013), Rhino and Highway 7 wells in the vicinity of the Canisteo pit. (Source: Adams and Liljegren 2011)
- MNDNR observation well, in the vicinity of Hibtac pits (Source: Crotteau, 2013).
- Dom-ex and Pinto wells north of Hibbing in the vicinity of Hibtac (Source: Crotteau, 2013).
- Keewatin City wells #1 and #2 in the vicinity of the Keetac pit (Source: Liesh and Associates Technical Memorandum, 2009).

Contour lines showing the analog well information in relation to the proposed NorthMet mine site are provided in Figure 1.

Wetland Analog Impact Zones and Significance Criteria

GLIFWC objections to the impact zones developed by the lead agencies are presented in Attachment A. We believe these distance zones are somewhat arbitrary and continue to have concerns regarding their use. Despite these concerns, we are using similar impact zones so that the results we present can be compared to the analysis that in presented in the NorthMet Project Wetland Data Package Version 7.

GLIFWC impact zones (Figure 2) are:

- Zone 1 – 0 to 1000 feet from the mine pit edge.
- Zone 2 – 1000 to 2000 feet from the mine pit edge.
- Zone 3 – 2000 to 5000 feet from the mine pit edge.
- Zone 4 – 5000 to 10000 feet from the mine pit edge.

For impact assessment, this analysis applies the significance criteria outlined in large table 8 of the NorthMet Project Wetland Data Package Version 7. However, GLIFWC does not automatically exclude wetlands that have been classified as ombotrophic in the data package from being considered impacted by drawdown. Literature indicates that ombotrophic wetlands can and are impacted by drawdown. Several studies document vegetation changes at ombotrophic bogs in Finland (Murphy et al, 2009, Grootjans et al 2009, Jaatinen et al 2006, Vassander 1995). In general, groundwater drawdown beneath these ombotrophic bogs leads to increases in the root mass of woody vegetation species as well as greater dominance of woody species at the surface. The functions and values changes resulting from the drawdown induced change in vegetation in ombotrophic bogs are not characterized in the PSDEIS.

The analysis in the NorthMet Project Wetland Data Package Version 7 relies on surface observations of plant communities to classify bog wetlands as ombotrophic or minerotrophic. GLIFWC agrees that this is useful information but we maintain that it is not a substitute for detailed understanding of the relationship of the water table and wetlands at the site. NorthMet Project Wetland Data Package Version 7 states that hydraulic conductivity in the unconsolidated deposits around the mine site can range between 0.012 to 31 feet per day. This range of values indicates that substantial water movement within the aquifer can occur. Therefore unless there is information on whether the unconsolidated deposits that underlie wetlands are saturated or not it

is not possible to know the degree to which groundwater supports wetland hydrology. Despite the assumption in the wetlands section of perched conditions for over 50% of wetlands at the mine site, Section 4.2.2-5 of the PSDEIS states that saturated conditions exist within the unconsolidated deposits and the underlying bedrock. It also states that recharge to the bedrock comes from leakage from the overlying surficial aquifer. Given these statements describing vertical movement of water in the mine site area, it does seem reasonable to also assume a vertical hydrologic connection between ombotrophic wetlands and the surficial aquifer.

The data package and PSDEIS assume that wetlands deemed to be ombotrophic are not connected to groundwater and therefore are not impacted by drawdown. This assumption is based mostly on plant lists and surface observations. We believe that this assumption is not supportable. Instead, GLIFWC assumes that there is at least a partial connection between ombotrophic wetlands and groundwater. Therefore, if groundwater under these "perched" wetlands is drawn down by several feet, this new head pressure would lead to impacts to the wetlands because of a "bathtub effect". In other words, water would seep out of ombotrophic wetlands in areas where there is a hydrologic connection to the saturated layer. This assumption is the support for assigning significance criteria for Deep Mersh/Shallow Marsh and Open bog wetlands for the Crandon project. It is this project that is the basis for the significance criteria used in the PSDEIS (large table 8 of the NorthMet Project Wetland Data Package Version 7).

Finally, the data package ignores the fact that the proposed NorthMet pits would be over twice the depth of a typical pit located up on the Mesabi Range and double the depth of the Canisteo pit analog. Thus the hydrologic effects on the surrounding aquifer will likely be greater for the NorthMet project.

Zone 1 Impacts (0 – 1000 Feet)

Wetlands within Zone 1 are depicted in Figure 3. Information provided by MNDNR Mining Hydrologist Michael Crotteau indicates that 2 wells at the Randall property (Wells T3 and T4) were artesian before a drain tile was installed to reduce groundwater levels in the area. This indicates a strong hydrologic connection between these wells and the Canisteo pit approximately 700 feet from the edge of the pit (Figure 4). The basement of the Randall residence was built when the Canisteo pit was dewatered is at an elevation of 1300 feet above sea level. The surface elevation at the site is 1310.73 feet above sea level. This indicates at least an 8 to 10 foot increase in the elevation of the water table 792 feet away from a reflooded Canisteo pit.

Based on these analog wells, a drawdown of up to 10 feet could affect wetlands in zone 1. We believe it is reasonable to assume that 5 to 10 feet of drawdown would occur throughout zone 1. In addition, these wetlands are often remnants of wetlands directly impacted by the pits and stockpiles, are surrounded by roads and ditches, and directly border the pits. Therefore, all wetlands in zone 1 are assessed as severely impacted (Table 1).

UNIQUE ID	EGGERS & REED CLASS	ACRES	IMPACT	IMPACT DESCRIPTION
24	Alder thicket	5.920	Severe	Conversion of wetland type
33A	Alder thicket	142.927	Severe	Conversion of wetland type
43	Alder thicket	7.456	Severe	Conversion of wetland type
44	Alder thicket	14.704	Severe	Conversion of wetland type
45	Alder thicket	159.903	Severe	Conversion of wetland type
51	Alder thicket	5.542	Severe	Conversion of wetland type
52	Alder thicket	18.113	Severe	Conversion of wetland type
53D	Alder thicket	39.376	Severe	Conversion of wetland type
100	Coniferous bog	981.692	Severe	Possible conversion of wetland type
101	Coniferous bog	60.631	Severe	Possible conversion of wetland type
103	Coniferous bog	174.579	Severe	Possible conversion of wetland type
107	Coniferous bog	126.238	Severe	Possible conversion of wetland type
25	Coniferous bog	20.965	Severe	Possible conversion of wetland type
32	Coniferous bog	73.745	Severe	Possible conversion of wetland type
48	Coniferous bog	190.986	Severe	Possible conversion of wetland type
62	Coniferous bog	1.782	Severe	Possible conversion of wetland type
76	Coniferous bog	22.181	Severe	Possible conversion of wetland type
77	Coniferous bog	118.315	Severe	Possible conversion of wetland type
79	Coniferous bog	25.709	Severe	Possible conversion of wetland type
82	Coniferous bog	44.293	Severe	Possible conversion of wetland type
888	Coniferous bog	12.481	Severe	Possible conversion of wetland type
90	Coniferous bog	499.822	Severe	Possible conversion of wetland type
96	Coniferous bog	52.276	Severe	Possible conversion of wetland type
97	Coniferous bog	32.904	Severe	Possible conversion of wetland type
99	Coniferous bog	14.536	Severe	Possible conversion of wetland type
107A	Coniferous swamp	3.090	Severe	Change in vegetation
33B	Coniferous swamp	47.690	Severe	Change in vegetation
68	Coniferous swamp	172.129	Severe	Change in vegetation
72	Coniferous swamp	14.910	Severe	Change in vegetation
13	Deep marsh	54.139	Severe	Conversion of wetland type
20	Sedge meadow	2.237	Severe	Conversion to upland
107B	Shallow marsh	27.922	Severe	Conversion of wetland type
9	Shallow marsh	19.424	Severe	Conversion of wetland type

Table 1. Zone 1 impact assessment.

Zone 2 Impacts (1000 – 2000 Feet)

Wetlands within zone 2 are depicted in Figure 5. The Dom-ex well is located on the north side of the city of Hibbing is 1320 feet from the nearest dewatered pit at Hibtac. According to Mr. Crotteau this well experienced a drop of 3.07 feet in response to pit dewatering. Because wells in zone 3 (discussed below) indicate drawdown values ranging between 1 and 3 feet, and wells in zone 1 indicate dewatering of up to 10 feet, this analysis assumes that drawdowns in zone 2 are on the order of 3 to 5 feet. In addition to drawdown, wetlands in zone 2 are remnants of wetlands directly impacted by the project are surrounded by roads, ditches and other mine features, or have sections in zone 1. These wetlands can also be impacted by aerial deposition of mine related contaminants. The impact assessment for wetlands in zone 2 is outlined in Table 2.

It is important to note that a section of the upper Partridge River is located within Zone 2. Drawdowns of 3 to 5 feet under a river could severely reduce baseflow leading to reductions in flow in the river channel. Reductions in flow could indirectly impact riparian wetlands downstream.

UNIQUE ID	EGGERS & REED CLASS	ACRES	IMPACT	IMPACT DESCRIPTION
100A	Alder thicket	8.275	Moderate to Severe	Change in vegetation to change in wetland type
53D	Alder thicket	802.660	Moderate to Severe	Change in vegetation to change in wetland type
43	Alder thicket	9.150	Moderate to Severe	Change in vegetation to change in wetland type
53	Alder thicket	15.967	Moderate to Severe	Change in vegetation to change in wetland type
100A	Alder thicket	8.210	Moderate to Severe	Change in vegetation to change in wetland type
22C	Alder thicket or Shrub-carr	30.447	Moderate to Severe	Change in vegetation to change in wetland type
315	Alder thicket or Shrub-carr	185.118	Moderate to Severe	Change in vegetation to change in wetland type
100	Coniferous bog	49.041	Severe	Possible conversion of wetland type
48	Coniferous bog	556.958	Severe	Possible conversion of wetland type
62	Coniferous bog	108.797	Severe	Possible conversion of wetland type
80	Coniferous bog	3.138	Severe	Possible conversion of wetland type
86	Coniferous bog	4.866	Severe	Possible conversion of wetland type
88	Coniferous bog	14.561	Severe	Possible conversion of wetland type
100	Coniferous bog	105.174	Severe	Possible conversion of wetland type
104	Coniferous bog	4.747	Severe	Possible conversion of wetland type
90	Coniferous bog	383.229	Severe	Possible conversion of wetland type
773	Coniferous bog	53.424	Severe	Possible conversion of wetland type
888	Coniferous bog	940.711	Severe	Possible conversion of wetland type
77	Coniferous bog	20.517	Severe	Possible conversion of wetland type
552	Coniferous bog	31.210	Severe	Possible conversion of wetland type
61	Coniferous swamp	3.727	Moderate to Severe	Possible changes in vegetation
701	Coniferous swamp	3.968	Moderate to Severe	Possible changes in vegetation
856	Coniferous swamp	74.335	Moderate to Severe	Possible changes in vegetation
22A	Coniferous swamp	9.564	Moderate to Severe	Possible changes in vegetation
53C	Coniferous swamp	28.741	Moderate to Severe	Possible changes in vegetation
48A	Coniferous swamp	7.821	Moderate to Severe	Possible changes in vegetation
57	Coniferous swamp	36.143	Moderate to Severe	Possible changes in vegetation
64	Hardwood swamp	3.290	Moderate to Severe	Change in vegetation to change in wetland type
47	Open bog	2.341	Severe	Change in vegetation to change in wetland type
90A	Open bog	78.350	Severe	Change in vegetation to change in wetland type
22B	Shallow marsh	29.190	Severe	Conversion of wetland type
16	Shallow marsh	3.317	Severe	Conversion of wetland type
22	Shallow marsh	15.372	Severe	Conversion of wetland type

Table 2. Zone 2 impact assessment.

Zone 3 Impacts (2000 – 5000 Feet)

GLIFWC has modified Zone 3 in response to available data (from 2000 to 3500 feet in data package to 2000 to 5000 feet). Wetlands within zone 3 are depicted in Figure 6. The Rhino and Highway 7 wells are 2150 and 2625 feet respectively from the Canisteo pit. In response to reflooding in the pit, the Rhino well responded with a greater than 1 foot increase and the Highway 7 well responded with a greater than 2 foot increase. Two additional wells provide analog information for this zone. First, the Pinto well north of Hibbing is 2112 feet from the nearest active pit shows a drop of at least 3.55 feet in response to pit dewatering. Second, a MNDNR observation well located 4224 feet from the nearest active pit at Hibtac shows a 3.5 foot drop in water level. Attachment B is a slide from a presentation given by Mr. Crotteau outlining the water level drop at this well.

In addition to these wells, the city of Keewatin has been greatly impacted by pit dewatering. Well #2 at approximately 4220 feet from the Mesabi Chief pit dropped 75 feet in response to a 150 foot drop in water levels in the pit. Water levels in Well #1 at approximately 4750 feet from the pit are also correlated with pit dewatering at the pit although the report indicates that the amount of water drop was less than at well #2. The correlations between pit

dewatering and water level drop at the wells were also supported by chemical characterization of the water in the pit (Attachment C).

These two wells are drilled into the bedrock and therefore it is not clear how those large water level drops in bedrock wells are expressed in the surficial aqufer and in wetlands. However, as previously stated, the PSDEIS does document vertical movement of water between the surficial aquifer and the bedrock aquifer. Regardless, this information fits with the analog approach of the lead agencies for NorthMet and illustrates that pit induced groundwater drawdowns can be expected to extend well into zone 3. The analog information suggests that drawdowns of 1 to 3.5 feet can be expected throughout zone 3. The impact assessment for zone 3 wetlands is provided in Table 3.

Zone 3 wetlands on the north side of the mine pits are also subject to impacts related to the dewatering of the Northshore pit. Figure 8 illustrates the possible extent of drawdown impacts at the Northshore pit based on the Hibtac well data provided by the MNDNR Mining Hydrologist Michael Crotteau. This cumulative effect is not included in version 7 of the data package or the PSDEIS. This analysis should be conducted.

It should also be noted that there are wetlands that fall within Zone 3 that have not been delineated by PolyMet. These wetlands should be delineated and the impacts of the combined Northshore and NorthMet drawdown on these wetlands should be assessed by the applicant.

Most of the east west reach of the Partridge River on the north side of the mine pits is within zone 3. As previously suggested, 1 to 3.5 feet of drawdown could be a significant impact to the hydrology of the river. In addition, the City of Kewaatin wells indicate that groundwater drawdown of tens of feet in the bedrock aquifer below the Partridge River are likely. This potential hydrologic impact should be assessed as part of the NEPA process. Finally, reductions in flow to the Partridge River could indirectly impact riparian wetlands downstream.

UNIQUE ID	EGGERS & REED CLASS	ACRES	IMPACT	IMPACT DESCRIPTION
53	Alder thicket	184.092	Moderate	Change in vegetation
53D	Alder thicket	714.287	Moderate	Change in vegetation
54B	Alder thicket	6.040	Moderate	Change in vegetation
54C	Alder thicket	8.015	Moderate	Change in vegetation
58	Alder thicket	372.266	Moderate	Change in vegetation
53D	Alder thicket	1283.309	Moderate	Change in vegetation
55	Alder thicket	15.732	Moderate	Change in vegetation
678	Alder thicket	1.676	Moderate	Change in vegetation
743	Alder thicket	4.750	Moderate	Change in vegetation
744	Alder thicket	10.344	Moderate	Change in vegetation
746	Alder thicket	3.572	Moderate	Change in vegetation
747	Alder thicket	10.027	Moderate	Change in vegetation
749	Alder thicket	99.326	Moderate	Change in vegetation
752	Alder thicket	36.908	Moderate	Change in vegetation
315	Alder thicket or Shrub-carr	2907.52	Moderate	Change in vegetation
565	Alder thicket or Shrub-carr	20.622	Moderate	Change in vegetation
566	Alder thicket or Shrub-carr	63.204	Moderate	Change in vegetation
480	Alder thicket or Shrub-carr	47.863	Moderate	Change in vegetation
555	Alder thicket or Shrub-carr	61.723	Moderate	Change in vegetation
557	Alder thicket or Shrub-carr	31.464	Moderate	Change in vegetation
890	Alder thicket or Shrub-carr	157.349	Moderate	Change in vegetation
106	Coniferous bog	581.72	Moderate to Severe	Change in vegetation
114	Coniferous bog	7.911	Moderate to Severe	Change in vegetation
406	Coniferous bog	26.125	Moderate to Severe	Change in vegetation
48	Coniferous bog	14.142	Moderate to Severe	Change in vegetation
552	Coniferous bog	31.738	Moderate to Severe	Change in vegetation
559	Coniferous bog	229.834	Moderate to Severe	Change in vegetation
562	Coniferous bog	56.744	Moderate to Severe	Change in vegetation
564	Coniferous bog	38.575	Moderate to Severe	Change in vegetation
62	Coniferous bog	20.018	Moderate to Severe	Change in vegetation
714	Coniferous bog	1692.646	Moderate to Severe	Change in vegetation
773	Coniferous bog	33.980	Moderate to Severe	Change in vegetation
774	Coniferous bog	88.486	Moderate to Severe	Change in vegetation
84	Coniferous bog	14.276	Moderate to Severe	Change in vegetation
84A	Coniferous bog	55.627	Moderate to Severe	Change in vegetation
88	Coniferous bog	6.396	Moderate to Severe	Change in vegetation
887	Coniferous bog	1359.301	Moderate to Severe	Change in vegetation
888	Coniferous bog	1123.789	Moderate to Severe	Change in vegetation
90	Coniferous bog	685.002	Moderate to Severe	Change in vegetation
98	Coniferous bog	24.180	Moderate to Severe	Change in vegetation
984	Coniferous bog	162.094	Moderate to Severe	Change in vegetation
105	Coniferous bog	62.495	Moderate to Severe	Change in vegetation
11	Coniferous bog	95.587	Moderate to Severe	Change in vegetation
479	Coniferous bog	157.954	Moderate to Severe	Change in vegetation
558	Coniferous bog	50.111	Moderate to Severe	Change in vegetation
697	Coniferous bog	48.894	Moderate to Severe	Change in vegetation
699	Coniferous bog	23.740	Moderate to Severe	Change in vegetation
713	Coniferous bog	80.451	Moderate to Severe	Change in vegetation
782	Coniferous bog	10.815	Moderate to Severe	Change in vegetation
783	Coniferous bog	20.604	Moderate to Severe	Change in vegetation
949	Coniferous bog	19.484	Moderate to Severe	Change in vegetation
53B	Coniferous swamp	4.626	Moderate	Minor vegetation change
53C	Coniferous swamp	2.275	Moderate	Minor vegetation change
54	Coniferous swamp	44.113	Moderate	Minor vegetation change
54A	Coniferous swamp	34.455	Moderate	Minor vegetation change
54D	Coniferous swamp	17.547	Moderate	Minor vegetation change
553	Coniferous swamp	27.413	Moderate	Minor vegetation change
57	Coniferous swamp	293.943	Moderate	Minor vegetation change
701	Coniferous swamp	1642.996	Moderate	Minor vegetation change
745	Coniferous swamp	143.479	Moderate	Minor vegetation change
81	Coniferous swamp	13.507	Moderate	Minor vegetation change
856	Coniferous swamp	29.496	Moderate	Minor vegetation change
864	Coniferous swamp	1005.134	Moderate	Minor vegetation change
1145	Coniferous swamp	30.313	Moderate	Minor vegetation change
404	Coniferous swamp	137.651	Moderate	Minor vegetation change
53A	Coniferous swamp	25.257	Moderate	Minor vegetation change
53E	Coniferous swamp	20.088	Moderate	Minor vegetation change
554	Coniferous swamp	23.212	Moderate	Minor vegetation change
891	Coniferous swamp	74.816	Moderate	Minor vegetation change

Table 3. Zone 3 impact assessment.

Zone 4 Impacts (5000 – 10000)

Wetlands within zone 4 are depicted in Figure 7. There is no well data that can be used to draw conclusions about mine pit related drawdown in this zone. Based on Zone 3, it is reasonable to assume that 0 to 1 feet of drawdown would occur under wetlands within this zone.

As discussed above zone 4 wetlands on the north side of the proposed mine pits are also subject to impacts related to the dewatering of the Northshore pit (Figure 8).

UNIQUE ID	EGGERS & REED CLASS	ACRES	IMPACT	IMPACT DESCRIPTION
752	Alder thicket	36.908	None	None
53D	Alder thicket	1283.309	None	None
55	Alder thicket	15.732	None	None
58	Alder thicket	235.493	None	None
678	Alder thicket	1.676	None	None
743	Alder thicket	4.750	None	None
744	Alder thicket	10.344	None	None
746	Alder thicket	3.572	None	None
747	Alder thicket	10.027	None	None
749	Alder thicket	99.326	None	None
53	Alder thicket	130.786	None	None
480	Alder thicket or Shrub-carr	47.863	None to Moderate	None to vegetation change
555	Alder thicket or Shrub-carr	61.723	None to Moderate	None to vegetation change
557	Alder thicket or Shrub-carr	31.464	None to Moderate	None to vegetation change
566	Alder thicket or Shrub-carr	35.777	None to Moderate	None to vegetation change
890	Alder thicket or Shrub-carr	157.349	None to Moderate	None to vegetation change
315	Alder thicket or Shrub-carr	1256.836	None to Moderate	None to vegetation change
558	Coniferous bog	50.111	None	None
84A	Coniferous bog	41.351	None	None
11	Coniferous bog	95.587	None	None
105	Coniferous bog	62.495	None	None
90	Coniferous bog	230.686	None	None
479	Coniferous bog	157.954	None	None
559	Coniferous bog	228.822	None	None
564	Coniferous bog	33.827	None	None
697	Coniferous bog	48.894	None	None
699	Coniferous bog	23.740	None	None
713	Coniferous bog	80.451	None	None
714	Coniferous bog	1002.456	None	None
782	Coniferous bog	10.815	None	None
783	Coniferous bog	20.604	None	None
887	Coniferous bog	1128.525	None	None
888	Coniferous bog	90.125	None	None
949	Coniferous bog	19.484	None	None
106	Coniferous bog	451.616	None	None
54A	Coniferous swamp	16.573	None to Moderate	None to minor vegetation change
57	Coniferous swamp	20.917	None to Moderate	None to minor vegetation change
404	Coniferous swamp	137.651	None to Moderate	None to minor vegetation change
553	Coniferous swamp	18.531	None to Moderate	None to minor vegetation change
554	Coniferous swamp	23.212	None to Moderate	None to minor vegetation change
701	Coniferous swamp	852.230	None to Moderate	None to minor vegetation change
745	Coniferous swamp	82.463	None to Moderate	None to minor vegetation change
53A	Coniferous swamp	25.257	None to Moderate	None to minor vegetation change
891	Coniferous swamp	74.816	None to Moderate	None to minor vegetation change
864	Coniferous swamp	901.932	None to Moderate	None to minor vegetation change
1145	Coniferous swamp	30.313	None to Moderate	None to minor vegetation change
53E	Coniferous swamp	20.088	None to Moderate	None to minor vegetation change
899	Open bog	23.039	None	None
83	Open bog	16.555	None	None
83	Open bog	26.414	None	None
885	Open bog	950.076	None	None
889	Shallow marsh	3.279	None	None
17	Shallow marsh	12.072	None	None
1	Shallow marsh	4.560	None	None
3	Shallow marsh	3.808	None	None
6	Shallow marsh	6.654	None	None
29	Shallow marsh	126.876	None	None
708	Shallow marsh	42.189	None	None
709	Shallow marsh	18.496	None	None
NWI	Black Spruce Forest - Undelineated	778.140	Moderate	Change in vegetation

Table 4. Zone 4 impact assessment.

Impacts to Riparian Wetlands along the Partridge River

The applicant and lead agencies have ignored repeated requests by cooperating agencies to better characterize the hydrology of the mine site through a robust surface and groundwater data collection program. Therefore reliable data with which to assess the effects of drawdown in the surficial and bedrock aquifers to riparian wetlands along the Partridge River are not available. Based on pit dewatering induced drawdowns at other sites described in this report, it is reasonable to assume that flow in the Partridge River would be significantly reduced if the NorthMet project proceeds as currently designed. This would have an effect on riparian wetlands far downstream. These effects are highly important because of the potential for increased methylation of mercury that is released by the project. To date, these potential impacts have not been characterized.

Summary

GLIFWC disagrees with the use of the Canisteo pit analog as the only method for estimating drawdown impacts for the NorthMet project. Repeated requests for a robust approach have not been successful. Therefore, this analysis uses the lead agencies own analog approach with data that is not included in the PSDEIS analysis. It is important to note that this analysis also uses the impact criteria developed for the Crandon project in Wisconsin which is the basis for impact criteria in the PSDEIS.

The assumption that ombotrophic bogs are completely separated from the surficial aquifer is not supportable. The extent of the hydrologic connection should be investigated.

Based on GLIFWCs analysis, wetlands severely impacted by drawdown total 3188.62 acres in zone 1; 2458.12 acres in zone 2; and 273.01 acres in zone 3. Severe indirect impacts to wetlands from mine pit drawdown total 5719.75 acres. All wetlands potentially impacted by drawdown are depicted in Figure 9. The Corps should require up front mitigation for all severely impacted wetlands. At a minimum, up front mitigation for all wetlands in zone 1 should be required. Additional up front mitigation should be considered for wetlands that are classified in the moderate to severe category. Robust monitoring is required for wetlands in the moderate category.

Impacts for wetlands suffering the cumulative effect of NorthMet and Northshore projects should be assessed and mitigation required. Un-delineated wetlands south of the Northshore pits should be delineated and included in the analysis. Impacts to riparian wetlands cannot be discounted given the shortcomings of the analog method and the inadequate characterization of surface and groundwater hydrology for the mine site area.

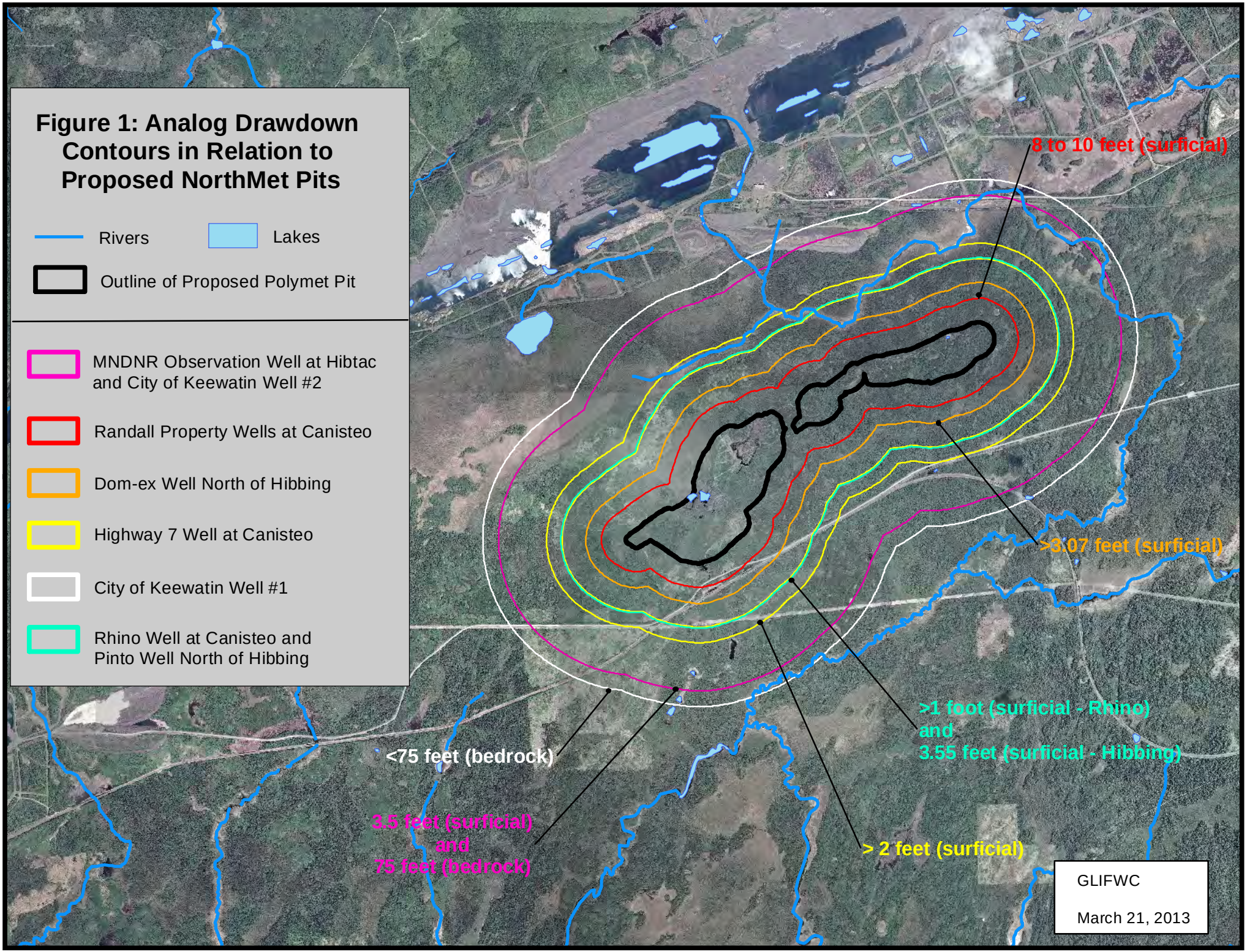


Figure 1: Analog Drawdown Contours in Relation to Proposed NorthMet Pits
Rivers
Lakes
Outline of Proposed Polymet Pit
MNDNR Observation Well at Hibtac and City of Keewatin Well #2
Randall Property Wells at Canisteo
Dom-ex Well North of Hibbing
Highway 7 Well at Canisteo
City of Keewatin Well #1
Rhino Well at Canisteo and Pinto Well North of Hibbing
8 to 10 feet (surficial)
>3.07 feet (surficial)
>1 foot (surficial - Rhino) and 3.55 feet (surficial - Hibbing)
<75 feet (bedrock)
3.5 feet (surficial) and 75 feet (bedrock)
> 2 feet (surficial)
GLIFWC
March 21, 2013

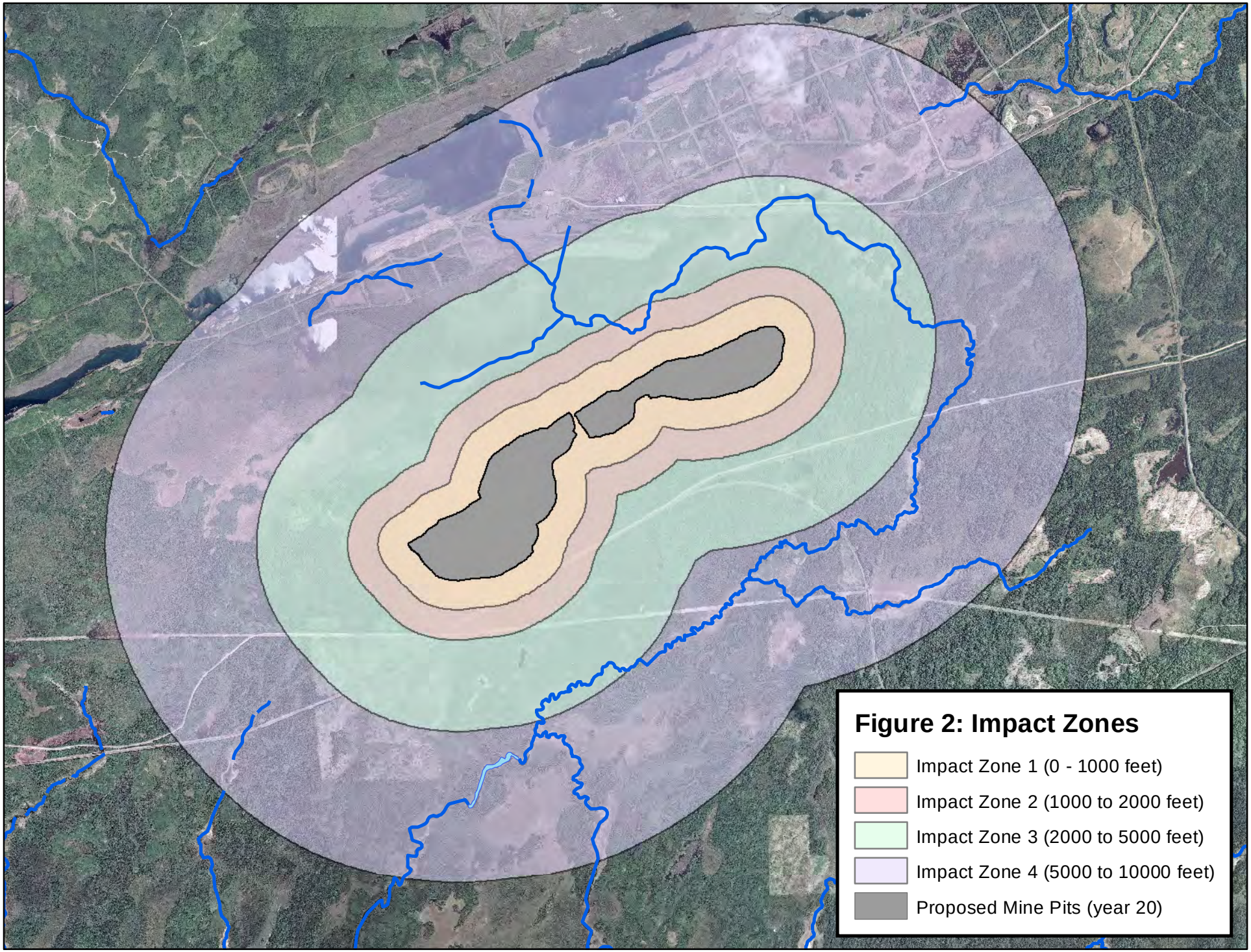


Figure 2: Impact Zones
Impact Zone 1 (0 - 1000 feet)
Impact Zone 2 (1000 to 2000 feet)
Impact Zone 3 (2000 to 5000 feet)
Impact Zone 4 (5000 to 10000 feet)
Proposed Mine Pits (year 20)

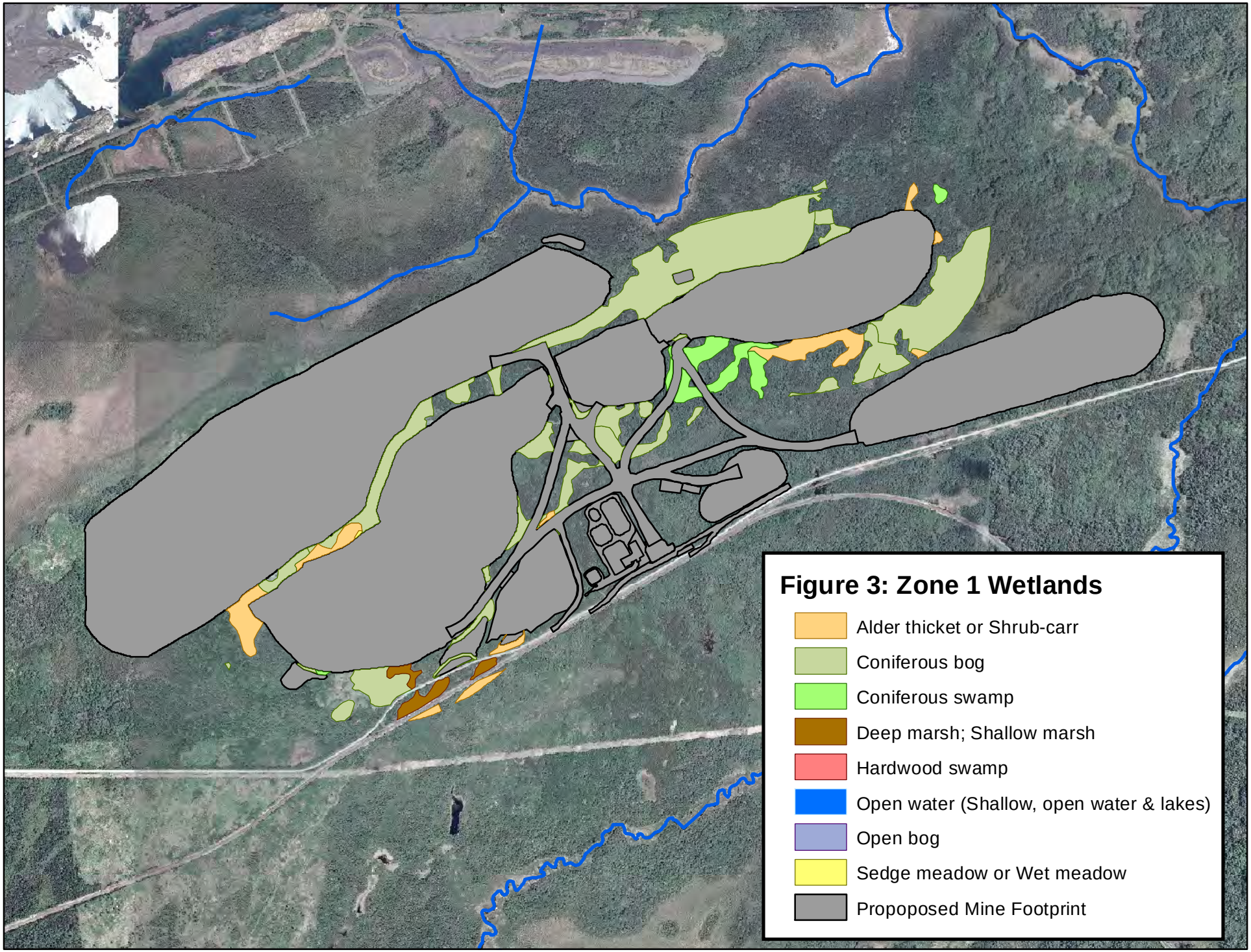
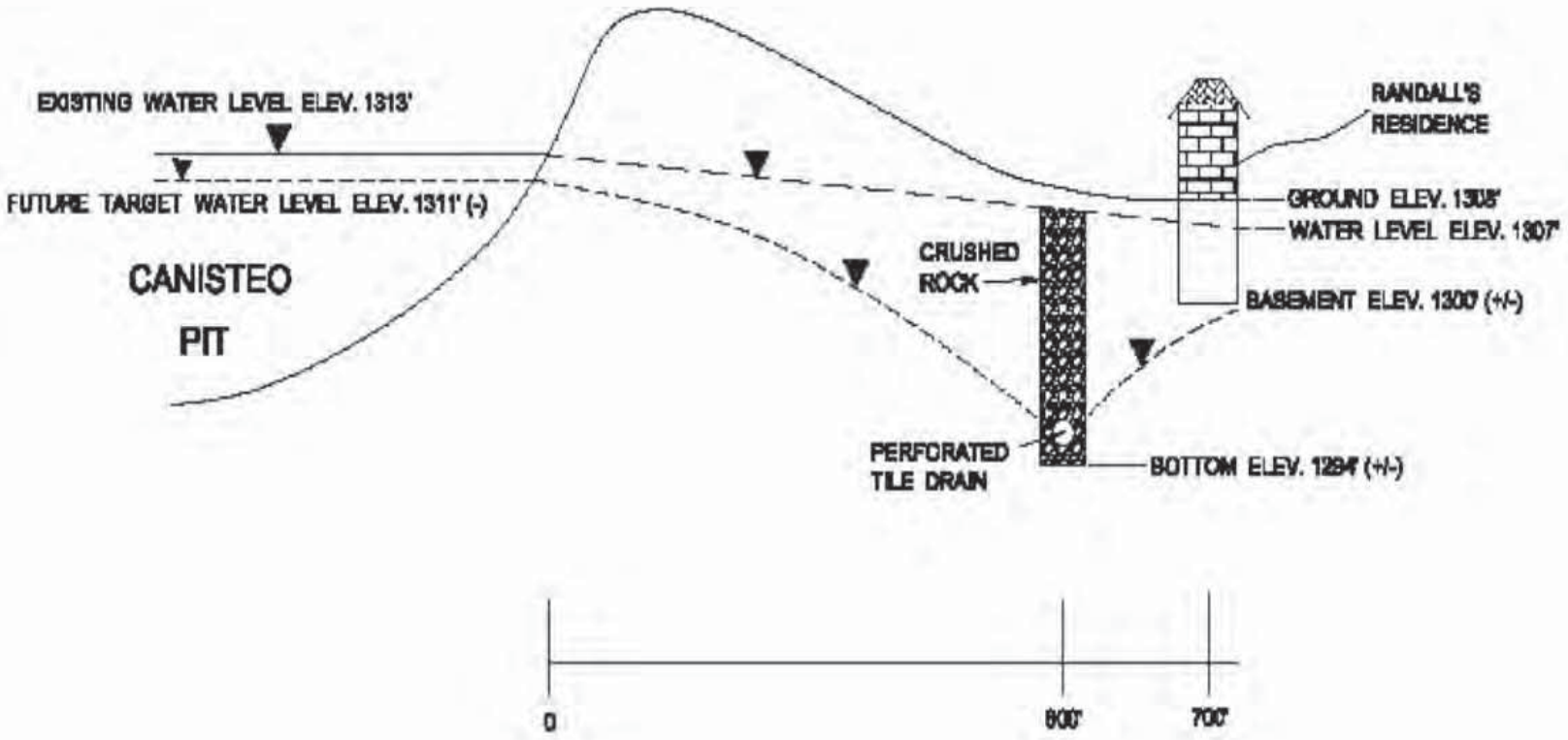


Figure 3: Zone 1 Wetlands
Alder thicket or Shrub-carr
Coniferous bog
Coniferous swamp
Deep marsh; Shallow marsh
Hardwood swamp
Open water (Shallow, open water & lakes)
Open bog
Sedge meadow or Wet meadow
Propoposed Mine Footprint

A

B

Figure 4



DNR Waters

3/2/09

EXISTING WATER LEVEL

FUTURE TARGET WATER LEVEL

NOT TO SCALE

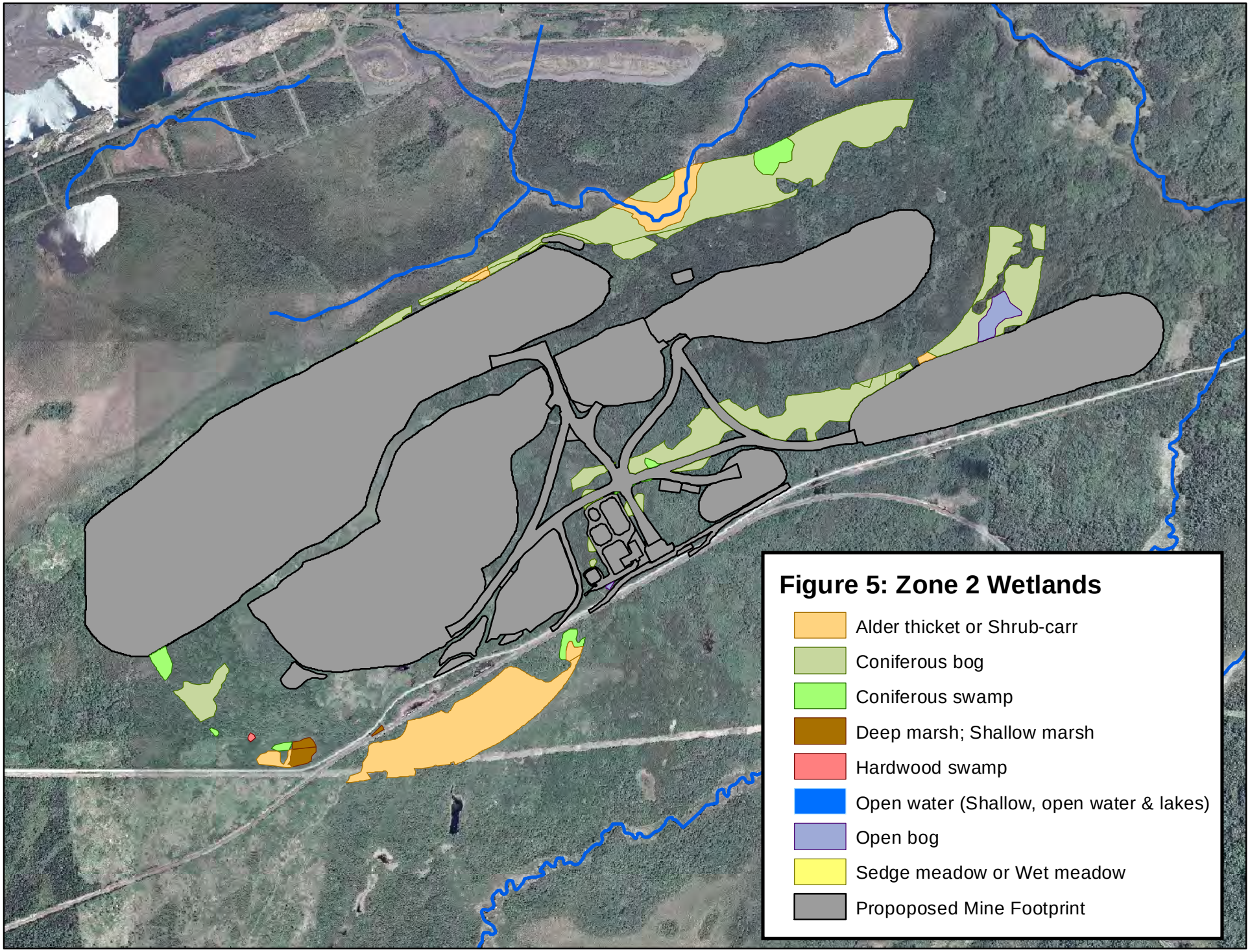


Figure 5: Zone 2 Wetlands
Alder thicket or Shrub-carr
Coniferous bog
Coniferous swamp
Deep marsh; Shallow marsh
Hardwood swamp
Open water (Shallow, open water & lakes)
Open bog
Sedge meadow or Wet meadow
Propoposed Mine Footprint

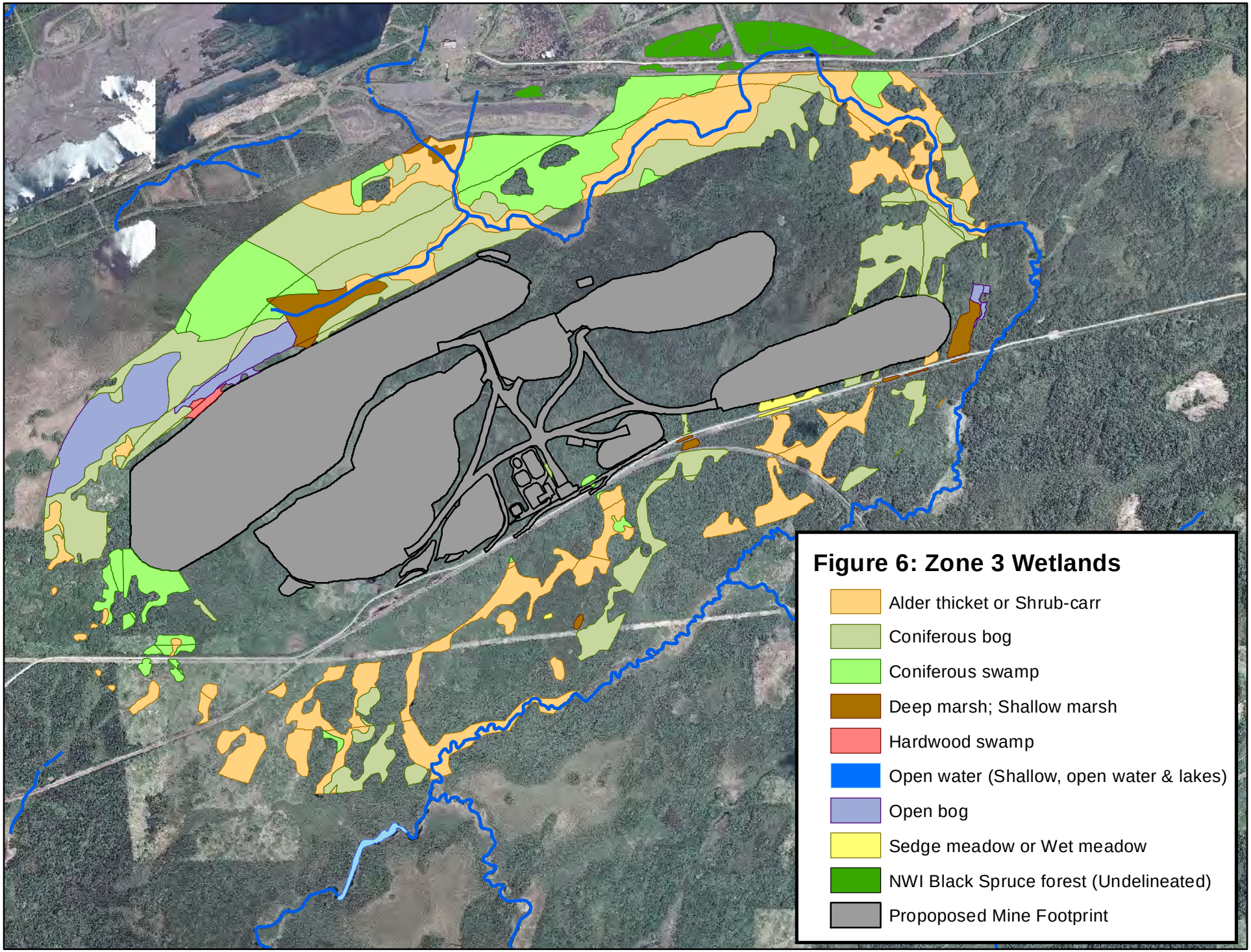


Figure 6: Zone 3 Wetlands
Alder thicket or Shrub-carr
Coniferous bog
Coniferous swamp
Deep marsh; Shallow marsh
Hardwood swamp
Open water (Shallow, open water & lakes)
Open bog
Sedge meadow or Wet meadow
NWI Black Spruce forest (Undelineated)
Propoposed Mine Footprint

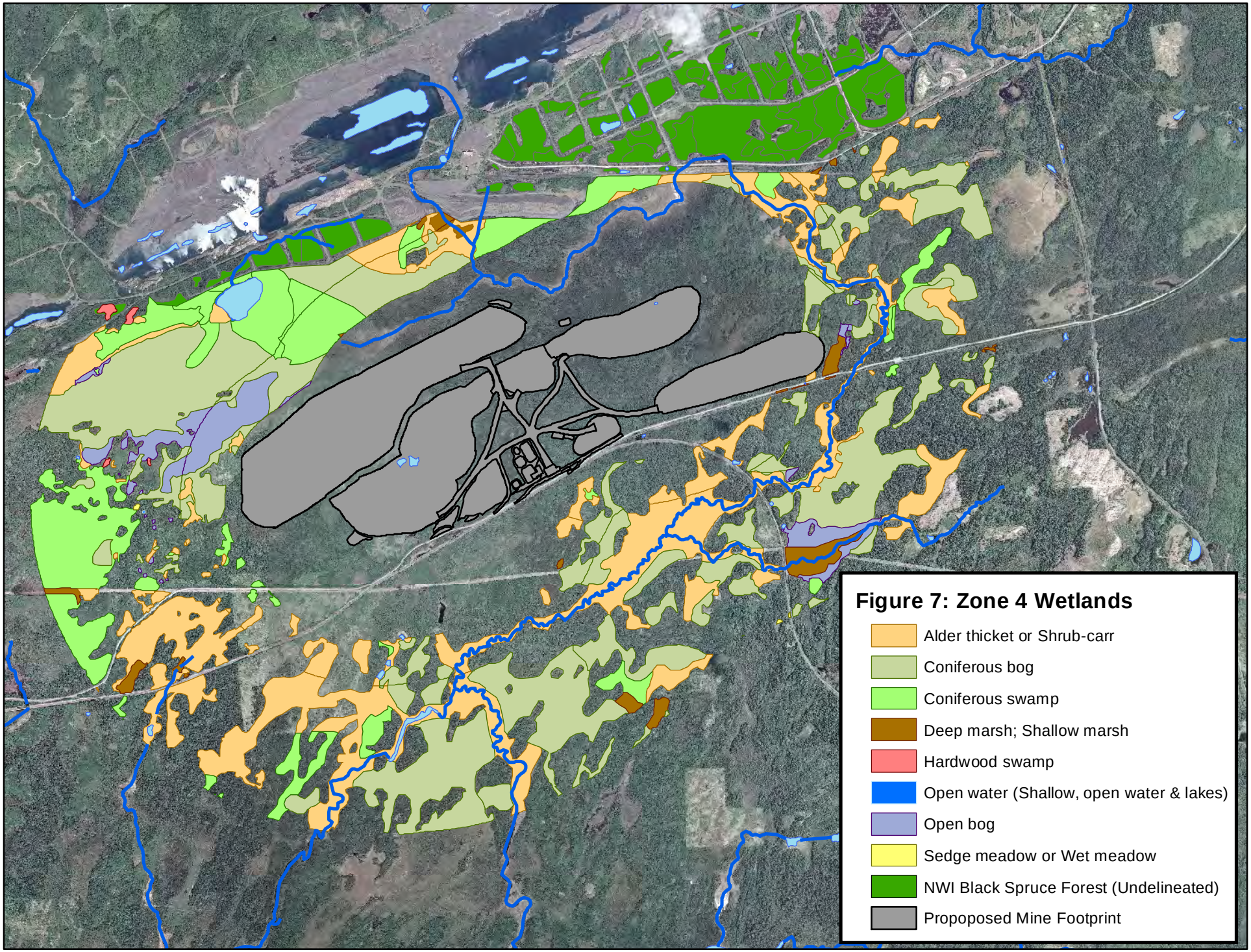
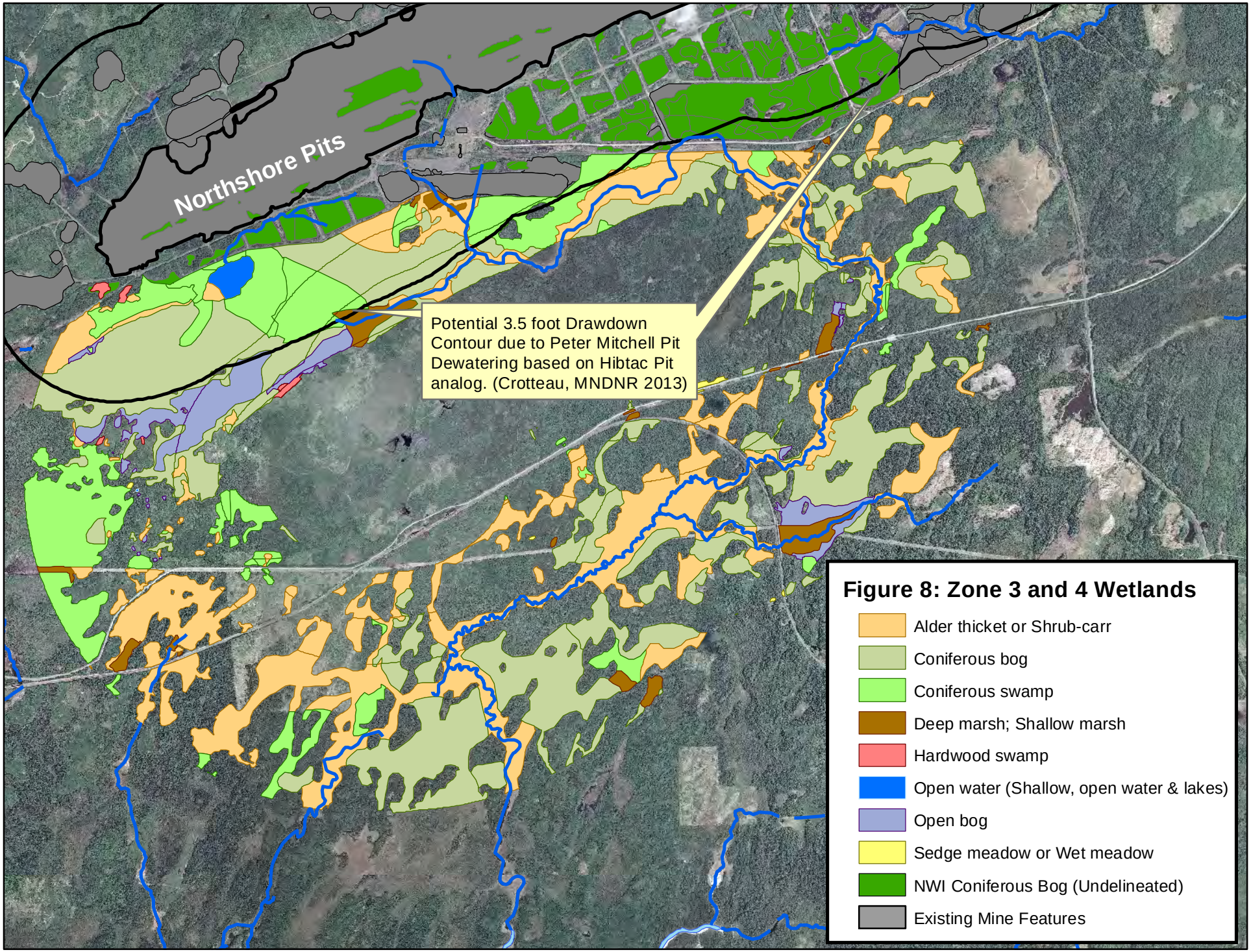


Figure 7: Zone 4 Wetlands
Alder thicket or Shrub-carr
Coniferous bog
Coniferous swamp
Deep marsh; Shallow marsh
Hardwood swamp
Open water (Shallow, open water & lakes)
Open bog
Sedge meadow or Wet meadow
NWI Black Spruce Forest (Undelineated)
Propoposed Mine Footprint


Northshore Pits
Potential 3.5 foot Drawdown Contour due to Peter Mitchell Pit Dewatering based on Hibtac Pit analog. (Crotteau, MNDNR 2013)
Figure 8: Zone 3 and 4 Wetlands
Alder thicket or Shrub-carr
Coniferous bog
Coniferous swamp
Deep marsh; Shallow marsh
Hardwood swamp
Open water (Shallow, open water & lakes)
Open bog
Sedge meadow or Wet meadow
NWI Coniferous Bog (Undelineated)
Existing Mine Features

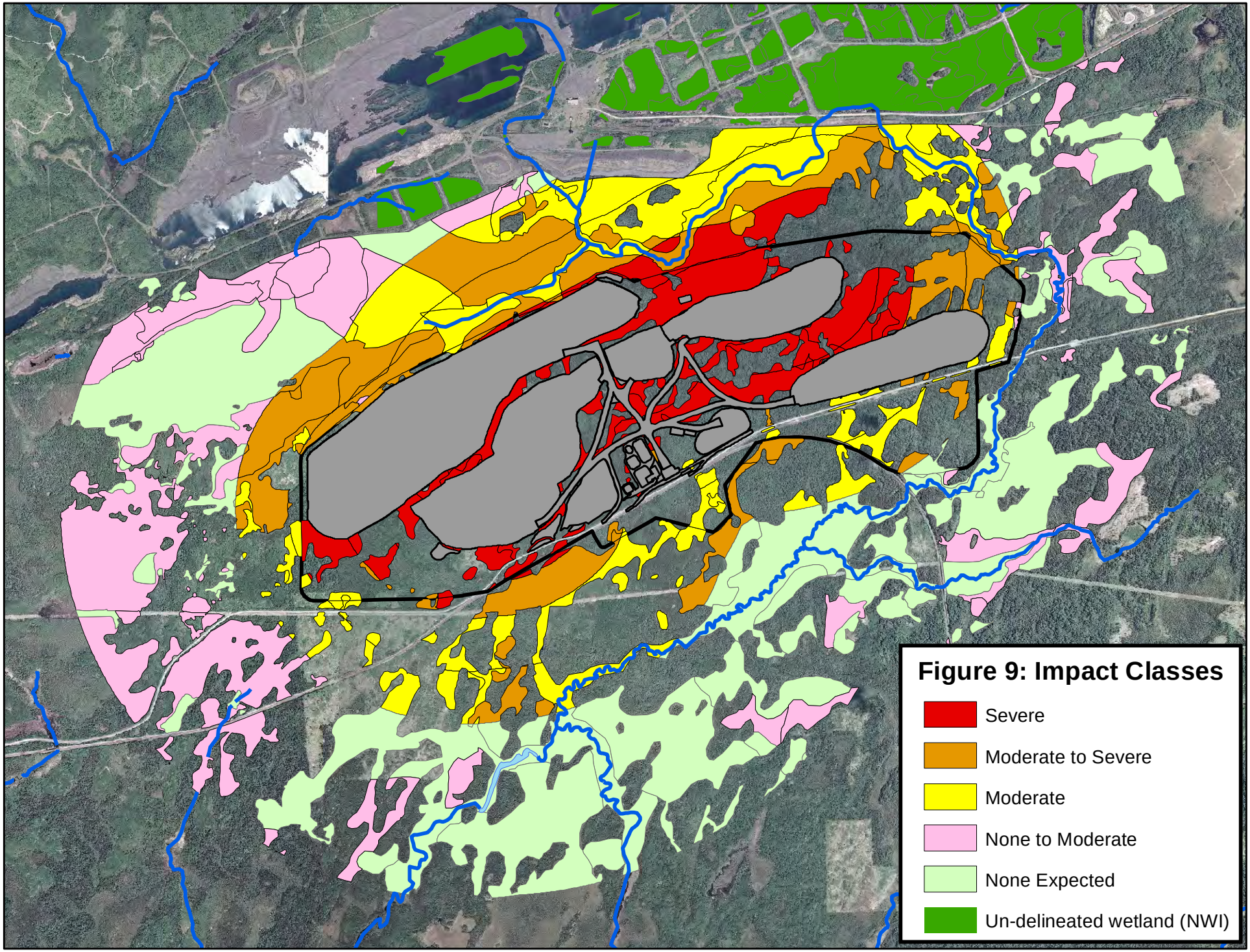


Figure 9: Impact Classes
Severe
Moderate to Severe
Moderate
None to Moderate
None Expected
Un-delineated wetland (NWI)

Attachment A

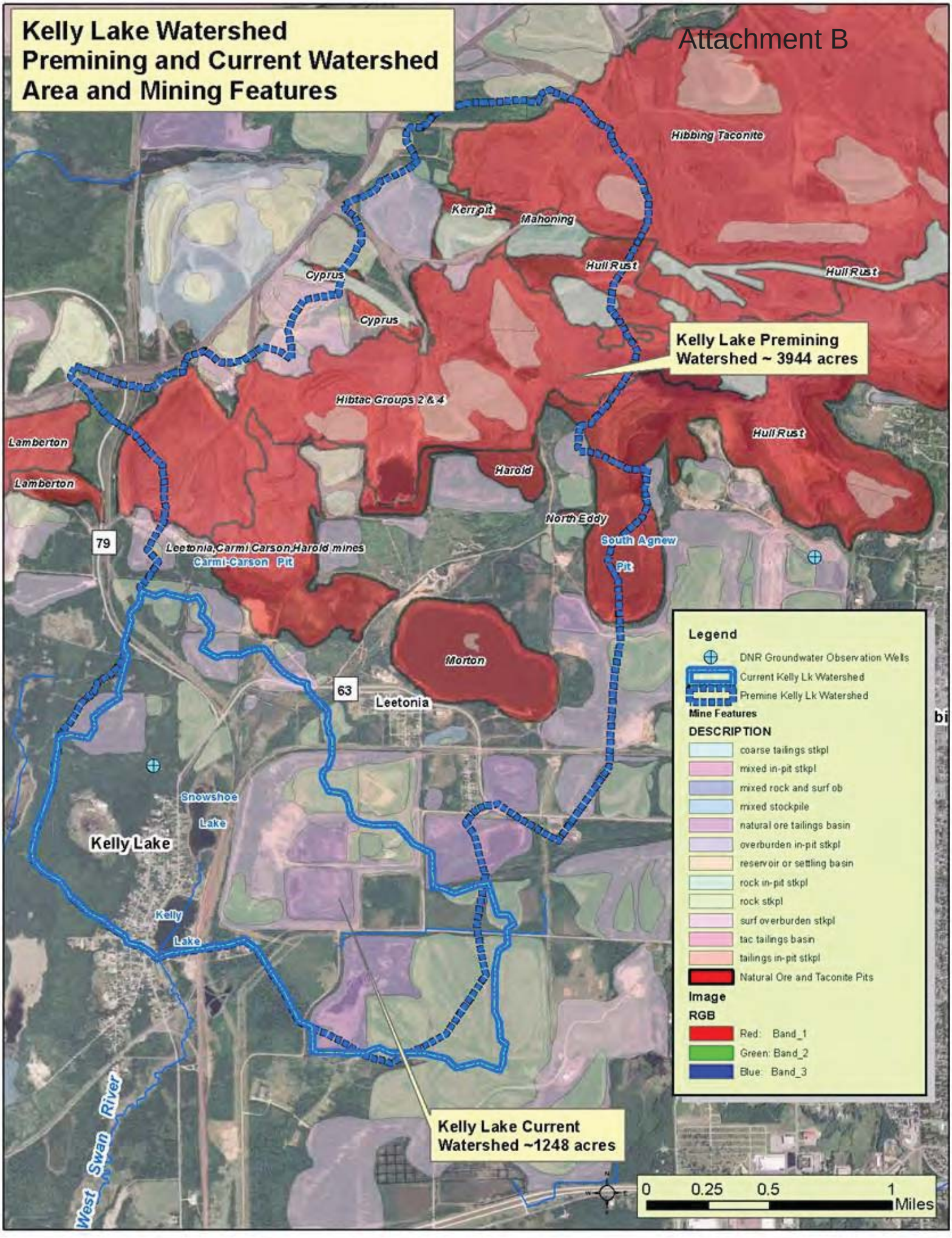
Wetland Resources IAP Draft Summary Memo

Line Number	Comments
	[insert your name]
General Comments (per line number)	
105	The Co-lead position described here is unchanged from the 2009 DEIS. This position is contrary to standard analysis that mining companies have to conduct as part of sulfide mine EIS processes across the country.
118	This characterization requires further detail. According to our meeting notes, the need for a quantitative assessment of drawdown at the mine site was a unanimous position among the tribal cooperating agencies, the EPA, and the Fish and Wildlife Service. This position also received strong support from the PCA. This is why the original request by the wetland workgroup for a quantitative method of assessing drawdown impacts at the mine site was described as a "consensus". This should be clarified in the summary memo. See attached comment letter for additional detail on the groundwater modeling issue.
143	GLIFWC staff concur with Margaret Watkins that the cumulative impact assessment should be conducted for the same area that is used in the cultural resource assessment (Wetland area of potential effect).
148	As discussed during the Wetland IAP call of May 13th 2011, baseline data for water quality in wetlands are essential to this analysis. We support the Corps request that the applicant provide a list of available baseline data that will be assessed for adequacy in describing the existing condition and no action alternative. We request that this be specifically included in the workplan.
PolyMet NorthMet Project Co-Lead Agency Workplan Preparation Guidance for Wetland Assessment General Comments	
032	GLIFWC staff maintains that the analogue method proposed by the Army Corps does not provide sufficient information to base the indirect wetland impact analysis for the entire project.
078	GLIFWC staff believe that the analysis area for cumulative impacts is not adequate. See comment on line 143 of the summary memo. In addition, the cumulative impact assessment should cover topics that were not part of the 2009 DEIS. Climate change in the region is a stressor for wetlands. This additional factor should be assessed. Cumulative impacts of Iron Range mine projects on water quality of wetlands should be described.
085	GLIFWC staff do not agree with the Corps' definition of "reasonably foreseeable project". Several mine projects to the east and northeast of Polymet are likely to be proposed, some as early as this summer. A mining company interested in the Dunka deposit will be installing a stream gauge on the upper Partridge River this spring. Because this project will likely impact some of the same areas as Polymet (Partridge River watershed), this project should be included in the analysis.

090	GLIFWC staff agree that the analogue data prepared by John Adams can be used as part of the indirect impact analysis. We remain concerned that this analysis is being used as the sole data source for the discussion of indirect wetland impacts at the Polymet mine site. As discussed during the wetland IAP call of May 13th 2011, a detailed report that includes all data and assumptions used by John Adams to assess the Canisteo Pit data should be developed and reviewed by the wetlands IAP group. After that review, a determination on the adequacy of the analysis as an analogue to Polymet can be made.
102	GLIFWC staff believe that these distances are open to a great deal of interpretation. We do not believe that the distance categories listed in this document are conservative interpretations of the Canisteo pit data.
118	The Canisteo Pit data indicated that water levels at a well 2300 feet from the pit were correlated with water fluctuations in the pit. Therefore it is inappropriate to exclude the "high likelihood" category from this distance category.
123	For the same reason stated in the comment on line 118, it is not appropriate to exclude the "high likelihood" or "moderate likelihood" of impact from this distance category.

Kelly Lake Watershed Premining and Current Watershed Area and Mining Features

Attachment B



Liesch Associates, Inc. ■ 13400 15th Avenue North ■ Minneapolis, MN 55441
Phone: (763) 489-3100 ■ Toll Free: (800) 338-7914 ■ Fax: (763) 489-3101

TECHNICAL MEMORANDUM

TO: **Mike Johnson, PE - Liesch Associates, Inc.**

FROM: **Jim de Lambert, PG - Liesch Associates, Inc.**

DATE: **February 18, 2009**

RE: **Water Supply Contingency Plans for Keewatin and Nashwauk**

U.S. Steel – Minnesota Ore Operations (US Steel) is proposing to increase production at the US Steel Corporation Keewatin Taconite Facility under a project known the Keetac Expansion Project (the "Project"). The Project involves continuous dewatering operations that are ongoing and will continue in current and future mining areas. These planned activities are expected to generate drawdown in the aquifer locally and potentially at the water supply wells for the Cities of Keewatin and Nashwauk.

This memorandum is intended to provide background on the City water supplies and the Biwabik Iron Formation and to outline a plan to monitor the effects of mine pit dewatering on the aquifer so that appropriate steps can be taken to maintain the water supplies.

Relatively little information exists concerning the hydrogeology of the Biwabik Iron Formation (BIF) and the City water supplies. The Minnesota Department of Health (MDH) has assisted both Cities with Wellhead Protection activities and the results of this work probably represent the most comprehensive source of information concerning the source of water discharging at the City wells. In conducting this work it was apparent that traditional groundwater flow models would not be appropriate tools to estimate capture zones in the fractured BIF Aquifer. Instead, MDH utilized isotopic and chemical characteristics of water from the wells and nearby surface water bodies to estimate the source of water discharging at the wells. This work is summarized in separate reports titled Wellhead Protection Plan for the City of Keewatin - Part I (Walsh 2003) and Wellhead Protection Plan for the City of Nashwauk - Part I (Walsh 2007). Each report includes a delineation of the Wellhead Protection Area (WHPA), determination of the Drinking Water Supply Management Area (DWSMA) and assessments of Well and DWSMA Vulnerability. In addition, the reports include a summary of the hydrogeologic

conditions concerning the city water supplies. Additional information used in preparing this memorandum includes various published maps and reports and personal communication with representatives from MDH, Department of Natural Resources and the Cities.

Keetac Mine Hydrogeology

The Keetac Mine extracts iron ore from the Biwabik Iron Formation (BIF) of the Mesabi Iron Range. The BIF is Precambrian in age, was deposited under marine conditions and is composed primarily of chert and iron minerals. Its subcrop area extends along strike for a distance of at least 100 miles generally from Grand Rapids to Babbitt and varies in width from one to three miles. The BIF has an overall thickness 350 to 750 feet and dips generally to the south at three to twelve degrees (Grout 1951). Information provided by the MDH from a deep test hole drilled near Keewatin suggests a BIF thickness of 590 feet in this area.

According to a suggestion by J. F. Wolf in 1917, and elaboration by J. W. Gruner in 1946 (Grout 1951), the BIF is generally divided into four members. From top to bottom, these are Upper Slaty, Upper Cherty, Lower Slaty, and Lower Cherty. The low grade magnetic iron ores, known as taconite, are mined from the Upper Cherty and Lower Cherty members. The Upper Cherty Member has a thickness ranging from 80 to 250 feet. The Lower Cherty ores are typically 120 to 425 feet thick. The slaty units can alter to form a sticky, clayey rock that generally exhibits low permeability including the Intermediate Slate which is a thin bedded silicate taconite, also known as paint rock that occurs at the base of the Lower Slaty Member. This is an important marker horizon for water supply purposes as it marks the contact with the Lower Cherty Member. Borehole logs suggest that the more productive zones for water supply wells may occur below this contact in the Lower Cherty Member.

In addition to being an important source of iron ore the BIF is also an important aquifer locally. Both Nashwauk and Keewatin, and numerous other range Cities and water users, utilize the BIF Aquifer. Depending on the amount of water desired and other factors, BIF aquifer wells are typically constructed by drilling a casing to solid rock, usually the top of the BIF Formation, and then drilling an open hole to a sufficient depth to obtain the required quantity of water. Yields in the 300 to 600 gallon per minute (gpm) range have been reported from existing wells. For Nashwauk and Keewatin, geochemical work conducted by MDH has indicated that a significant percentage of the water discharging at some of the wells originates from nearby mine pits.

The BIF Aquifer consists primarily of fine grained chert and iron minerals, exhibiting very little primary porosity. Groundwater movement appears to be restricted to zones of secondary permeability controlled by fractures and joints particularly in the cherty portions of the BIF. The MDH has conducted a suite of borehole logs at available wells constructed in the BIF Aquifer in an attempt indentify preferred flow paths and to further characterize the hydrogeology of the formation. This information suggests the occurrence of preferred flow zones in both of the cherty members.

The Virginia Formation immediately overlies the BIF while the Pokegama Formation and the Giants Range Batholith underlay the BIF. These bedrock formations generally do not yield significant volumes of water to wells and are generally not considered important aquifers. Up to 200 feet of glacial drift lies above the consolidated bedrock near the Mesabi Range. Where these deposits include saturated granular outwash they may provide a potential source for significant volumes of water.

Little information is available regarding groundwater flow fields in the BIF due to a lack of available wells and detailed water level measurements over time. Mining operations conducted to date have undoubtedly altered natural flow patterns and planned mine dewatering activities in the Mesabi Range will continue to influence flow patterns.

Keewatin Water Supply

In recent years the City of Keewatin has obtained its water supply from two wells, designated Well 1 and Well 2. The City has indicated that it drilled an additional well in 2007, designated Well 3, in response to increasing manganese concentrations at Well 2. All wells are shown on the attached **Figure 1** (Attachment 1). Keewatin Well 3 has been added to the City's water supply system and Well 2 has been removed from service.

Basic information concerning Keewatin's wells is summarized on **Table 1** below and logs for each well are included in Attachment 2.

Table 1

Well	Well	Casing		Open Hole, Elevation (ft msl)			
Name	Number	Diameter	Depth (ft)	Top	Bottom	Status	Notes
1	192359	8-inch	249	1224	867	Active	Drilled in 1952/1982
2	228828	10-inch	344	1113	984	Observation	Drilled in 1951
3	751520	12-inch	198	1274	857	Active	Drilled in 2007

Water level information contained in Keewatin's Part 1 WHP plan shows a direct correlation between the dewatering of the Mesabi Chief Pit which was initiated in 1995 and Keewatin Well 2. As of 2002, the water level was lowered approximately 150 feet at the Mesabi Chief Mine while the static water level fell approximately 75 feet at Keewatin Well 2. Water levels were not collected at Keewatin Well 1 after 1998, however, the earlier measurements at Keewatin Well 1 also showed water level declines but somewhat less than those observed at Well 2. The WHP plan shows a correlation between water levels at select existing mine pits within the footprint of the proposed Project during dewatering and the water level at Well 2. The correlation was also supported by chemical characterization of water from the mine pits and well.

Details of the connection between mine dewatering, water levels and water chemistry at the City Wells are not clear. Long term monitoring is recommended to obtain additional

information concerning the connection and to provide a mechanism to determine whether additional steps are needed to maintain the City's source of water supply.

Keewatin Water Use

The City of Keewatin is currently operating under Minnesota Department of Natural Resources (DNR) Appropriations Permit number 1972-2192. This permit allows Keewatin to pump up to 75 million gallons of water per year (mgy) at a permitted rate not to exceed 350 gallons per minute. The yearly reported pumping volumes submitted to the DNR are provided on **Table 2**. The reported values illustrate that the City's annual water use has increased from 45 to approximately 65 mgy in recent years.

Table 2

Permit	Well	Unique Well No.	Permit Vol (mgy)	Permit Rate (gpm)	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998
1979-2192	1	192359	75.0	350.0	54.6	49.5	44.0	43.7	24.3	29.2	28.8	23.8	18.3	26.2
	2	228828			8.8	14.5	16.2	16.9	29.2	15.8	17.1	22.8	25.8	18.2
	3	751520			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ten Year Average = 52.8 mgy				**Total:**	63.4	64.1	60.2	60.5	53.5	45.0	45.9	46.6	44.1	44.4

Nashwauk Water Supply

The water supply for the City of Nashwauk is obtained from two bedrock wells located within the City limits of Nashwauk as shown on **Figure 1**. Like Keewatin, both of Nashwauk's wells tap portions of the BIF Aquifer. Basic information concerning Nashwauk's wells is summarized on **Table 3** below and logs for each well are included in Attachment 2. Less information is available concerning Nashwauk's wells and some discrepancies exist regarding well numbering and depths. The well names and unique numbers used here are as presented in the MDH Wellhead Protection Plan Part 1, prepared for the City. The log for Well 3 indicates a casing depth of 40 feet in combination with a depth to bedrock of 110 feet. This is an unlikely scenario as the casing would typically extend at least to the top of the rock.

Table 3

Well Name	Well Number	Casing		Open Hole, Elevation (ft msl)		Status	Notes
		Diameter	Depth (ft)	Top	Bottom		
3	241017	8-inch	40	1449	1075	Active	Drilled in 1930
4	228819	16-inch	150	1289	899	Active	Drilled in 1947

The northern portion of the City of Nashwauk and the City's Well 3 are situated directly between two former natural ore pits, the Larue to the northeast and the Hawkins to the southwest. Well 4 is situated in the southern portion of the City approximately 3200 feet south of Well 3. Geochemical information provided in the MDH WHP report suggests that a significant percentage of water discharging at the wells originates at the Larue Pit. It is also likely that a connection exists between the levels in nearby mine pits and the

City wells. To the northeast, the nearest mining proposed under the Keetac Project is more than two miles away. The effects of mine pit dewatering under this Project on the City wells will likely depend on the effects at the former natural ore pits between the Project and the City. Anecdotal evidence suggests that the former natural ore pits are separated by "land bridges" that may serve to reduce the effects of dewatering at the City wells.

To the southwest of Nashwauk, Minnesota Steel also has plans for taconite extraction, including mine pit dewatering and water supply pumping that could also affect water levels in nearby natural ore pits and the City wells.

Nashwauk Water Use

Nashwauk is currently operating under Minnesota Department of Natural Resources (DNR) Appropriations Permit number 1975-2151. This permit allows the City of Nashwauk to pump up to 70 million gallons of water per year (MGY) at a permitted rate not to exceed 1,100 gallons per minute. The yearly reported pumping volumes submitted to the DNR are provided on **Table 4**. Pumping in recent years has ranged from approximately 45 to 65 mgy.

Table 4

Permit	Well	Unique Well No.	Permit Vol (mgy)	Permit Rate (gpm)	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998
1975-2151	4	228819	70.0	1,100.0	25.1	25.9	27.7	34.0	33.3	32.9	25.5	23.6	22.1	23.7
	3	241017			27.2	20.1	29.3	29.5	30.6	23.1	26.4	21.6	21.4	22.1
Ten Year Average = 52.5 mgy				**Total:**	52.3	46.0	57.1	63.6	63.9	55.9	52.0	45.2	43.4	45.8

Proposed Monitoring Plan

Monitoring is proposed to establish baseline conditions, to monitor changes in the BIF Aquifer that could impact the existing water supply wells for the Cities of Keewatin and Nashwauk and to assess potential measures to mitigate impacts, if necessary. Development and implementation of the Keetac Project will take place in stages over a period of several years. Sufficient time exists to monitor the resources in question and to develop a mitigation plan, if required. Impacts could include interference drawdown from dewatering activities or water supply pumping and/or changes in water quality that make use of the water undesirable. Therefore, the monitoring program should include both water quantity and quality components.

Water Quality

Existing water quality from both Cities supply wells should be obtained from the City and MDH. Additional baseline samples should be taken from existing wells for dissolved mineral constituents and general chemistry. Annual sampling of the wells should continue for select parameters to detect changes over time. Wells to be sampled include Nashwauk Wells 3 and 4 and Keewatin Wells 1 and 3. Parameter lists for

baseline and annual sampling are included in Attachment 3.

The MDH has recommended that the Cities sample for stable isotopes of water, chloride and sulfate as part of their ongoing WHP efforts. MDH has indicated that they will conduct the analysis but the City would be responsible for obtaining the samples. US Steel representatives responsible for sample collection will contact MDH prior to sampling to coordinate collection of MDH samples with the sampling recommended here. The results could assist the Cities in their WHP efforts and provide useful information concerning the hydrogeology of the BIF Aquifer and the source of water discharging at the City wells.

Water Quantity

Long term water level monitoring points are required to assess drawdown in the aquifer. A search should be conducted to identify potential monitoring points including wells and surface water locations. MDH and DNR staff have expressed an interest in long term monitoring and noted a lack of available points in the BIF aquifer.

We understand that not all of the City wells involved are accessible for water level measurements. Arrangements should be made for the wells to be accessible and for City utility personnel to make regular measurements of static levels, pumping levels, pumping rates and volume.

Former Well 2 at Keewatin is now out of service and could serve as a useful monitoring point. We understand that the DNR has recently conducted logging procedures at the well and that both the DNR and MDH are interested in data from this location. The City has indicated that this well is available for long term monitoring by US Steel. A data logger and transducer will be installed and maintained by US Steel for well water level measurement at this location.

At present we are not aware of a suitable BIF Aquifer well for long term monitoring near Nashwauk. A new observation well is proposed for use as a dedicated monitoring point generally between the City and the Keetac project. This well should also be equipped with a transducer and data logger. Transducers and data loggers will be visited quarterly to verify operation, collect data and to reset the instruments to correct for drift.

Measurements of water levels from select mine pits, should also be collected as part of the Monitoring Plan. This includes water levels from pits within the Keetac Project, the LaRue pit complex and data collected by Minnesota steel for their operations southwest of Nashwauk. This information will be useful for correlating mine pit water levels with the City wells and the BIF Aquifer water levels in general.

Reporting

All data should be collected and summarized in a report format annually. The report should include a summary of the data collected during the previous year, a description of any changes to the monitoring network, recommended changes to the monitoring network and a determination as to any effects of the dewatering activities on the Cities well water supplies. If the results of the planned monitoring suggest significant changes in well water quality or level that may be related to Keetac mining activities, additional

monitoring activities may be recommended. The annual report will be prepared by US Steel no later than February 15th for the previous calendar year and distributed to the Cities, DNR and MDH for review.

Potential Mitigation Measures

In the event that mine dewatering activities have an adverse impact on the production or quality of the City water supply additional monitoring, treatment, augmentation or replacement of the impacted supply may become necessary. The hydrogeology of the Keewatin/Nashwauk area limits the available options to the following:

- Increased monitoring or changes to the monitoring plan if suspected impacts do not immediately threaten the City's ability to supply water.
- Modification of existing facilities including lowering, or replacing, existing pumps and deepening wells.
- New wells drilled in the BIF Aquifer in areas where interference effects are not as great.
- New wells drilled in the glacial outwash if areas of sufficient saturated thickness and favorable water quality can be identified.
- A new water treatment system to treat surface water, mine water or affected well water.

The extent of potential interference effects associated with the Project cannot be predicted with certainty at this time. The BIF Aquifer is utilized throughout the area and has the potential to supply adequate amounts of water to satisfy municipal needs. However, a better understanding of the effects of pumping on the BIF Aquifer is required to assess the potential for ongoing use and locations for additional BIF wells.

Glacial outwash deposits are utilized as municipal water sources throughout Minnesota. Although historical publications suggest that glacial outwash deposits are present between Keewatin and Nashwauk, glacial outwash deposits can change significantly over very short distances and specific investigations would be required to identify and assess the suitability for use as sources of water supply.

There are surface water resources in the area that could potentially provide a source of water including lakes that fill old mine pits and underground workings. It is anticipated that such a system would require construction of a surface water treatment plant.

Select References

Grout, F. F., Gruner J. W., Schwartz G. M., and Thiel G. A. (1951) Precambrian Stratigraphy of Minnesota, Bulletin of the Geological Society of America, Volume 62, pages 1017-1078

Walsh, J. F. (2003) Wellhead Protection Plan for the City of Keewatin, Part 1 Delineation of the Wellhead Protection Area (WHPA), Drinking Water Supply Management Area (DWSMA) and Assessments of Well and DWSMA Vulnerability, Minnesota Department of Health, St. Paul, MN, 30 p.

Walsh, J. F. (2007) Wellhead Protection Plan, Part 1, Wellhead Protection Area Delineation, Drinking Water Supply Management Area Delineation, Well and Aquifer Vulnerability Assessments for the City of Nashwauk, Minnesota Department of Health, St. Paul, MN, 43 p.

Attachment 1

St. Paul Pit
Carlz Pit
KEEWATIN 2
Perry-Wyman Pit
KEEWATIN 3
KEEWATIN 1
LaRue Pit Complex
Proposed Monitoring Well
NASHWAUK 3
Hawkins Pit
NASHWAUK 4

Proposed Monitoring point
City Wells
DWSMA Boundary
Proposed Keetac Mining Area Limit

0 4,000 8,000 12,000 16,000 20,000
Feet

N

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LIESCH
Hydrogeologists ▪ Engineers ▪ Environmental Scientists
Minneapolis ▪ Chicago ▪ Los Angeles ▪ Madison ▪ Milwaukee ▪ Phoenix

Keetac Expansion Project	Feb 09
Location Map Nashwauk and Keewatin Water Supplies	Figure 1

W:\ww\94213\Water Supply Contingency Plans\Memo Report\Figure 1 A.pdf

Attachment 2

Unique No. 00192359

County Name Itasca

MINNESOTA DEPARTMENT OF HEALTH
WELL AND BORING RECORD
Minnesota Statutes Chapter 1031

Update Date 2002/01/29

Entry Date 1992/08/03

Township Name	Township	Range	Dir	Section	Subsection
	57	22	W	25	ABDC

Well Depth 606 ft. | Depth Completed 606 ft. | Date Well Completed 1982/11/03

Well Name KEEWATIN 1

Drilling Method Cable Tool

Contact's Name KEEWATIN 1

KEEWATIN MN 55753

Drilling Fluid

Well Hydrofractured? ☐ Yes ☐ No

From ft. to ft.

Use Community Supply (municipal)

Casing Drive Shoe? ☐ Yes ☑ N

Casing Diameter 8 in. to 249 ft | Weight(lbs/ft) 28

Hole Diameter 0 in. to 249 ft | in. to 606 ft

GEOLOGICAL MATERIAL	COLOR	HARDNESS	FROM	TO
CLAY			0	40
QUICKSAND			40	50
CLAY			50	80
QUICKSAND			80	90
CLAY			90	180
SLATE			180	211
DISSEMINATED TACONITE			211	216
DISSEM. CHERTY & SLATY			216	281
DISSEM. CHERTY & SLATY			281	471
DISSEM. CHERTY TAC. & P			471	481
PAINT ROCK NON-MAG.			481	491
DISSEM. CHERTY TAC. & P			491	496
PORUS DISSEM. CHERTY T			496	526
POURS DISSEM. CHERTY T			526	606

Screen N | Open Hole From 249 ft. to 606 ft.

Make Type

Static Water Level 86 ft. from Land surface Date 1982/10/13

PUMPING LEVEL (below land surface)

ft. after hrs. pumping g.p.m.

Well Head Completion

Pitless adapter mfr Model

Casing Protection ☑ 12 in. above grade

☐ At-grade(Environmental Wells and Borings ONLY)

Grouting Information Well grouted? ☑ Yes ☐ No

Material	From	To (ft.)	Amount(yds/bags)	
G	0	185	239	Y
G	185	223	22	Y
G	223	249	0.3	Y

Nearest Known Source of Contamination

50 ft. direction type

Well disinfected upon completion? ☑ Yes ☐ No

Pump ☐ Not Installed Date Installed Y

Mfr name RED JACKET

Model HP 60 Volts 460

Drop Pipe Length 441 ft. Capacity 375 g.p.m

Type S

Any not in use and not sealed well(s) on property? ☐ Yes ☐ No

Was a variance granted from the MDH for this Well? ☐ Yes ☐ No

REMARKS, ELEVATION, SOURCE OF DATA, etc.

ORIGIN CASING 12 INCH DIAMETER TO 217 FEET.

WELL ORIGINALLY DRILLED BY MCCARTHY WELL CO. APRIL 1952.

USGS Quad: Keewatin Elevation: 1473

Aquifer: PEBI Alt Id: 79-2192

Well CONTRACTOR CERTIFICATION Lic. Or Reg. No. 69183

License Business Name

Name of Driller PETERSON, D.

Report Copy

Unique No. 00228828

County Name Itasca

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 1031

Update Date 2004/03/10

Entry Date 1992/08/03

Township Name	Township	Range	Dir	Section	Subsection
	57	22	W	24	DCDABB

Well Depth 473 ft. | Depth Completed 473 ft. | Date Well Completed 1951/00/00

Well Name KEEWATIN 2

Drilling Method Cable Tool

Contact's Name KEEWATIN 2

KEEWATIN MN 55753

Drilling Fluid

Well Hydrofractured? ☐ Yes ☐ No

From ft. to ft.

Use Community Supply (municipal)

Casing **Drive Shoe?** ☐ Yes ☐ N

Hole Diameter

Casing Diameter **Weight(lbs/ft)**

10 in. to 344 ft

GEOLOGICAL MATERIAL	COLOR	HARDNESS	FROM	TO
CLAY	BLUE		0	6
CLAY & BIG STONES	BLUE		6	10
CLAY & BIG STONES, SAND	RED		10	24
CLAY & BIG BOULDERS	BLUE		24	29
CLAY	BLUE		29	58
SANDY CLAY, SOME GRAV			58	73
MUDDY SAND & BIG STONE			73	82
SANDY CLAY	BLUE	HARD	82	90
CLAY	BLUE	HARD	90	115
SLATE			115	124
DECOMPOSED TANCONITE			124	130
SOLID TACONITE			130	133
DECOMPOSED TACONITE			133	143
PAINTY DECOMPOSED TAC			143	165
DECOMPOSED TACONITE			165	170
PAINTY DECOMPOSED TAC			170	201
DECOMPOSED TACONITE			201	205
TACONITE		V.HARD	205	208
DECOMPOSED PAINTY CUT			208	212
SANDY DECOMPOSED TAC			212	220
SOLID TACONITE LITTLE SL			220	224
DECOMPOSED TACONITE L			224	230
SLATY TACONITE			230	345
DECOMPOSED TACONITE			345	350
DEC. TACONITE & PAINT R			350	355
PAINT ROCK			355	365
SAND & ORE (WATER)			365	369
CHERTY TACONITE			369	374

Screen N

Open Hole From 344 ft. to 473 ft.

Make Type

Static Water Level 279 ft. from Land surface Date 1951/00/00

PUMPING LEVEL (below land surface)

324 ft. after hrs. pumping 280 g.p.m.

Well Head Completion

Pitless adapter mfr Model

Casing Protection ☐ 12 in. above grade

☐ At-grade(Environmental Wells and Borings ONLY)

Grouting Information Well grouted? ☐ Yes ☐ No

Nearest Known Source of Contamination

ft. direction type

Well disinfected upon completion? ☐ Yes ☐ No

Pump ☐ Not Installed Date Installed Y

Mfr name

Model HP 60 Volts

Drop Pipe Length ft. Capacity g.p.m

Type

Any not in use and not sealed well(s) on property? ☐ Yes ☐ No

REMARKS, ELEVATION, SOURCE OF DATA, etc.

WELL DEEPENED FROM 374 TO APPROX.473 AROUND 1960, CASING IS SLOTTED FROM 344-374

USGS Quad: Keewatin
Aquifer: PEBI

Elevation: 1457
Alt Id: 79-2192

Was a variance granted from the MDH for this Well? ☐ Yes ☐ No

Well CONTRACTOR CERTIFICATION Lic. Or Reg. No. 27022

License Business Name

Name of Driller MCCARTHY

Report Copy

HE-01205-06 (Rev. 9/96)

Unique No. 00751520

County Name Itasca

MINNESOTA DEPARTMENT OF HEALTH
WELL AND BORING RECORD
Minnesota Statutes Chapter 1031

Update Date 2007/10/01

Entry Date 2007/08/23

Township Name	Township	Range	Dir	Section	Subsection
	57	22	W	25	ABDADB

Well Depth 615 ft. | Depth Completed 615 ft. | Date Well Completed 2007/08/16

Well Name KEEWATIN 3

Drilling Method Multiple methods used

Contact's Name CITY OF KEEWATIN
P. O. BOX 190
KEEWATIN MN 55753

Drilling Fluid: Water

Well Hydrofractured? ☐ Yes ☑ No
From ft. to ft.

Well Owner's Name KEEWATIN 3
2ND E AV
KEEWATIN MN 55753

Use Community Supply (municipal)

Casing — Drive Shoe? ☐ Yes ☐ N

Casing Diameter				Weight(lbs/ft)
18	in. to	80	ft	70.59
12	in. to	198	ft	49.56

Hole Diameter

in. to	80	ft	
in. to	198	ft	
in. to	615	ft	

GEOLOGICAL MATERIAL	COLOR	HARDNESS	FROM	TO
FILL	BROW	SOFT	0	3
CLAY	BROW	SOFT	3	7
SAND, GRAVEL, ROCKS	BROW	SOFT	7	20
SANDY CLAY	BROW	SOFT	20	22
SAND & GRAVEL	BROW	SOFT	22	32
GRAVEL & CLAY LAYERS	BROW	SOFT	32	35
CLAY & GRAVEL	GRAY	SOFT	35	163
SLATE & CLAY LAYERS	BLACK	V.SOFT	163	164
SLATE & CLAY LAYERS	BLACK	V.SOFT	164	168
SLATE & CLAY LAYERS (SO	BLK/G	V.SOFT	168	190
SLATE & QUARTZ	BLACK	SFT-MED	190	195
SLATE & QUARTZ	BLACK	SFT-MED	195	245
SLATE	GRN/G	SFT-MED	245	265
SLATE & TACONITE (MAGN	GRN/B	MED-HRD	265	315
TACONITE (MAGNETIC) GR	VARIE	HARD	315	450
TACONITE (MAGNETIC) RU	VARIE	MED-HRD	450	470
TACONITE (MAGNETIC)	VARIE	HARD	470	585
TACONITE (MAGNETIC)	GRN/G	HARD	585	615

Screen N — Make — Type

Open Hole From 198 ft. to 615 ft.

Static Water Level 186 ft. from Land surface — Date 2007/08/16

PUMPING LEVEL (below land surface)
370 ft. after 6 hrs. pumping 450 g.p.m.

Well Head Completion
Pitless adapter mfr — Model
Casing Protection ☑ 12 in. above grade
☐ At-grade(Environmental Wells and Borings ONLY)

Grouting Information — Well grouted? ☑ Yes ☐ No

Material	From	To (ft.)	Amount(yds/bags)	
G		80	3	Y

Nearest Known Source of Contamination
100 ft. direction E type SEW
Well disinfected upon completion? ☐ Yes ☐ No

Pump ☑ Not Installed — Date Installed N
Mfr name
Model — HP — Volts
Drop Pipe Length ft. — Capacity g.p.m
Type

Any not in use and not sealed well(s) on property? ☐ Yes ☑ No

Was a variance granted from the MDH for this Well? ☐ Yes ☑ No

REMARKS, ELEVATION, SOURCE OF DATA, etc.

CALIPER, MULTI TOOL, & FLOW METERED 9-12-2007. LOGGED FOR MDH.

GAMMA LOGGED 8-31-2007. M.G.S. NO. 4741. LOGGED BY JIM TRAEN.

USGS Quad: Keewatin — Elevation: 1472
Aquifer: PEBI — Alt Id: 4741

Well CONTRACTOR CERTIFICATION — Lic. Or Reg. No. 1404
License Business Name
Name of Driller TONY/DAN

Report Copy

Unique No. 00241017

County Name Itasca

MINNESOTA DEPARTMENT OF HEALTH
WELL AND BORING RECORD
Minnesota Statutes Chapter 1031

Update Date 2005/06/23

Entry Date 1992/08/03

Township Name	Township	Range	Dir	Section	Subsection
	57	22	W	32	BACD

Well Depth 414 ft. | Depth Completed 414 ft. | Date Well Completed 1930/00/00

Well Name NASHWAUK 3

Drilling Method

Drilling Fluid

Well Hydrofractured? ☐ Yes ☐ No

From ft. to ft.

Use Community Supply (municipal)

Casing Drive Shoe? ☐ Yes ☐ N

Hole Diameter

GEOLOGICAL MATERIAL	COLOR	HARDNESS	FROM	TO
DRIFT			0	110
BIWABIK OXIDES OF IRON			110	210
BIWABIK, MASSIVE IRON F			210	414

Casing Diameter Weight(lbs/ft)

8 in. to 40 ft

Screen

Open Hole From ft. to ft.

Make Type

Static Water Level ft. from Date

PUMPING LEVEL (below land surface)

ft. after hrs. pumping g.p.m.

Well Head Completion

Pitless adapter mfr Model

Casing Protection ☐ 12 in. above grade

☐ At-grade(Environmental Wells and Borings ONLY)

Grouting Information Well grouted? ☐ Yes ☐ No

Nearest Known Source of Contamination

ft. direction type

Well disinfected upon completion? ☐ Yes ☐ No

Pump ☐ Not Installed Date Installed

Mfr name

Model HP Volts

Drop Pipe Length ft. Capacity 450 g.p.m

Type T

Any not in use and not sealed well(s) on property? ☐ Yes ☐ No

Was a variance granted from the MDH for this Well? ☐ Yes ☐ No

Well CONTRACTOR CERTIFICATION Lic. Or Reg. No.

License Business Name

Name of Driller

REMARKS, ELEVATION, SOURCE OF DATA, etc.

DATE OF SAMPLE 11/73

INFO FROM CITY CLERK

USGS Quad: Nashwauk Elevation: 1489

Aquifer: PEBI Alt Id: 75-2151

Report Copy

HE-01205-06 (Rev. 9/96)

Unique No. 00228819

County Name Itasca

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 1031

Update Date 2005/06/23

Entry Date 1992/08/03

Township Name	Township	Range	Dir	Section	Subsection
	57	22	W	32	CDAD

Well Depth 540 ft. | Depth Completed 540 ft. | Date Well Completed 1947/00/00

Well Name NASHWAUK 4

Drilling Method

Drilling Fluid

Well Hydrofractured? ☐ Yes ☐ No

From ft. to ft.

Use Community Supply (municipal)

Casing Drive Shoe? ☐ Yes ☐ N

Hole Diameter

Casing Diameter 16 in. to 150 ft

Weight(lbs/ft)

GEOLOGICAL MATERIAL	COLOR	HARDNESS	FROM	TO
UPPER SLATEY ABSENT			0	144
UPPER CHERTY			144	335
LOWER SLATE			330	345
LOWER CHERTY MEMBER			345	540

Screen

Make Type

Open Hole From ft. to ft.

Static Water Level 150 ft. from Land surface Date

PUMPING LEVEL (below land surface)

ft. after hrs. pumping g.p.m.

Well Head Completion

Pitless adapter mfr Model

Casing Protection ☐ 12 in. above grade

☐ At-grade(Environmental Wells and Borings ONLY)

Grouting Information Well grouted? ☐ Yes ☐ No

Nearest Known Source of Contamination

ft. direction type

Well disinfected upon completion? ☐ Yes ☐ No

Pump ☐ Not Installed Date Installed

Mfr name

Model HP Volts

Drop Pipe Length ft. Capacity 450 g.p.m

Type T

Any not in use and not sealed well(s) on property? ☐ Yes ☐ No

Was a variance granted from the MDH for this Well? ☐ Yes ☐ No

REMARKS, ELEVATION, SOURCE OF DATA, etc.

LOCATED BY CITY CLERK

USGS Quad: Pengilly Elevation: 1439

Aquifer: PEBI Alt Id: 1310024S02

Well CONTRACTOR CERTIFICATION Lic. Or Reg. No.

License Business Name

Name of Driller

Report Copy

HE-01205-06 (Rev. 9/96)

Attachment 3

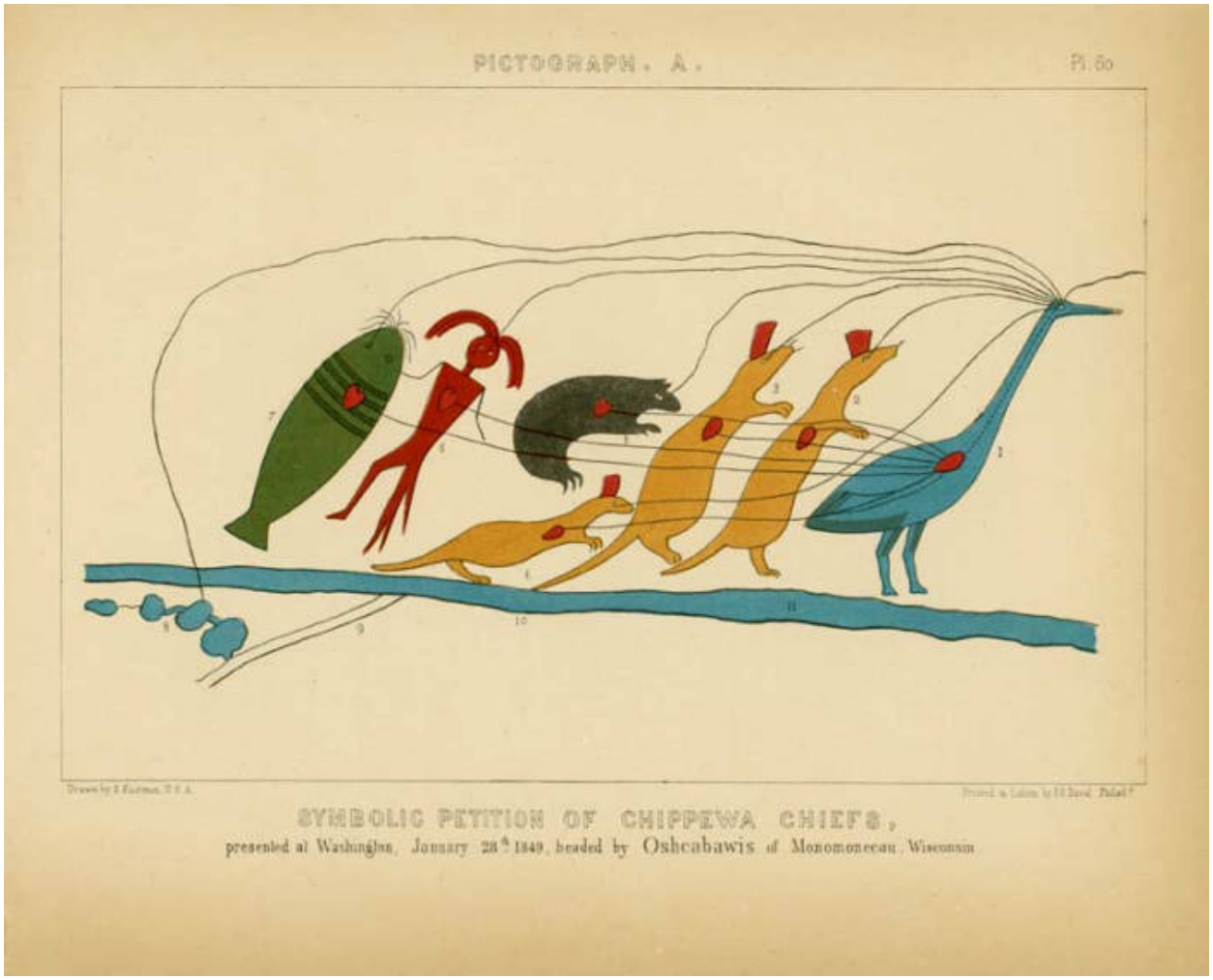
Table 5 - Baseline and Annual Sampling Lists

Baseline List

Analyte	Units
Gross Alpha	pCI/L
Gross Beta	pCI/L
Uranium	ug/L
Radium 226	pCI/L
Radium 228	pCI/L
Radon 222	pCI/L
Alkalinity, Total	mg/L
Arsenic	mg/L
Barium	mg/L
Cadmium	mg/L
Calcium	mg/L
Carbonate/Bicarbonate	mg/L
Chloride	mg/L
Chromium	mg/L
Fluoride	mg/L
Hardness, Total	mg/L
Iron	mg/L
pH, Lab	units
Lead	mg/L
Magnesium	mg/L
Manganese	mg/L
Mercury	mg/L
Nitrogen, Nitrate +Nitrite	mg/L
Potassium	mg/L
Selenium	mg/L
Silver	mg/L
Sodium	mg/L
Sulfate	mg/L
Thallium	mg/L
Dissolved Solids, Total	mg/L
Cation/Anion Ballance	--
Volatile Organic Compounds 465 F	ug/l

Annual List

Analyte	Units
Alkalinity, Total	mg/L
Arsenic	mg/L
Barium	mg/L
Cadmium	mg/L
Calcium	mg/L
Carbonate/Bicarbonate	mg/L
Chloride	mg/L
Chromium	mg/L
Fluoride	mg/L
Hardness, Total	mg/L
Iron	mg/L
pH, Lab	units
Lead	mg/L
Magnesium	mg/L
Manganese	mg/L
Mercury	mg/L
Nitrogen, Nitrate +Nitrite	mg/L
Potassium	mg/L
Selenium	mg/L
Silver	mg/L
Sodium	mg/L
Sulfate	mg/L
Thallium	mg/L
Dissolved Solids, Total	mg/L
Cation/Anion Ballance	--



Tribal Cooperating Agencies Cumulative Effects Analysis

NorthMet Mining Project and Land Exchange

Prepared by staff from the Bois Forte Band of Chippewa, the Fond du Lac Band of Lake Superior Chippewa, the Grand Portage Band of Lake Superior Chippewa, the Great Lakes Indian Fish and Wildlife Commission, and the 1854 Treaty Authority

September 2013

Tribal Cooperating Agencies Cumulative Effects Analysis

NorthMet Mining Project and Land Exchange

In Chapter 6 of the *Preliminary Supplemental Draft Environmental Impact Statement (PSDEIS) for the NorthMet Mining Project and Land Exchange,* the co-lead agencies present a resource-specific cumulative effects analysis (CEA) for the NorthMet Project Proposed Action and Land Exchange Proposed Action that may result when combined with effects from other activities. It acknowledges that in addition to additive effects, cumulative effects may be further magnified by synergisms or cross-interactions in the environment. The analysis was developed by the co-lead agencies and their third-party contractor with consideration of the 1997 CEQ guidance *Considering Cumulative Effects under the National Environmental Policy Act* and EPA's 1999 NEPA review guidance *Consideration of Cumulative Impact in EPA Review of NEPA Documents.* However, despite specific and repeated requests from tribal cooperating agencies, the co-lead agencies did not elect to utilize a tool developed in 2011 by the EPA in cooperation with tribes, *Applying Cumulative Impact Analysis Tools to Tribes and Tribal Lands*, in order to discern potential cumulative effects to resources important to the tribes who retain usufructuary rights within the 1854 Ceded Territory. The NorthMet Project Proposed Action and Land Exchange Proposed Action are both located entirely within the boundaries of the 1854 Ceded Territory (Figure 1).

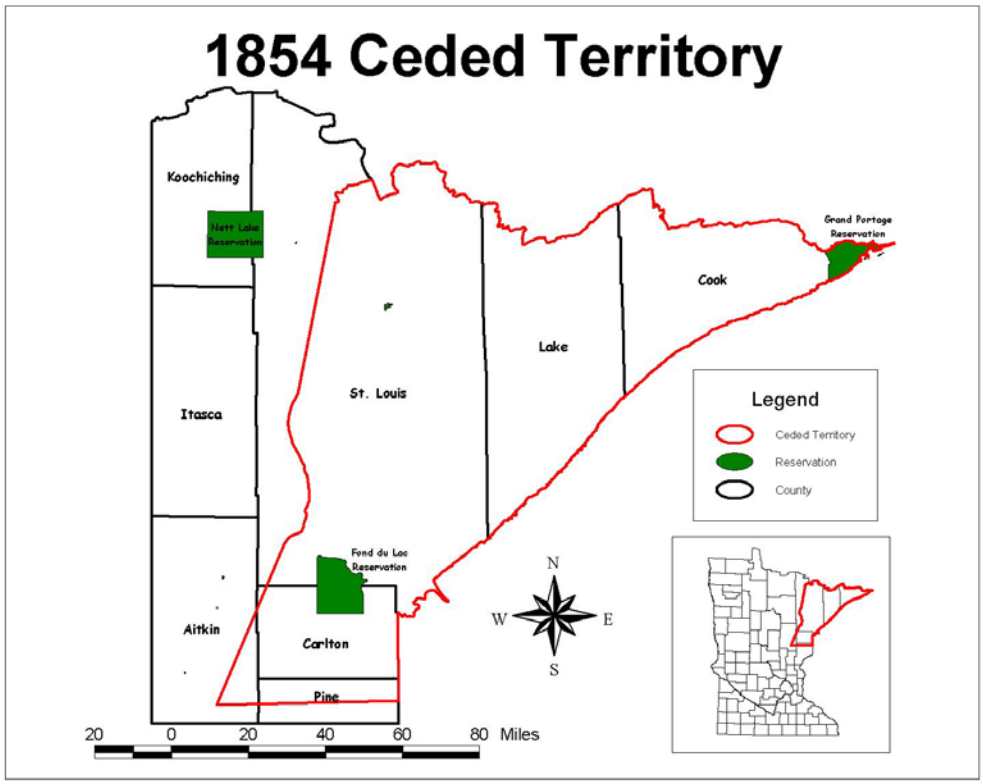


Figure 1.1854 Ceded Territory.

The Fond du Lac, Bois Forte, and Grand Portage Bands, as well as the 1854 Treaty Authority (1854) and the Great Lakes Indian Fish & Wildlife Commission (GLIFWC), have consistently advocated for a more robust, comprehensive CEA for the PolyMet NorthMet project and other mining projects. We have observed that current, historic, and 'reasonably foreseeable' mining activities have profoundly and, in many cases permanently, degraded vast areas of forests, wetlands, air and water resources, wildlife habitat, cultural sites and other critical treaty-protected resources within the 1854 Ceded Territory. As we have engaged with the lead federal and state agencies for the environmental review process under NEPA and the tribal consultation process under §106 of the National Historic Preservation Act (NHPA), we have clearly expressed our concerns for the incompleteness and inadequacy of their CEA.

In the 2008 CPDEIS section 2.2, Issues Identified During the EIS Scoping Process, it is stated that "The MnDNR and USACE determined that the following topics are not expected to present significant impacts, but would be addressed in the EIS using limited information beyond that provided in the Scoping EAW commensurate with the anticipated impacts: Cover Types; Vehicle Related Air Emissions; Air Emissions; Noise; Archeology; Visibility; Compatibility with Plans and Land Use Regulations; Infrastructure; Asbestiform Fibers; and 1854 Ceded Territory". Yet none of these resource categories or issues was fully evaluated from the standpoint of describing cumulative effects at spatial or temporal scales that the tribes find relevant, either in the earlier environmental impacts analysis or the current SDEIS process. The tribal cooperating agencies' perspectives on the resource-specific temporal and spatial boundaries for the CEA are significantly different from the co-lead agencies. Additionally, many of the tribal cooperating agencies' assumptions regarding predicted effects of the proposed actions (both the project and the land exchange) and the predicted success of proposed mitigations are significantly different from the co-lead agencies. Therefore, the tribal cooperating agencies have undertaken an alternative cumulative effects analysis, considering impacts to multiple resource categories to the extent we were able to do in the brief time within which we have been able review the draft PSDEIS, provide comments, and identify major differences of opinion.

In this CEA, we will be presenting major differences of opinion regarding cumulative effects to the 1854 Ceded Territory, Tribal Historic District (Figure 2) and the St. Louis River watershed. In addition, our analysis of the No-Action Alternative assumes current legal and regulatory requirements to remediate pollution from previous mining activities will, if implemented and enforced, lead to resource conditions that are substantially improved from their current degraded condition.

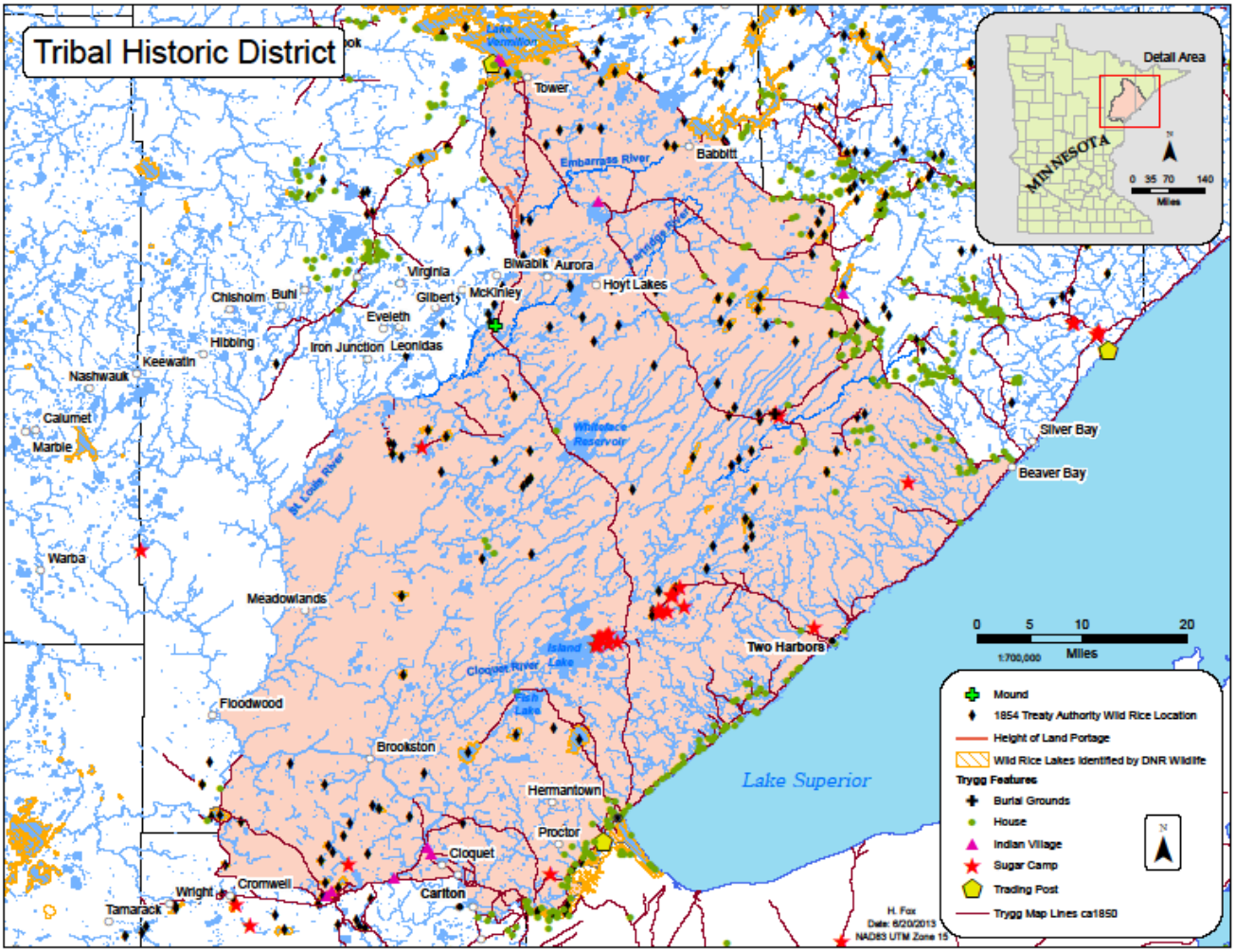


Figure 2. Tribal Historic District.

The tribal cooperating agencies use a resource-specific GIS-based approach as defined in the 2011 guidance to generate an alternative CEA that more accurately accounts for cumulative impacts to resources of tribal significance. From: *Applying Cumulative Impact Analysis Tools to Tribes and Tribal Lands:*

> The National Environmental Policy Act (NEPA) requires Federal agencies to evaluate the environmental impacts of their major projects. The scope of a federal Environmental Impact Statement (EIS) is spelled out in the NEPA legislation, in guidance documents published by the Council on Environmental Quality (CEQ) and EPA, and in various federal agencies' promulgated rules for implementing NEPA. An EIS evaluates the project's impacts to natural resources, the human environment, historical properties, and cultural properties. EIS documents are submitted for public review. Under Section 309 of the Clean Air Act, EPA is required to review and publicly comment on the environmental impacts of major federal actions including actions which are the subject of EISs.
>
> The assessment of cumulative impacts in NEPA documents is required by CEQ regulations. A cumulative impact is "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." (Title 40 Code of Federal Regulations (CFR) Section 1508.7, CEQ Regulations for Implementing NEPA, 1987). Only resources that are directly impacted or indirectly affected by an action are subject to a cumulative impacts analysis….
>
> In 1984, EPA issued its Indian Policy stressing two related themes: EPA will (1) pursue the principle of Indian self-government and (2) work directly with tribal governments on a government-to-government basis. Consistent with this Indian Policy and other EPA's statutory and regulatory authorities, EPA will identify and consider potential effects to reservation environments and take these potential effects into account as the Agency fulfills its regulatory duties. As a regulatory agency, EPA does not manage tribal trust resources or treaty resources in ceded territory. The U.S. Department of Interior, Bureau of Indian Affairs, does manage tribal trust resources. However, the Agency acknowledges its general trust responsibility to tribal governments which derives from the historical relationship between the Federal government and Indian tribes as expressed in certain treaties and Federal Indian laws, and understands that its regulatory activities can affect tribes.
>
> Tribal lands are fixed; that is the reservations, Indian lands, and ceded territories are specific places, defined by treaty, and tribes may hold certain rights within these areas. In addition, tribal cultural identity may be tied to specific areas, cultural properties, natural resources found within these areas or properties, and traditions and uses involving these places and resources. For this reason, tribes are not considered mobile. For these

reasons, many tribes have expressed interest and concern about cumulative impacts of actions relative to the areas they govern and/or use….

Tribal concerns about impacts to natural and cultural resources and properties and to their particular uses may include, but are not limited to the following:

- Water with naturally high quality and impacts involving -
    - Changes in concentrations of unregulated substances
    - Synergistic effects of multiple individually unregulated or regulated substances
    - Changes to water that make it unsuitable for cultural uses
- Lakes, rivers, wetlands, and other water bodies where plants of significance to tribes grow (e.g., wild rice)
- Water quality and quantity and soil quality that enable wild rice to grow
- Water quality necessary to support fish populations
- Plants and wildlife (e.g., moose, grouse, deer) of significance to tribes
- Sufficient wildlife populations and habitat to support traditional hunting, fishing, and gathering
- Fish and wildlife without contaminants that preclude their frequent consumption
- Archeological locations or areas
- Traditional or historic properties, locations or areas (e.g., traditional locations for hunting, fishing, and gathering; springs and ceremonial sites; other places where historic events occurred)
- Sacred locations or areas (e.g., gravesites, spiritual sites) without visual or noise impacts that would make them unsuitable for traditional activities
- Habitats that host culturally important resources (e.g., pipestone, sage, other culturally important plants)
- Access to areas where tribes have hunting, fishing, or gathering rights and to lands where off-reservation harvest under treaty rights occurs, including trails or passageways that link tribal use areas.
- Cultural items as defined by the Native American Graves Protection and Repatriation Act, 25 United States Code (USC) 3001, including funerary objects, sacred objects, and cultural patrimony
- Social bonds associated with traditional activities
- Tribal jurisdiction and control over reservation lands, thus improving or maintaining quality of life for residents of the reservations

An EIS that addresses cumulative impacts with respect to tribal uses and practices related to natural and cultural resources and properties should consider an analysis approach that uses:

1. A geographic area that is relevant to the tribe, for which information is collected and evaluated,

2. Information that reflects and describes tribal uses and tribal rights, and

3. A timeframe that is relevant to tribal uses.

In short, considering cumulative impacts to tribes may require a wider focus area and a discussion of direct and indirect impacts of all projects in an area, relative to tribal traditions, values, and concerns that involve using the resources affected by the project.

Regarding the geographic scope for a tribally relevant cumulative effects analysis:

- Scale is a central issue in the ecosystem approach.
- The appropriate boundary is one that ensures adequate consideration of all resources that are potentially subject to non-trivial impacts.
- For some resources, that boundary can be very large. For example, the long-range atmospheric transport of nutrients and contaminants into water bodies such as the Great Lakes and Chesapeake Bay transcends even the boundaries of their vast watersheds.
- At the other end of the spectrum, significant contributions to biodiversity protection can be made by identifying and avoiding small sensitive areas, such as rare plant communities.
- Determining relevant boundaries for assessment is guided by informed judgment, based on the resources potentially affected by an action and its predicted impacts.

The 1997 CEQ document notes that, for a project-specific analysis, it is often sufficient to analyze impacts within the immediate area of the proposed action. When analyzing the proposed action's contribution to cumulative impacts, however, the geographic boundaries of the area should almost always be expanded. Project-specific analyses are usually conducted on the scale of forest management units, or facility footprints, or mixing zone in a waterbody pursuant to a discharge permit. Cumulative impacts analysis should be conducted in the scale of human communities, landscapes, watersheds, or airsheds.

Finally, EPA's 1999 document notes that the EPA reviewer can determine an appropriate spatial scope of the cumulative impact analysis by identifying a geographic area that includes resources potentially affected by the proposed project and extending that area, when necessary, to include the same and other resources affected by the combined impacts of the project and other actions. Furthermore:

- Geographical boundaries should not be extended to the point that the analysis becomes unwieldy and useless for decision-making.

- The analysis should use an ecological region boundary that focuses on the natural units that constitute the resources of concern.

- For non-ecological resources, other geographic areas, such as historic districts (for cultural resources) or metropolitan areas (for economics), should be used.

Cultural Resources

During the EIS scoping process for the NorthMet Project (see Section 2.1 of the Final Scoping Decision Document), no cumulative impact issues associated with cultural resources were identified. Tribes were not invited to participate in scoping. However, Tribal comments on the June 2008 PDEIS, the 2009 CPDEIS and the 2009 DEIS noted this cumulative impact and the need for analysis. The tribal cooperating agencies have repeatedly stated and commented in writing that there likely will be substantial impacts to cultural resources, and impacts to cultural resources need to be fully integrated into evaluation of potential impacts to cultural sites and cultural resources. However, there appears to be a concerted effort to diminish any and all comments on this subject and simply revert back to decisions made during the scoping phase.

The Traditional Use Survey conducted in 2011 (Latady and Isham 2011) focused on identifying and evaluating significance of places of importance to the Bands within the area to be affected by the proposed mine. Identification and evaluation is the first step before assessing adverse effects and integral to the development of a cultural resource management plan to facilitate preservation and management of cultural resources including traditional use areas. Beyond identification, the intent of the survey highlighted the potential to bridge the past and future in terms of native culture, history and natural resources.

Tribal cooperating agencies consider a 216,300 acre area bounded by the St Louis River, Lake Superior, Lake Vermilion and the Beaver Bay to Vermilion Trail to be a Tribal Historic District, and the pertinent area for consideration of cumulative effects to cultural resources. In addition to the St Louis River, the area supports three major drainage systems, the Cloquet, Embarrass and Pike Rivers. Trygg maps (1966), historic documents (Brownell 1967, Carey 1936, Chester 1902, Lancaster 2009, Trygg 1969, Van Brunt 1922, Jenks 1901, Moyle 1941) and information contained in site files located at the Bois Forte Tribal Historic Preservation Office were used to determine the extent of the district. Additional information on Historic places and properties are available at SHPO, Superior National Forest Headquarters and Duluth Archaeology Center. Included within the proposed historic district are the headwaters of the St. Louis River, the site of ongoing mineral exploration.

Ancestors of present day Band members resided in this area for centuries and many Band members followed traditional practices extensively until about a generation ago when the effects of mining devastated the rice beds in the Embarrass and St. Louis River watersheds and closed access to large tracts of public (USFS) land where traditional harvest and collection areas occur. This proposed Tribal Historic District encompasses complex trail systems, Indian villages, trading posts, encampments for fishing, hunting, wild rice harvest

and processing, sugar bush, and other traditional subsistence practices. It includes what was essentially a 'water highway' used by the Ojibwe at the time of European contact, and subsequently by Voyaguers during the era of heavy fur trading. In addition, numerous medicinal plant gathering sites, Midewewin lodges, vision quest locales and other sacred places occur.

Land Use

The co-lead agencies define the CEAA for land use to include effects associated with the NorthMet Project Proposed Action combined with other industrial (including mining) or public works projects located within the portion of the Mesabi Iron Range encompassed by St. Louis County". Tribal cooperating agencies believe the CEA for land use should encompass the 1854 Ceded Territory, as the signatory Bands have lost access to substantial portions of the 1854 CT and the resources within (Figure 3). The 1854 Ceded Territory encompasses 6,283,836 acres in North Eastern Minnesota. Of that, 4,095,146 acres are public land ranging from Federal to CRP lands. The remaining 2,188,578 is private to private industrial land[1]. Band members generally do not exercise usufructuary rights on private lands without landowner permission, although the treaty does not hold that restriction. Lands within the 1854 Ceded Territory that have experienced urban and/or industrial development are permanently 'lost' as a source of treaty resources.

[1] http://deli.dnr.state.mn.us/data_catalog.html using GAP Stewardship 2008 – all Ownership Types shape file and database

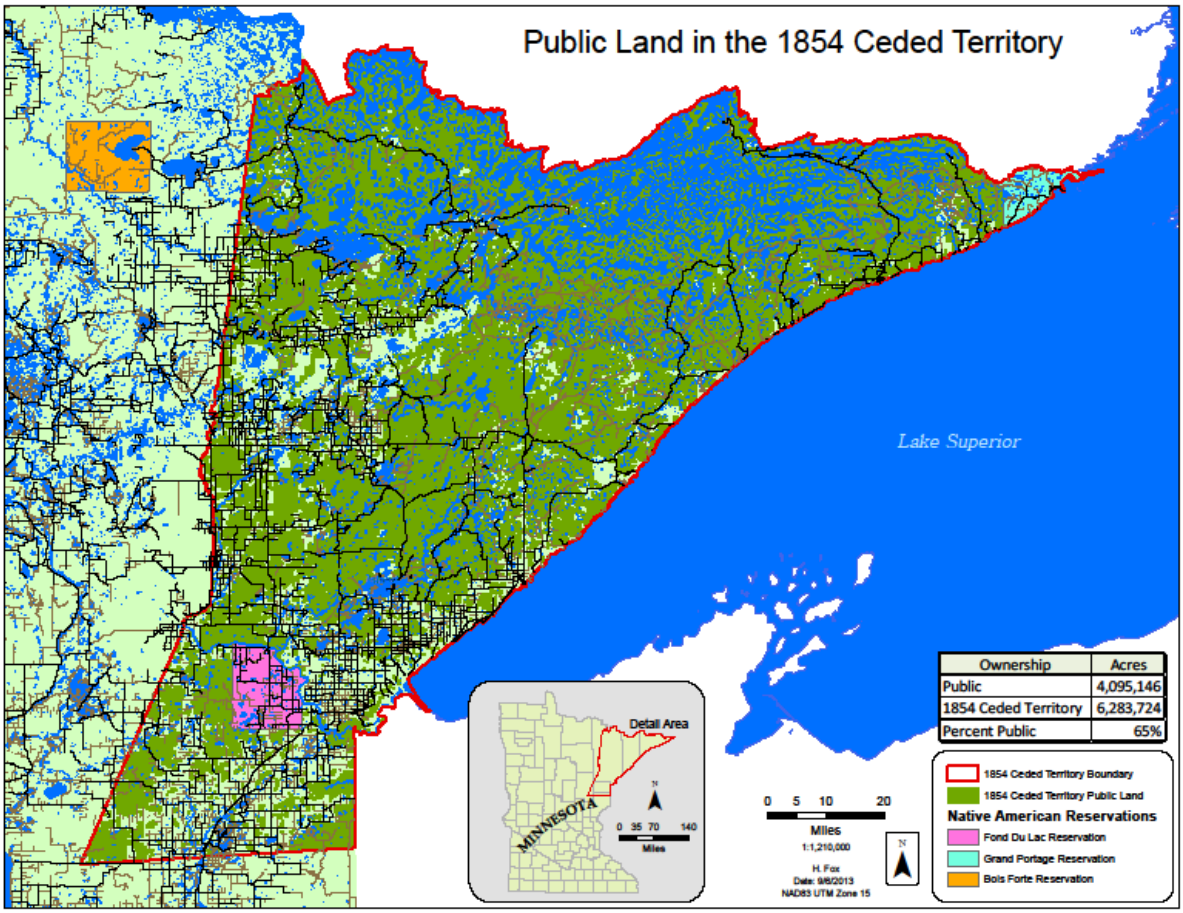


Figure 3. Public Lands within the 1854 Ceded Territory

Water Resources

The co-lead agencies evaluated cumulative impacts to surface water within the Partridge and Embarrass River watersheds only. From the preliminary SDEIS: "The St. Louis River was considered for inclusion in the cumulative effects assessment. The NorthMet Project Proposed Action is predicted to meet all water quality evaluation criteria or not make concentrations worse. Further, concentrations of sulfate and mercury, two key constituents of concern, are predicted to decrease as a result of the NorthMet Project Proposed Action. The NorthMet Project Proposed Action would also result in only minor changes in hydrology within the Partridge River and Embarrass River. Therefore, the NorthMet Project Proposed Action is not considered to have the potential for cumulative effects on hydrology and water quality in the St. Louis River. As a result, the CEAA for surface water is defined by the Partridge River and Embarrass River watersheds as shown on Figure 6.2.3-1."

The tribal cooperating agencies believe the relevant spatial scale for water quality and hydrologic cumulative effects analysis is the entire St. Louis River watershed. This watershed has experienced substantial historic, current and proposed expanded mining activities, as well as other industrial, agricultural and urban development. In addition to the direct surface water and wetland impacts (loss and/or degradation) from these activities, nearly half of the watershed has experienced hydrologic alteration from extensive ditching. It is reasonably foreseeable that an additional 3000 acres of wetlands within the watershed will be directly impacted by proposed new mining projects and expansions that are in active permitting and/or environmental review: the PolyMet NorthMet project, Mesabi Nugget Phase II, US Steel Minntac expansion, US Steel Keetac expansion, United Taconite Tailings Basin 3 construction. To date, virtually all required wetland mitigation for mining impacts has been implemented out of the basin, representing a permanent loss of high quality ecological resources and functions.

Modeling

The tribal cooperating agencies' review of the water modeling data packages for the NorthMet Project Proposed Action led to our conclusion that Goldsim did not accurately predict existing conditions, and cannot be relied upon to accurately predict future project conditions. While we feel that modeling of the existing conditions is an inadequate substitute for a realistic No-Action Alternative model and does not follow CEQ guidelines, it appears that Goldsim does not even accurately model existing conditions. As noted in spreadsheet comments submitted June 25, 2013, for many parameters at several waterbodies the No-Action P50 model of annual average value is substantially different than the observed average existing conditions. Because of the inaccuracy of the Goldsim predictions of current conditions it is not clear that use of the Goldsim estimates of project impacts are adequate to ensure protection of water resources. For example:

- PSDEIS Table 4.2.2-18 reports Colby Lake as currently having an observed mean Arsenic of 0.78 to 1.4 ug/L (depending on the data set), whereas Figure 5.2.2-35, the No-Action (continuation of current conditions) P50 model for Colby Lake Arsenic shows annual maximum values of 0.5 ug/L

- PSDEIS Table 4.2.2-34 reports PM-10 (seep at the basin north toe) as having an observed mean Mn value of 100,192 ug/L, whereas Figure F-01-18.1 (Water Modeling Data Package Vol 2-Plant Site v9 MAR2013) shows the No-Action (continuation of existing conditions) P50 as an annual maximum Mn of 390 ug/L. at the north toe.
- PSDEIS Table 4.2.2-34 reports PM-10 as having an observed mean Aluminum of 39.6 ug/L yet Figure F-01-02.1 (Water Modeling Data Package Vol 2-Plant Site v9 MAR2013) shows an annual maximum for No-Action (continuation of existing conditions) at the north toe as 11 ug/L.
- PSDEIS Table 4.2.2-14 shows that observed average SO4 at SW-005 (9.11 mg/L) is nearly identical to the Goldsim P50 predicted current annual maximum for that site (PSDEIS Fig. 5.2.2-27, 9 mg/L). This suggests that Goldsim is under-predicting SO4 at SW-005. (The authors of the text on page 5.2.2-125 of the PSDEIS seem to misinterpret the P50 of the figure as a predicted annual average. This is not the case. The P50 of that figure is the "best" estimate of the annual maximum. The Goldsim model estimate of the annual average at SW-005 is shown as the P50 in Mine Site Data Package Attachment K Figure K-06-24.2, i.e. 6 mg/L) Again, this suggests that Goldsim is underpredicting SO4 at SW-005.
- PSDEIS Table 4.2.2-29 shows that observed average Al at PM-13 is 221 ug/L. This observed average is much higher than the modeled No-Action (continuation of existing conditions) P50 annual maximum (PSDEIS Table 5.2.2-47, 159-166 ug/L). The modeled No-Action P50 annual average for Al at PM-13 of 75 ug/L (attached Fig.I-05-02.2, Water Modeling Data Package Vol 2-Plant Site v9 MAR2013) is only 1/3 of the observed average.

Tables 1-3 below compare the observed existing conditions values found in various PSDEIS tables to the P50 existing conditions predicted by Goldsim. While a very few of these model predictions are presented in the PSDEIS, many are not and therefor, the tables below refer back to the underlying data packages from which the PSDEIS was written.

Parameter (ug/L)	Average existing water quality (PSDEIS Table 4.2.2-14)	Annual average P50 existing conditions predicted by Goldsim (Mine Site Data Package Attach.K)
Mn	SW-002 = 142	SW002 = 80 (Fig.K-01-18.2)
Tl	SW-002 = 0.6	SW002 = 0.11 (Fig.K-01-25.2)
Mn	SW-003 = 147	SW003 = 85 (Fig.K-02-18.2)
B	SW-004a = 126.5	SW004a = 30 (Fig.K-04-05.2)
K	SW-004a = 2,700	SW004a = 1,600 (Fig.K-04-16.2)
SO4	SW-004a = 15,900	SW004a = 8,000 (Fig.K-04-24.2)
Pb	SW-005 = 1.3	SW005 = 0.26 (Fig.K-06-21.2)
SO4	SW-005 = 9,110	SW005 = 6,000 (Fig.K-06-24.2)
Tl	SW-005 = 0.4	SW005 = 0.05 (Fig.K-06-25.2)

Table 1. Observed existing conditions in the Partridge River vs. annual average existing conditions predicted by Goldsim.

Parameter (ug/L)	Colby Lake mean existing water quality (PSDEIS Table 4.2.2-18, Barr data)	Colby Lake Annual average P50 existing conditions predicted by Goldsim (Mine Site Data Package Attach.K)
Al	108	75 (Fig.K-08-02.2)
As	0.78	0.4 (Fig.K-08-04.2)
Cu	2.4	0.7 (Fig.K-08-13.2)
Ni	2.5	1.1 (Fig.K-08-20.2)
SO4	33,800	~10,000 (Fig.K-08-24.2)
Tl	0.1	0.025 (Fig.K-08-25.2)

Table 2. Observed mean existing conditions in Colby Lake vs. annual average existing conditions predicted by Goldsim.

Parameter (ug/L)	Mean seep measured value at Basin Toe (Table 4.2.2-34)	Annual maximum P50 existing condition predicted by Goldsim (Plant Site Data Package Attach.F)
Al	PM-8 = 25.7	West toe = 14 (Fig.F-04-02.1)
AL	PM-9 = 29.9	NW toe = 13 (Fig.F-02-02.1)
AL	PM-10 = 39.6	North toe = 11 (Fig.F-01-02.1)
Mn	PM-8 = 3,039	West toe = 1,250 (Fig.F-04-18.1)
Mn	PM-10 = 100,192	North toe = 380 (Fig.F-01-18.1)
F	PM-8 = 2,900	West toe = 1,100 (Fig.F-04-14.1)
As	PM-8 = 3	West toe = 2 (Fig.F-04-04.1)
B	PM-10 = 379	North toe = 330 (Fig.F-01-05.1)
Pb	PM-10 = 1.3	North toe = 1 (Fig.F-01-21.1)

Table 3. Observed mean existing conditions at the tailings basin toe vs. annual maximum existing conditions predicted by Goldsim. (Goldsim predicted mean concentrations are not provided in Modeling Data Package Vol 2-Plant Site v9 MAR2013).

The above examples are not an exhaustive list of discrepancies between observed existing water quality data and the Goldsim P50 prediction of the No-Action alternative (continuation of existing conditions) but highlight some of the most notable discrepancies. What the discrepancies demonstrate is that the Goldsim model is a relatively poor predictor of current conditions. If a model is unable to accurately predict current conditions it is even less likely to accurately predict future Project conditions. The Goldsim models need to be better calibrated to existing conditions (the calibration effort reported in "Calibration of the Existing Natural Watershed at the Plant Site v4 MAR2012" only compared model output to upstream site PM-12 and apparently did a poor job of preparing the models to predict either the lower reaches of the Embarrass or the Partridge River.) and model results recalculated.

Surface water quality

Evaluation Criteria that are used by the Project Proponent to evaluate the impacts of pollutants that are currently exceeding WQS do not comply with the Clean Water Act. 40 CFR § 122.44 (d) requires that all effluents be characterized to determine the need for a

Water Quality Based Effluent Limit (WQBEL). If a projected concentration of a specific pollutant exceeds the applicable numeric WQS, there is a reasonable potential that the discharge may cause or contribute to an excursion above WQS. Where existing data demonstrates an excursion from WQS, a WQBEL may be imposed without facility-specific effluent monitoring. In order to calculate a WQBEL, a Waste Load Allocation (WLA) for each permitted discharge must be established. The WLA is the portion of a Total Maximum Daily Load that is allowed for each point source to ensure compliance with WQS. However, it is very difficult to determine based on the information that has been provided by PolyMet if the additional contribution of each pollutant that currently exceeds WQS will exceed the load limit that would be required by a WLA to ensure compliance with WQS. And, the additional loading of pollutants that already exceed WQS demonstrates cumulative water quality impacts from the Project. Therefore, the Area of Potential Effect for water quality extends from the Embarrass and Partridge rivers to the mouth of the St. Louis River.

The Embarrass River, Partridge River and Colby Lake already have several constituents including sulfate, manganese, and mercury in concentrations that already exceed Minnesota Water Quality Standards ("WQS"). The existing large number of water-quality exceedances and the suite of constituents, particularly trace metals, exceeding WQS indicate the site has not been remediated from previous mining activities, and that the required reclamation was not adequate to ensure compliance with WQS. Concentrations of sulfate, specific conductance, manganese, mercury and arsenic that exceed MN WQS have been measured for NPDES permit Data Monitoring Reports and by the PolyMet project proponent demonstrate both water quality contamination issues and cumulative water quality impacts.

Specific conductance

Tribal staff have noted that elevated specific conductance is a water chemistry 'signature' for mining discharges. Specific conductance is the ability of a material to conduct an electric current measured in microSiemens per centimeter (μS/cm) standardized to 25°C. Specific conductance reflects concentrations of dissolved solids, including metal and other contaminants from mining, other industrial activities, and agriculture.

Tribal staff conducted analysis of specific conductance downstream of mine discharges using agency monitoring data (1990-2013). Analysis of specific conductance downstream of mine discharge sites indicated that specific conductance was highest nearest to mine discharge sites, and tended to only gradually decrease downstream of mine discharge sites. Linear regressions demonstrated that specific conductance was significantly negatively related to distance across all sample sites ($P < 0.01$, $R^2 = 0.15$; $n = 123$ sites; Fig. 4) and within the St. Louis River and Swan River systems ($P < 0.05$, $R^2 = 0.18$ and 0.52, respectively; Fig. 5). This analysis included stream and river monitoring only (not lakes). The regression suggests that specific conductance could drop to 150 μS/cm only 203 km (126 mi) downstream of the nearest upstream mine discharge site.

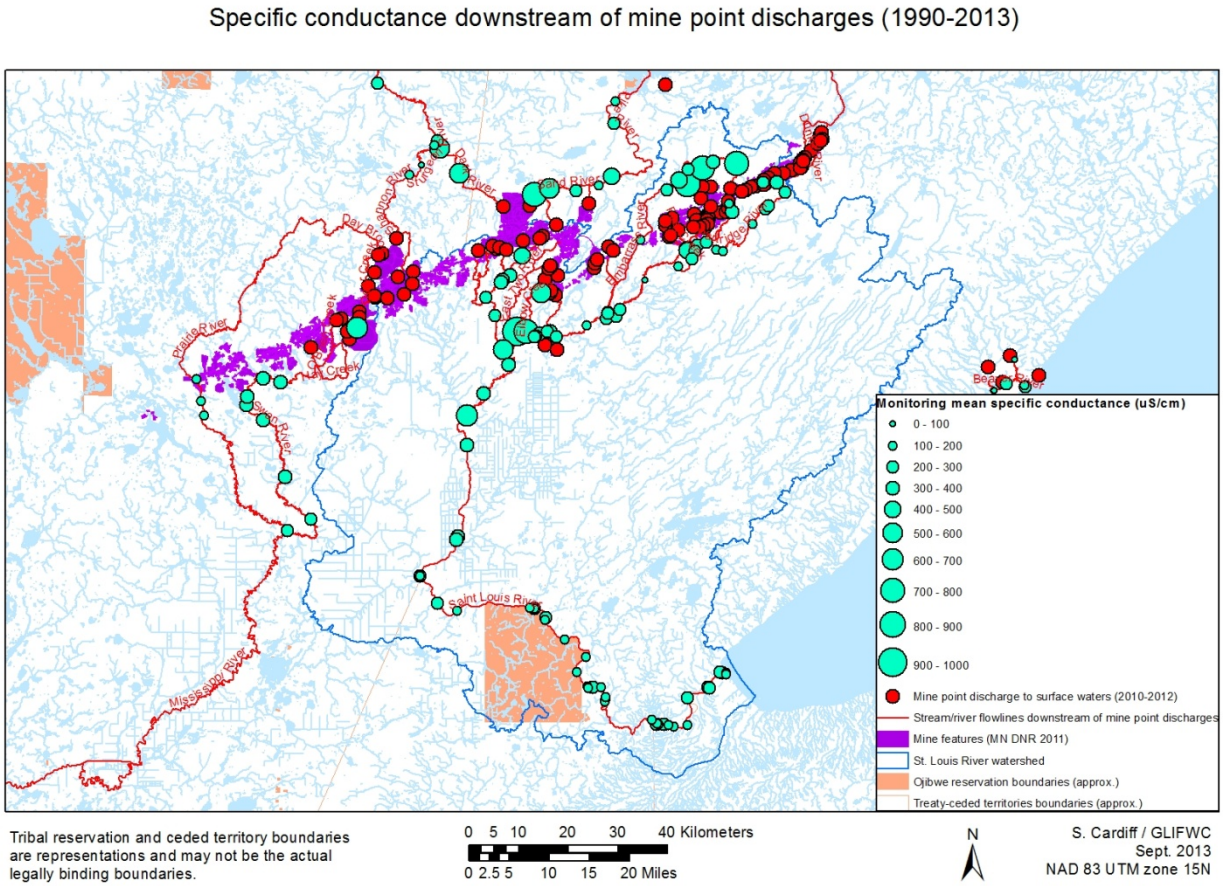


Figure 4. Mean specific conductance measurements at monitoring stations downstream of mine point discharges were inversely related to distance downstream from mine point discharge sites.

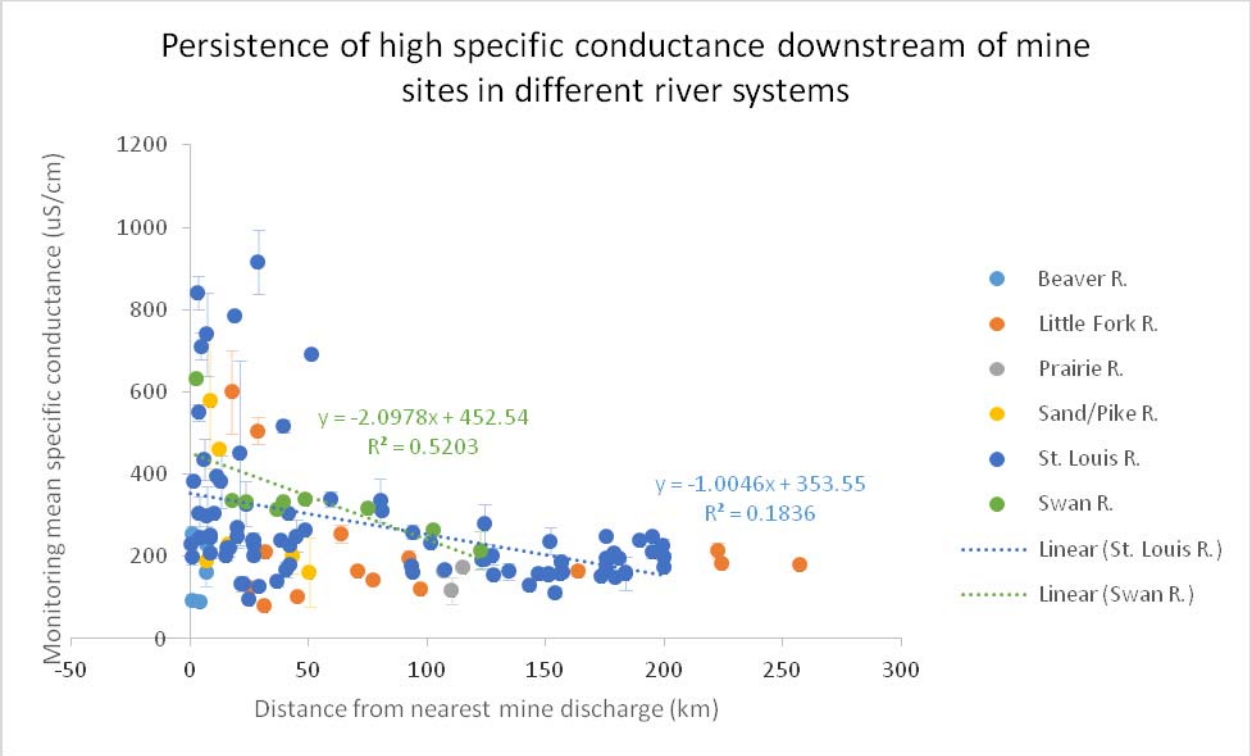


Figure 5. Linear regression indicated that mean specific conductance (±1 SE) was significantly negatively related to distance of the monitoring location downstream of the nearest mine discharge in two of the main downstream river systems, with highest specific conductance nearest to mine discharges and decreasing relatively gradually downstream (St. Louis River system $P < 0.01$, $R^2 = 0.18$, $n = 85$; and the Swan River system ($P < 0.05$, $R^2 = 0.52$, $n = 9$).

These analyses demonstrate that existing mining discharges result in elevated concentrations of pollutants that persist far downstream in the St. Louis River, which is consistent with the findings of the USEPA in their assessment report on the effects of mountaintop removal and valley fill mining[2].

Manganese

The Health Risk Limit (HRL) for manganese is 100 micrograms per liter (µg/l) because it is a potent neurotoxin known to cause brain damage when formula fed infants are exposed to high concentrations, and can cause Parkinsons-like symptoms in adults exposed to high concentrations. The average measured concentration of manganese in Wyman Creek between April 2005 and December 2012 was 1383 µg/l. Water discharging from Area Pit 5 to Spring Mine Creek, a tributary to the upper Embarrass River, between July 2010 and

[2] U.S. EPA (Environmental Protection Agency). 2011. The Effects of Mountaintop Mines and Valley Fills on Aquatic Ecosystems of the Central Appalachian Coalfields. Office of Research and Development, National Center for Environmental Assessment, Washington, DC. EPA/600/R-09/138F.

October 2011, had an average measured concentration of 804 µg/l. Test results from sixteen private drinking water wells located between the proposed project and the Embarrass River in 2008 revealed concentrations of manganese that exceeded the HRL in eight wells. The range of manganese concentrations from all of the wells was 0.66 – 4710 µg/l. The PolyMet project will contribute additional manganese to the groundwater from tailings basin water that is not captured and treated, and the water that seeps through fractures in the mine pit walls once the pit has filled with water.

In the Partridge river watershed, measured concentrations of manganese increase dramatically from the most upstream measurements to the furthest downstream measurements (Figure 6).

In the Embarrass River watershed, high concentrations of manganese are associated with mining features. SD033 is the discharge from Area Pit 5, and the former LTV tailings basin appears to be the source of pollution for monitoring locations MLC-2, PM-19, and PM-11 (Figure 7).

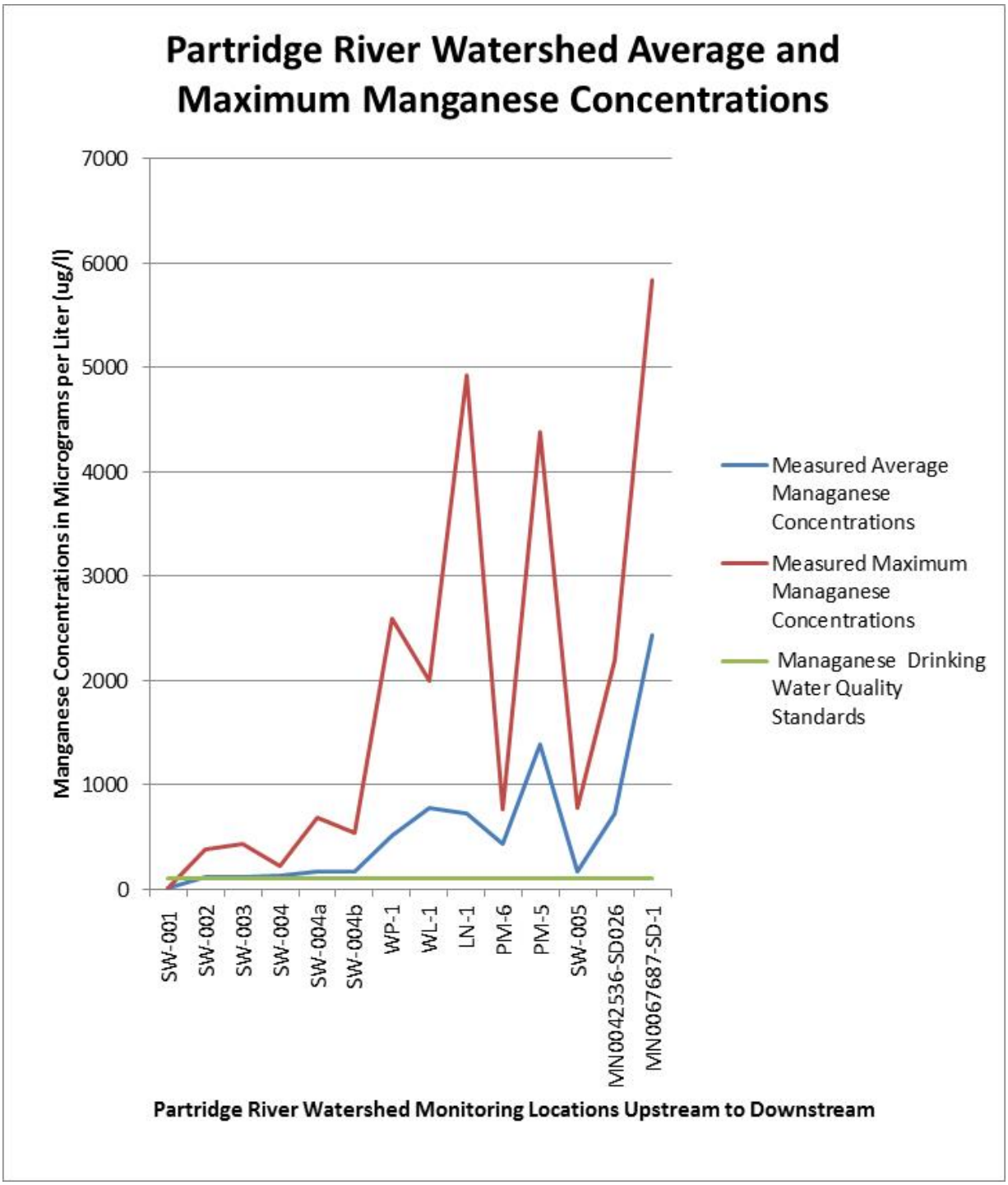


Figure 6. Partridge River Watershed Manganese Concentrations.

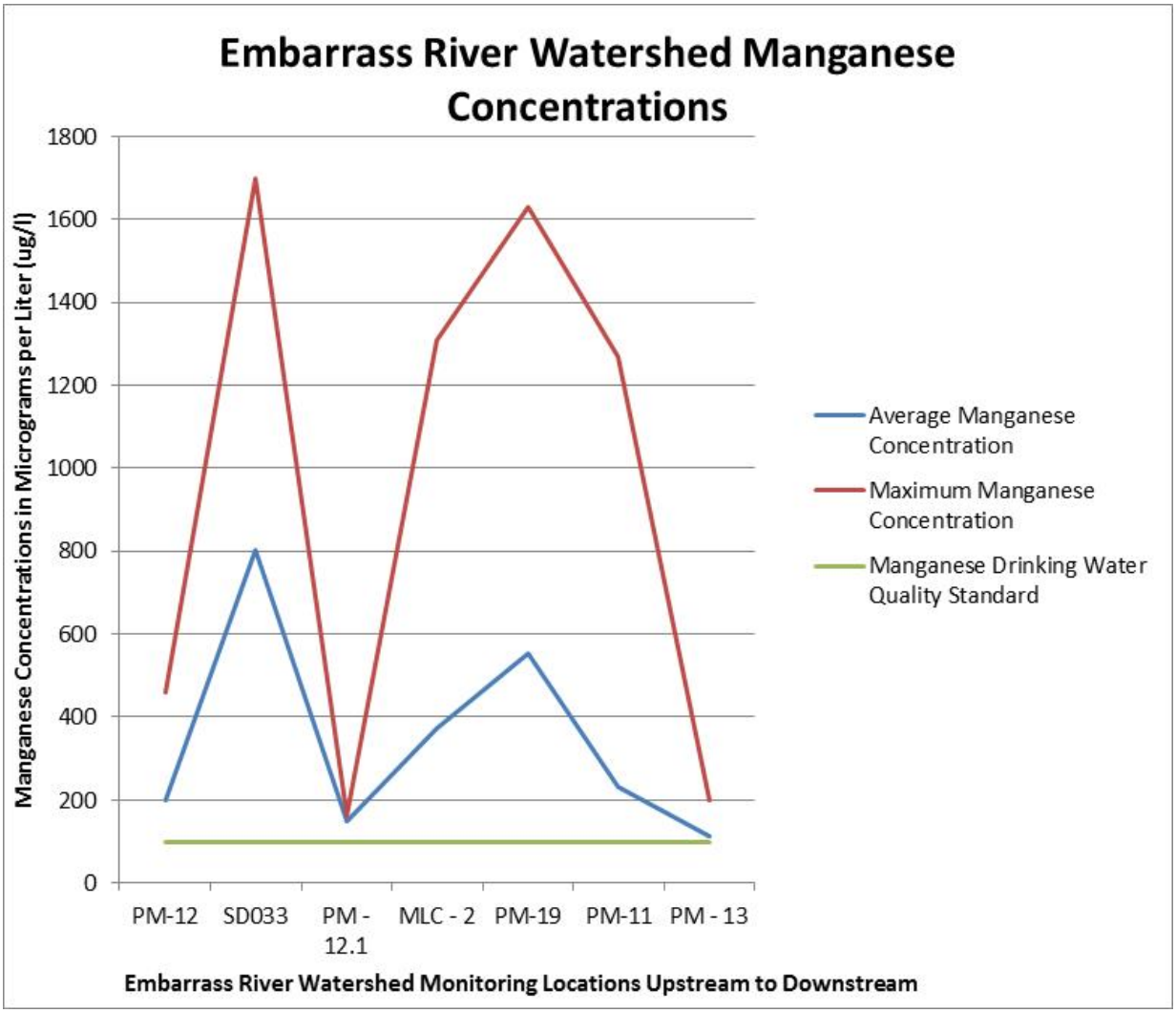


Figure 7. Embarrass River Watershed Manganese Concentrations.

Arsenic

Arsenic is a known carcinogen. The drinking water standard for arsenic is 10 µg/l, based on both human health and the economics of treating drinking water to meet the standard. Based on human health alone, the standard for arsenic is less than 2 µg/l[3]. Arsenic concentrations measured in sixteen private drinking water wells between the proposed project and the Embarrass River in 2008 ranged from less than the detection limit of 2 to 7.5 µg/l. Arsenic concentrations are projected to increase as a result of the PolyMet project[4].

In the Partridge River watershed, measured maximum arsenic concentrations exceed Class 2A and 2Bd water quality standards at all but three locations (Figure 8). The locations where the maximum measured concentration of arsenic does not exceed the Class 2A and 2Bd water quality standards are in the upper portion of the watershed.

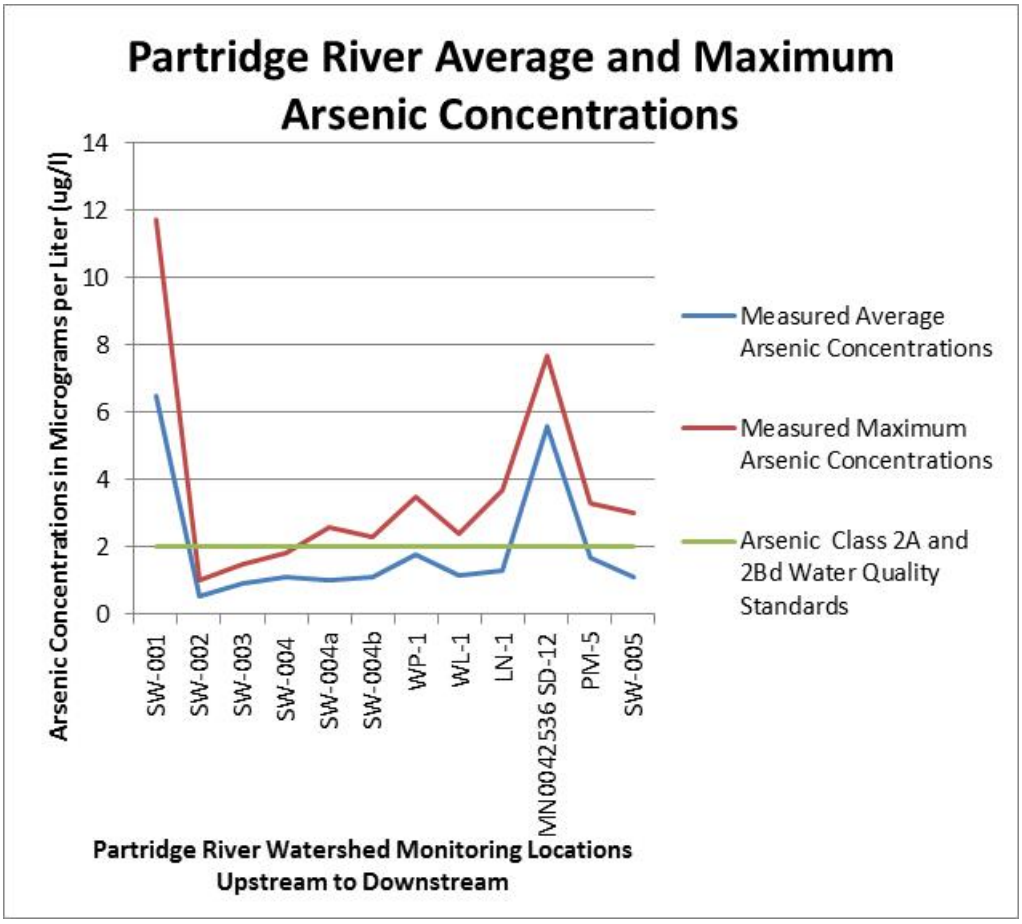


Figure 8. Partridge River Arsenic Concentrations.

[3] 40 CFR 131.36
[4] PolyMet Water Modeling Data Package

In Colby Lake, which is the City of Hoyt Lakes drinking water source, the increase in arsenic from the PolyMet project would be 38.5% (5.2.2-127 Table 5.2.2-33 Maximum Modeled Monthly P90 Surface Water Concentrations for the Colby Lake). This is significant because the US EPA's Priority Toxic Pollutants rule suggests that this level of arsenic would be more than an order of magnitude higher than what would prevent cancer in humans. The increased arsenic in the Partridge River — up to 55% at SW-004b are even more striking (p. 5.2.2-113, Table 5.2.2-29 Maximum Modeled Monthly P90 Surface Water Concentrations for the Mine Site), which may affect humans through fish consumption, even if the water isn't used for drinking.

Aluminum

The Class 2A chronic standard for total aluminum, applicable to Wyman Creek, is 87µg/l. The quality of Class 2Bd surface waters shall be such as to permit the propagation and maintenance of a healthy community of cool or warm water sport or commercial fish and associated aquatic life and their habitats. These waters shall be suitable for aquatic recreation of all kinds, including bathing, for which the waters may be usable. The Class 2Bd standard for aluminum is 125µg/l, applicable to the Embarrass River, Partridge River and St. Louis River. As Figure 9 below demonstrates, at every site where data is available the maximum aluminum concentrations exceed WQS, except at SW-001. The average aluminum concentration exceeds WQS at one quarter of the sites where monitoring data is available for aluminum.

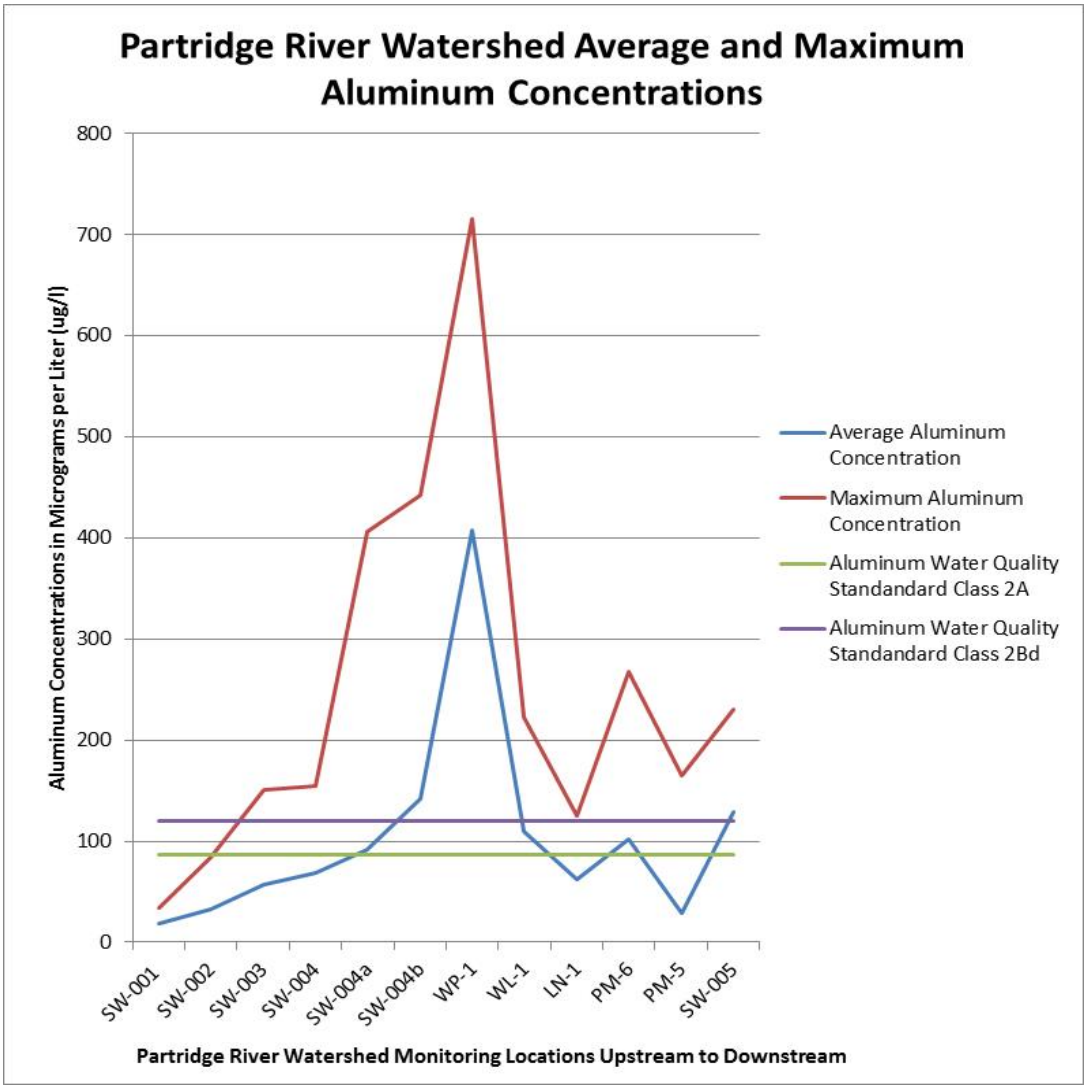


Figure 9. Partridge River Watershed Aluminum Concentrations.

Aquatic Species

Within the CEA area defined by the co-leads for impacts to aquatic species (the Partridge and Embarrass Rivers from their headwaters to a point approximately 15.5 miles downstream of the NorthMet Project Proposed Action activities, where the rivers form the St. Louis River), the MPCA has assessed and identified waterbodies that are impaired for fish and/or benthic macroinvertebrate communities, based upon recent monitoring data (since 2009). The draft 2012 §303(d) list prepared by the MPCA includes more headwaters streams and rivers in the St. Louis River watershed that are also impaired for aquatic communities (Figure 10). It is likely that the state-led stressor identification process underway will identify historic and existing mining operations as major causal factors for these impairments. The tribal cooperating agencies believe that the appropriate spatial scale for considering cumulative impacts to aquatic species is the St. Louis River watershed.

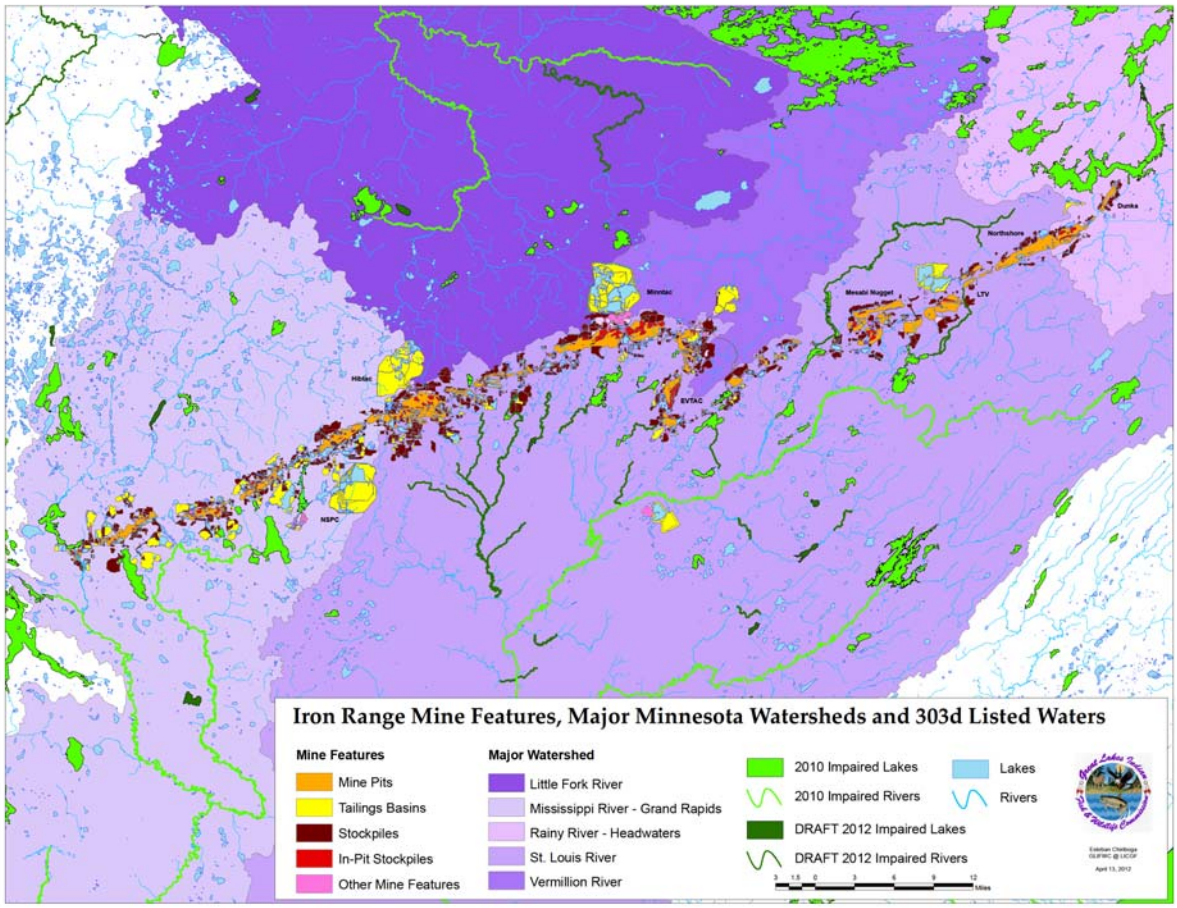


Figure 10. Impaired Waters (§303(d) Listed) within the St. Louis River and other mining-impacted watersheds.

The co-lead agencies conclude that, since the NorthMet Project Proposed Action is not predicted to result in any short- or long-term exceedances of surface water chronic standards in the Partridge River, Colby Lake, or the Embarrass River, even under extreme low-flow conditions during operations, no cumulative effects on aquatic resources are predicted within the CEAA. The co-lead agencies also conclude that there will be no effects on current baseline habitat conditions (as defined by hydrologic changes) from the NorthMet Project Proposed Action; therefore, no cumulative effects are anticipated. Both of these assumptions are major differences of opinion between the co-lead agencies and the tribal cooperating agencies. Clearly there are already adverse effects of mining operations and other development within these subwatersheds.

Mercury

From the PSDEIS: "The NorthMet Project Proposed Action is predicted to result in a net decrease in mercury loadings to the Partridge River from 24.2 grams per year to 23.0 grams per year. This would primarily be a result of a decrease in natural runoff (with a total mercury concentration of 3.6 ng/L) and a proportional increase in water discharged from the West Pit via the WWTF (with a total mercury concentration of 1.3 ng/L)."

The understanding of mercury dynamics in the St. Louis River watershed is very limited and is insufficient to lead to the conclusion reached in the PSDEIS that "the NorthMet Project Proposed Action would not exceed applicable environmental evaluation criteria." This lack of scientific information is explicitly stated throughout the PSDEIS and is what led the Minnesota Pollution Control Agency (MPCA) early this year to delay the establishment of a St. Louis River TMDL until further mercury cycling data could be collected.

The PSDEIS also states that the current fish tissue concentration in the five local lakes results in Hazard Quotients (HQs) that exceed 1 (page 6-58), but gives no further information. The *Cumulative Impacts Analysis, Local Mercury Deposition and Bioaccumulation in Fish (July 2012)* (Barr report) showed modeled contributions from both the Mesabi Nugget LDSP and PolyMet; this information should be included in the SDEIS for public review. The Barr report provides the actual HQs, rather than just saying "they exceed 1". The SDEIS should state clearly that in one case, the existing HQ equals 46.2, which is 46 times as high as the number where action is recommended.

The Barr report also states that "the existing health risk under Scenario 1 and 2 to subsistence/tribal and subsistence anglers eating three pounds or more per week of fish from these lakes would be significantly higher – up to fifteen times the EPA assumed safe risk intake level for a pregnant mother or child under the age of 15". While the incremental risk from the project may be small, the existing risk is large and has not yet been addressed through a total maximum daily load (TMDL) or other reduction program. Table 5 and Figure 9 from the Barr report should be included to give the public a clear idea of the existing condition of the local waters and why the tribes believe that no additional mercury should be added at this time. The SDEIS does not provide any rationale for more mercury to be added to a system that is already so high in mercury, but rather only suggests that the TMDL should take care of this.

Mercury is potent neurotoxin, with the primary human and wildlife route of exposure through consumption of fish. The Embarrass River, Wyman Creek, Whiteface Reservoir, Stony Creek, West Two River, numerous lakes, and the entire St. Louis River all have fish consumption advisories in place for recreational fishing. These advisories do not consider subsistence fishing. Mercury concentrations in fish from these impaired waters will require additional load reductions beyond the emissions reductions required by the statewide mercury TMDL.

Mercury levels in Lake Superior lake trout remain higher than the other Great Lakes, despite significant reductions in the amount of mercury being released from sources around the lake. The largest source of mercury from within the Lake Superior basin is the mining sector, at 63% of total emissions.[5] There has not been significant "ground-truthing" of mercury deposition rates that were used in the modeling assessment. Tribal cooperating agencies note that no studies have been conducted within this region of active mining to determine why fish tissue mercury concentrations are so high if the local sources mainly emit 'non-locally polluting' forms of mercury.

[5] Lake Superior Lakewide Management Plan Annual Report 2012, Catalogue No.: En161-9/2012E-PDF

A 2011 Minnesota Department of Health study[6] of infants in the Lake Superior basin found that 1 in 10 infants are born with unsafe mercury levels in blood. Blood spot mercury concentrations in infants from Minnesota were significantly higher than infants born in the Lake Superior basin in Wisconsin and Michigan.

Increased sulfate concentrations increase bioaccumulation of mercury. Additionally, mercury loadings to surface waters from the project is expected to increase from removing peat and storing peat in the overburden storage layout area without a cover or liner. Stormwater run-off containing concentrations of mercury that exceed MN WQS have been well documented (Aitkin AgriPeat). The Laskin Energy Center NPDES permit MN000990-SD-2 has a permit limit of 19.1 ng/l[7], even though the aquatic life WQS for the Lake Superior basin is 1.3 ng/l. Other existing permitted facilities contribute mercury loadings to the Partridge and Embarrass Rivers, in addition to the local atmospheric deposition (Figures 11, 12).

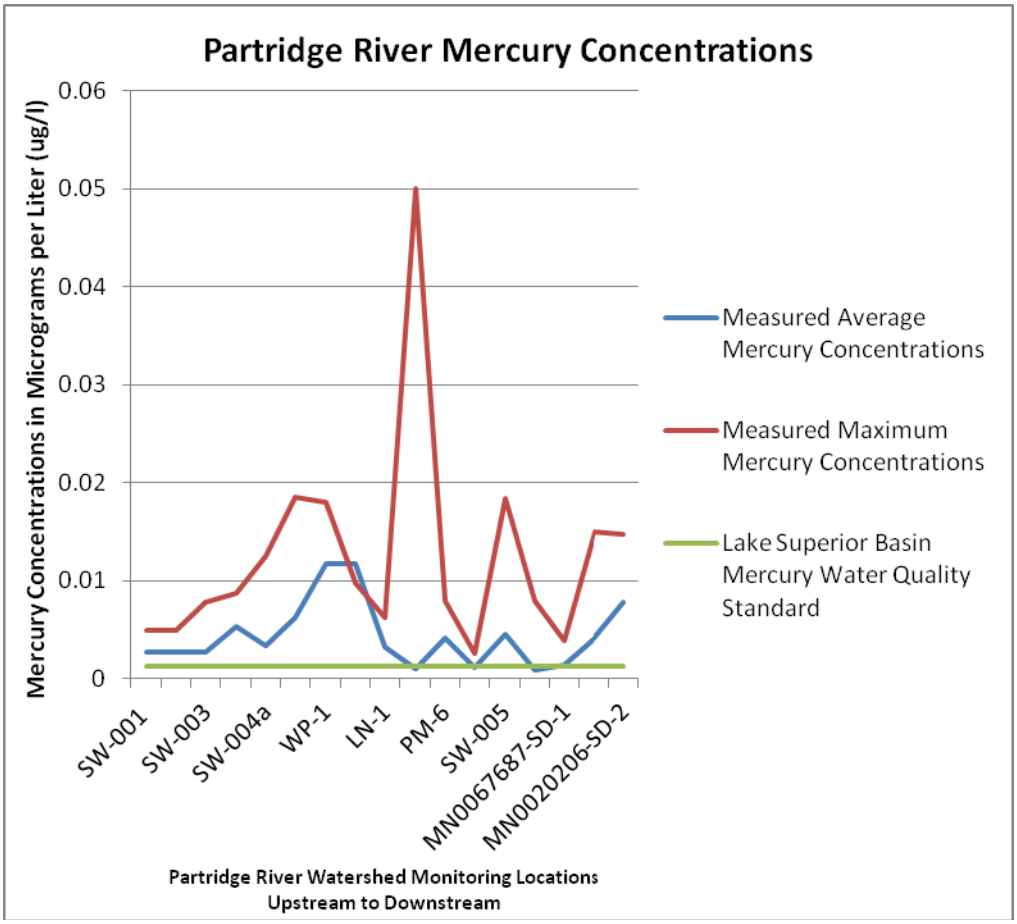


Figure 11. Partridge River Mercury Concentrations

[6] McCann, P. (2011). *Mercury Levels in Blood from Newborns in the Lake Superior Basin* (Minnesota Department of Health: Environmental Health, pp. 181)

[7] MPCA DMR data for NPDES permit MN0000990-SD-2 2000-2013.

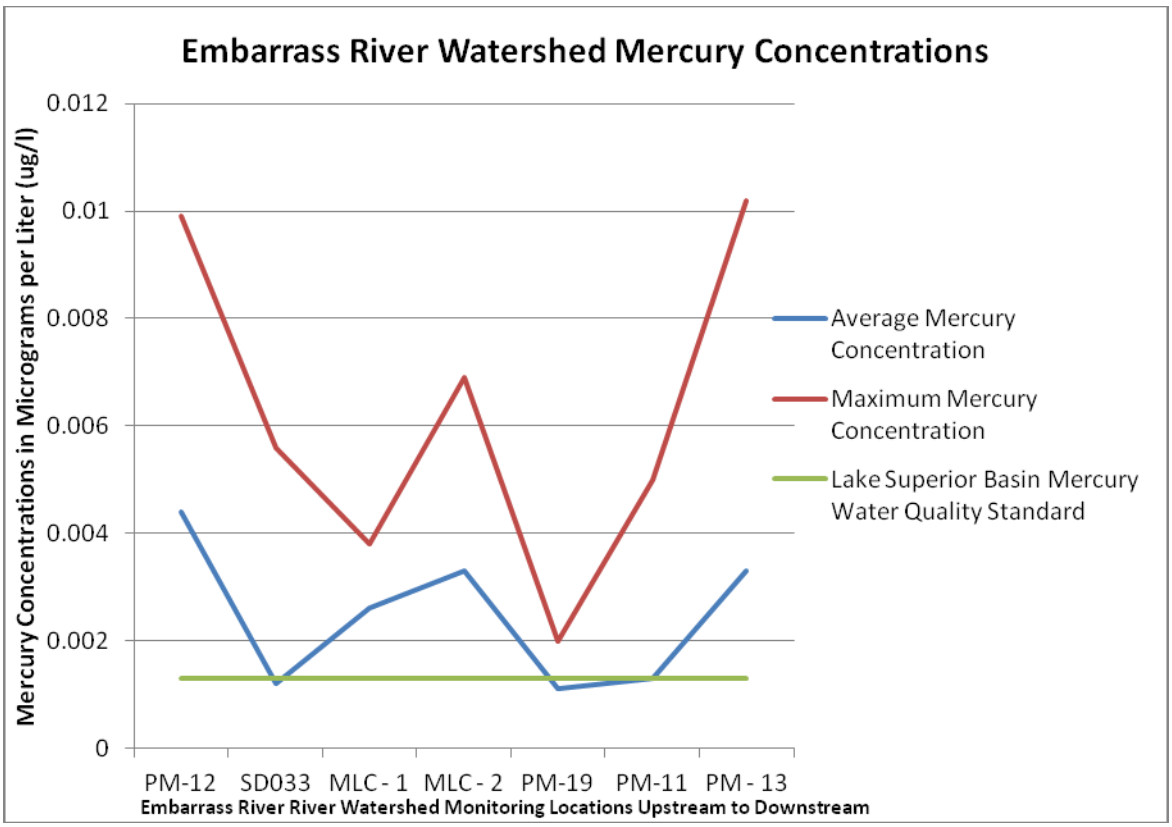


Figure 12. Embarrass River Mercury Concentrations.

Cumulative effects associated with mercury deposition and increased mercury methylation (mediated by increased sulfate loading and hydrologic alteration of peatlands) therefore extend from the plant site down the Embarrass River to the St. Louis River estuary. Additional analyses of predicted mercury impacts from the NorthMet Project Proposed Action have been provided by GLIFWC[8].

Sulfate

From the preliminary SDEIS: "Sulfate concentrations increase to an average of approximately 150 mg/L downstream of the confluence with Second Creek at the County Road 110 bridge (Mesabi Nugget monitoring location MNSW12). The wild rice surveys found sulfate concentrations as high as 289 mg/L below Second Creek during a relatively dry period. The baseline sulfate concentrations found in the Partridge River reflect the effects of discharges from existing activities within the watershed. The NorthMet sulfate load to the Partridge River would total an average of about 41 kg/d, which represents a 0.1 percent

[8] Great Lakes Indian Fish and Wildlife Commission (GLIFWC) Comments Related to Mercury on the "Northmet Mining Project and Land Exchange: Preliminary Supplemental Draft Environmental Impact Statement"

increase over existing loads. Therefore, the NorthMet Project Proposed Action should not adversely affect downstream waters that support the production of wild rice."

Sulfate concentrations in Trimble Creek, the Embarrass River, and the Partridge River currently exceed the wild rice standard of 10 mg/l. The drinking water standard and the cold water fisheries standard for sulfate is 250 mg/l. Discharge from Area Pit 5 near the proposed PolyMet tailings basin has measured sulfate concentrations that range from 170 to 2520 mg/l, averaging 1,083 mg/l between 2001 and 2013[9]. Sulfate concentrations measured in the discharge from the Peter Mitchell Pit to the upper Partridge River for NPDES permit MN0046981-SD-9 ranged from 14-37 mg/l. Sulfate concentrations measured in the discharge from the LTV Tailings basin to Second Creek for NPDES permit MN0042536-SD026 ranged from 118-360 mg/l in the period between 2008 - 2013[10]. Sulfate impaired wild rice waters, for the first time ever, will be included in the MPCA impaired waters list in 2014. The Bands believe that the Embarrass River, Second Creek, the Partridge River, Dunka River, and Bobs Bay of Birch Lake should be included on that list. In addition, the Swan River, Swan Lake, Sand River and the Twin Lakes (Sandy and Little Sandy Lakes, adjacent to the US Steel Minntac tailings basin) are all impaired wild rice waters due to concentrations of sulfate that exceed the MN wild rice sulfate standard.

The wild rice sulfate WQS is exceeded at almost every point where data is available in the Embarrass River watershed (Figure 12), and the drinking water standard is exceeded at half of the monitoring locations. In the Partridge River watershed, the wild rice sulfate WQS is exceeded at fourteen of seventeen locations (Figure 13). And, the sulfate drinking water standard is exceeded at two locations in the Partridge river watershed. The NorthMet Project Proposed Action will contribute additional sulfate to the groundwater from tailings basin water that is not captured and treated, water that seeps through fractures in the mine pit walls once the pit has filled with water, and stockpile infiltration and run-off.

[9] MPCA DMR data for NPDES permit MN0042536-SD033 2001 -2013.
[10] MPCA DMR data for NPDES permit MN0042536-SD026 2008 -2013.

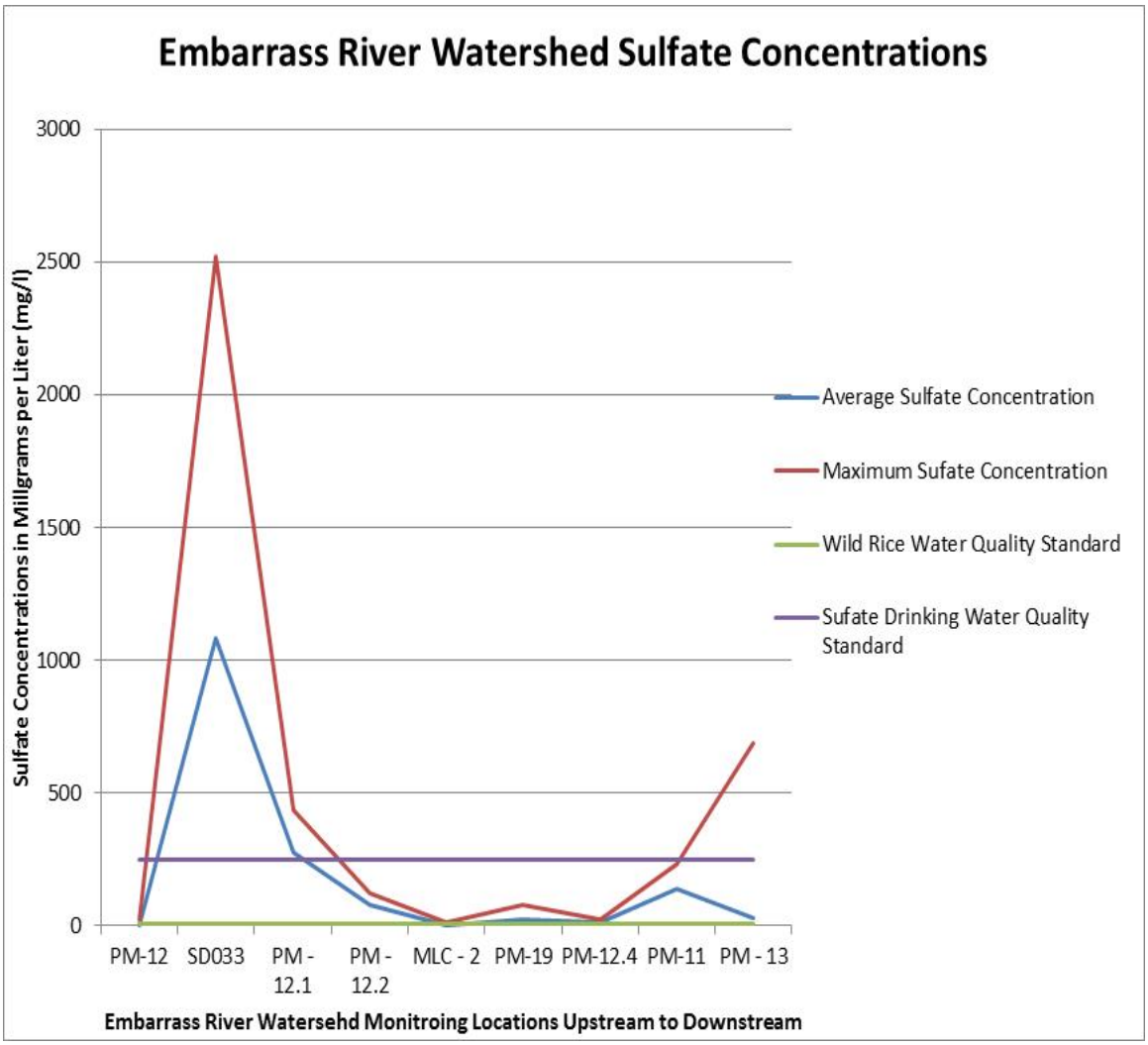


Figure 12. Embarrass River Watershed Sulfate Concentrations.

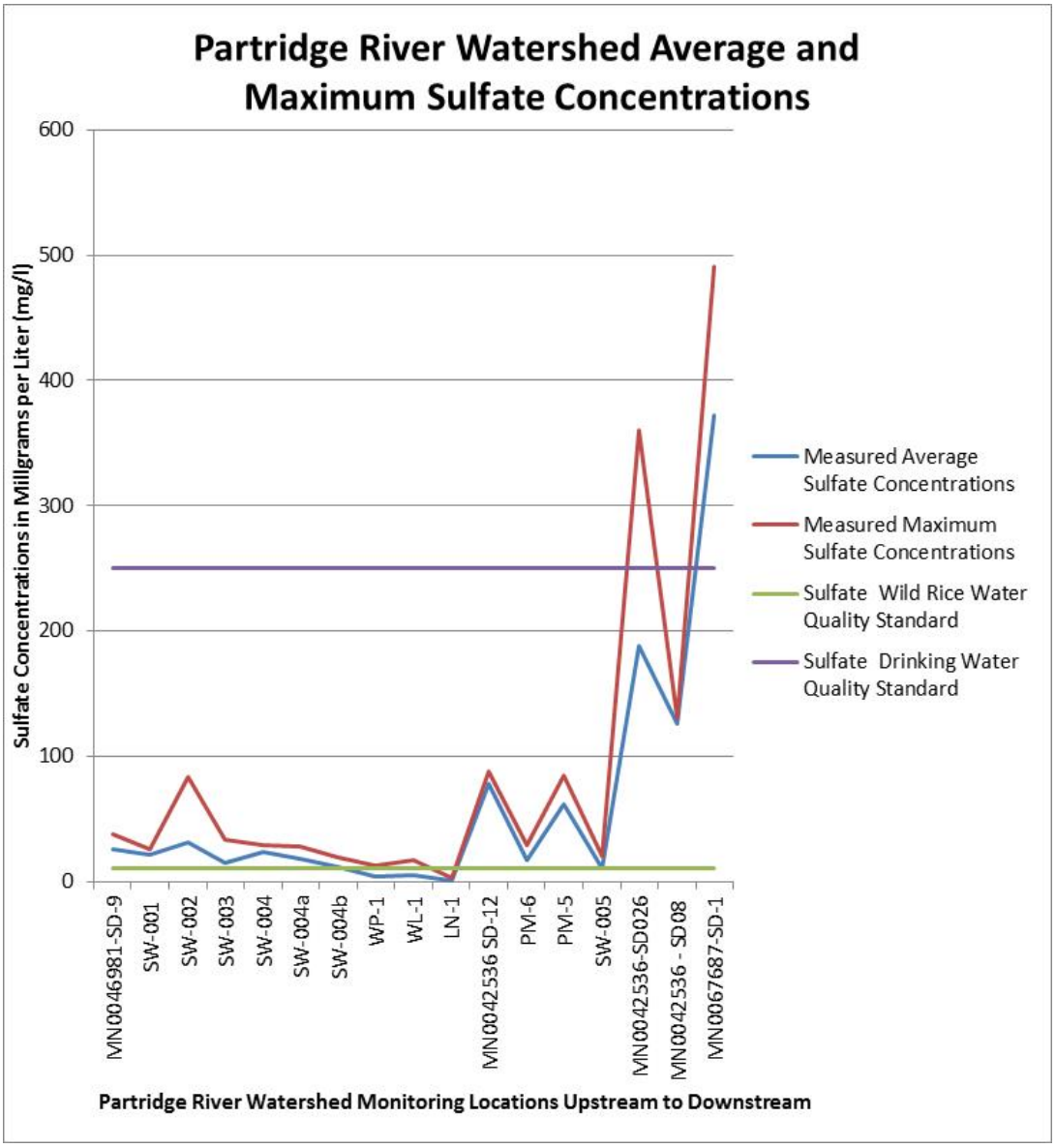


Figure 13. Partridge River Watershed Sulfate Concentrations.

Tribal staff did additional analysis of sulfate concentrations throughout the St. Louis River watershed. Analysis of sulfate concentrations downstream of mine discharge sites indicated that sulfate concentrations were highest nearest to mine discharge sites, and tended to only gradually decrease downstream of mine discharge sites. Linear regressions demonstrated that mean sulfate was significantly negatively related to distance across all sample sites ($P < 0.01$, $R^2 = 0.14$, $n = 92$) and within the Saint Louis River system ($P < 0.01$, $R^2 = 0.17$, $n = 73$; Figure 14). This analysis included stream and river monitoring only (not lakes).

The regression suggests that sulfate concentrations could drop to less than 10 mg/L only 170 km (105 mi) downstream of the nearest upstream mine discharge site (Figure 15).

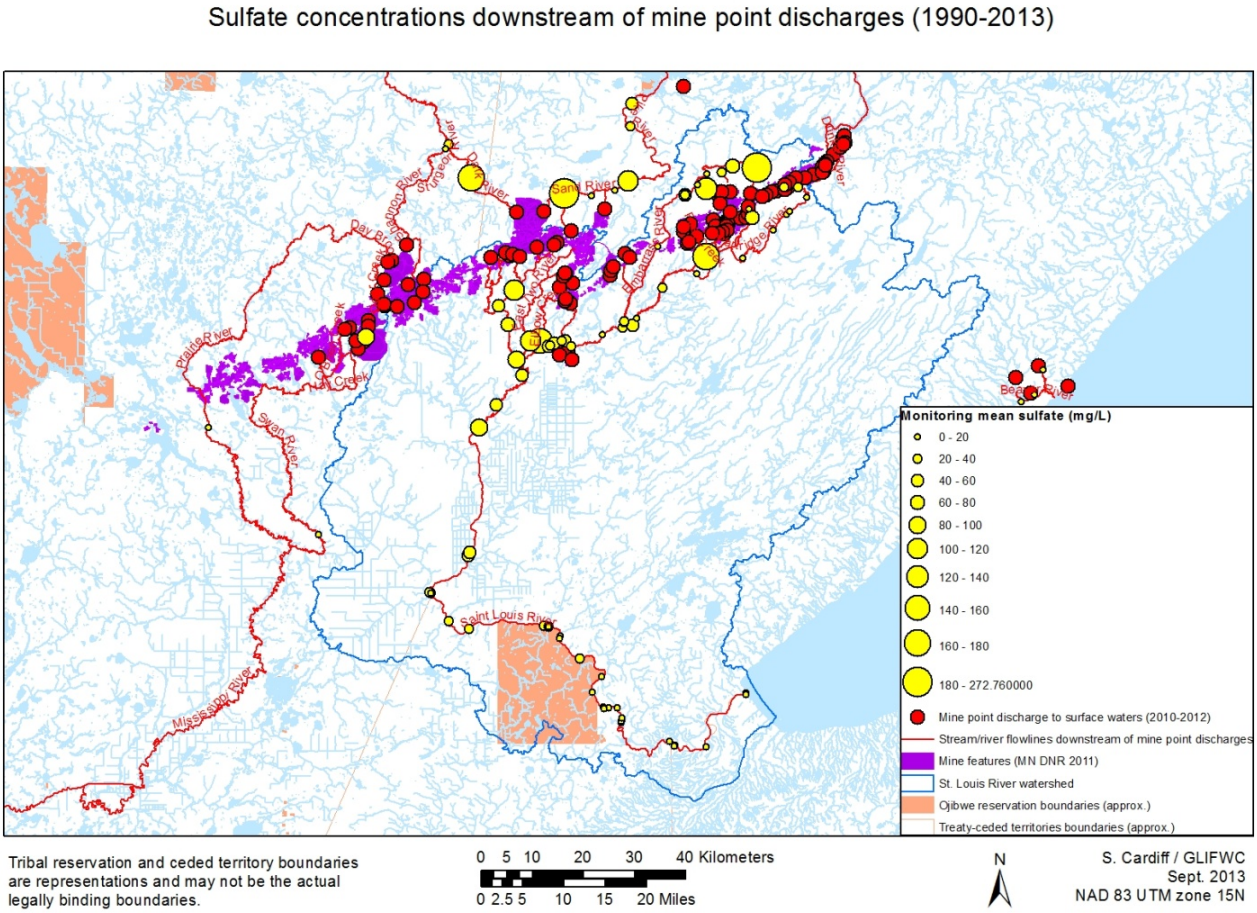


Figure 14. Mean sulfate concentrations at monitoring stations downstream of mine point discharges was inversely related to distance downstream from the discharge sites.

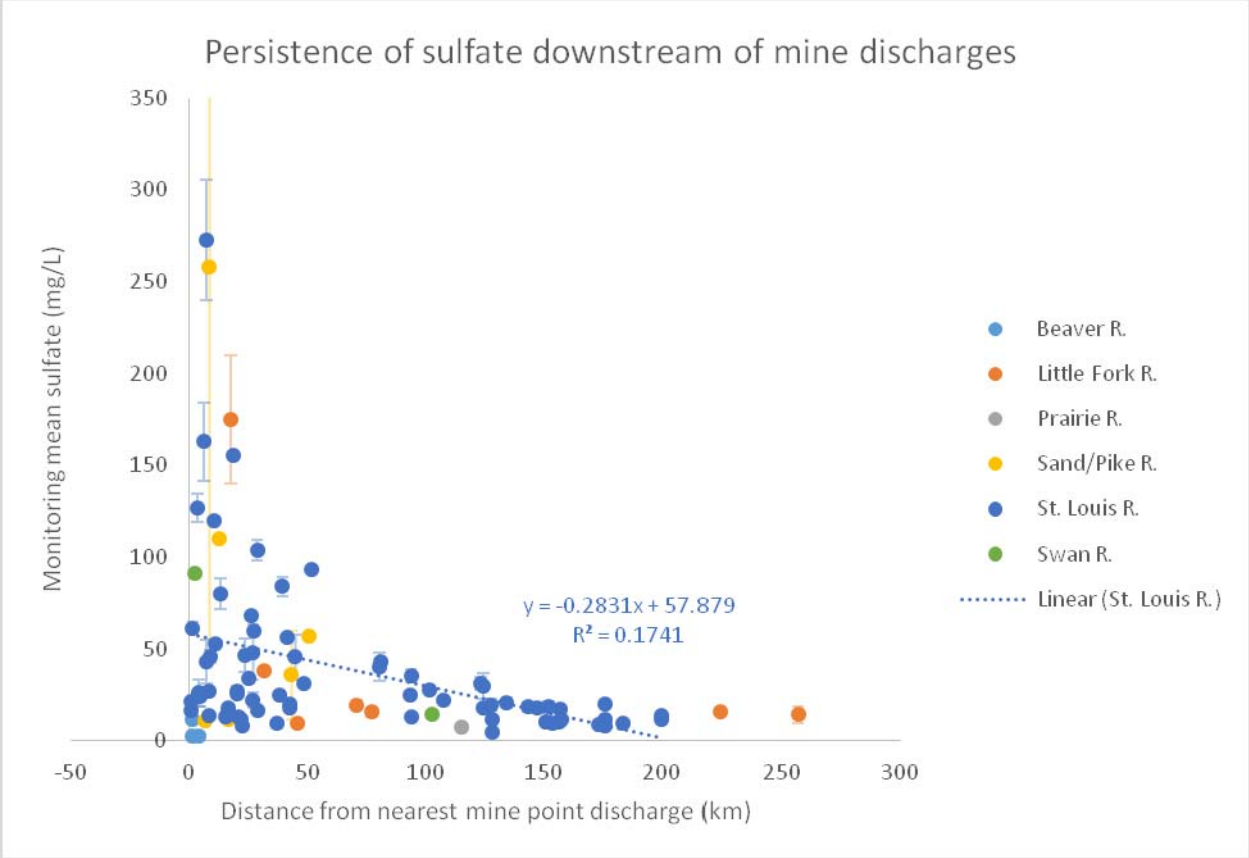


Figure 15. Linear regression indicated that mean sulfate (±1 SE) was significantly related to distance of the monitoring location downstream of the nearest mine discharge in the St. Louis River with highest sulfate concentrations nearest to mine discharges and decreasing relatively gradually downstream ($P < 0.01$, $R^2 = 0.17$, $n = 73$).

Ground water quality

From the PSDEIS: "Neither the Scoping Decision Document nor the SDEIS identified potential cumulative effects on groundwater. Although the NorthMet Project Proposed Action would affect groundwater levels, this effect would be very limited geographically and temporally (e.g., groundwater levels would be restored once pit dewatering ceases) and not subject to any off-site cumulative effects. The effects of mine dewatering are considered in terms of effects on surface water flows."

The cumulative effect of blasting ore, or vibration, has not been mentioned in the SDEIS, or even considered. It is evident that effect of blasting ore will increase fractures in the Virginia Formation and the Duluth Complex in the vicinity of the Project[11]. And, that

[11] ISEE Presentation Wesley L. Bender, Understanding Blast Vibration and Airblast, their Causes, and their Damage Potential (updated 2009), available at http://www.iseegoldenwest.org/Blast%20Effects.pdf (last visited 9/5/13)

fractures have already hydrologically connected the Biwabik Iron Formation with the Virginia Formation and Duluth Complex, as a result of blasting in the Peter Mitchell Pit. The increase in fractures from blasting has likely hydrologically connected some of the known and inferred faults in the vicinity of the Peter Mitchell Pit, too. And, there will be a cumulative impact on water quality and water quantity resulting from blasting ore in the proposed PolyMet mine pit because the fractures from blasting in the Peter Mitchell Pit will overlap fracturing resulting from blasting in the PolyMet Pit. The area where most of the new fractures are likely to be created lie within the Virginia formation between the two pits. The Virginia Formation is known to have the highest sulfur content of the three bedrock formations found within the area between the proposed PolyMet mine pit and the Peter Mitchell mine pit, and the second highest transmissivity rate.

The PolyMet SDEIS section on vibration (Chapter 5.2.8) does not discuss impacts of blasting in creation of fractures. However, fractures created by blasting and shoveling ore would extend far beyond the pit walls. Section 5.2.8-9 **Vibration** of the preliminary SDEIS states: "permanent ground displacement occurs close to the blast. For heavily confined rocks, ground vibrations of 25.4 mm/sec will occur as far away as 1,581 meters. For free face average rock, ground vibrations of 25.4 mm/sec will occur as far away as 627 meters." "Permanent ground displacement" is a discreet way to refer to the creation of new fractures without having to discuss the resulting increase in groundwater flow and connectivity to surface waters. In fact, all of the PolyMet predictions regarding discharge from the mine pits and waste rock piles, including the more reactive waste rock piles and the ore surge pile as well as the unlined permanent Category 1 waste rock pile, are made without considering the effects of fractures on discharge to groundwater and surface water.

Excerpts from three reports produced for the PolyMet project regarding groundwater/surface water interactions include the following:

"Groundwater samples were collected from three of the deep borings at the site. Two of the samples were collected from 6-in diameter exploratory boreholes. The remaining sample was collected from the water supply well (Unique Well Number 717972). This well is open to both the Duluth Complex (20-150 feet below ground surface) and the Virginia Formation (150-200 feet below ground surface)….The water sample from well MW-05-02 exceeded criteria for ammonia (240 ug/l), pH (10),aluminum (322 ug/l), and copper (11.2 ug/l). The sample from MW-05-08 exceeded criteria for aluminum (1,040 ug/l), copper (10 ug/l), and mercury (0.0053 ug/L). The sample from MW-05-09 exceeded criteria for aluminum (4,640 ug/L), chromium (28.6 ug/l), cobalt (5.4 ug/l), copper (72.2 ug/l), lead (5.6 ug/l), and mercury (0.0181 ug/l)…. The presence of ammonia in the deep boreholes may indicate that the water in the borehole came from the shallow surficial deposits. Ammonia is not typically found in deep bedrock systems but is common in wetland environments."[12]

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[12] Hydrogeologic Investigation- PolyMet NorthMet Mine Site report RS-02. Barr Engineering. 2006

"The water samples from wells P-2 and P-4 exceeded the nitrogen (ammonia as N) criteria (270 ug/L and 110 ug/L respectively). The presence of ammonia nitrogen in the samples likely indicates that there is a hydraulic connection between the bedrock aquifer and the surficial aquifer; however, the nature of this connection cannot be determined at this time."[13]

"The samples from pumping well P-2 all contained measurable tritium, indicating that at least a portion of the source water is post-1952 water."[14]

The Peter Mitchell Pit lies approximately one mile north of the proposed PolyMet mine pit. Taconite production began in 1955 at the Peter Mitchell Pit. Based on the review of the Peter Mitchell NPDES permit MN0046981 at various discharge locations, unionized ammonia nitrogen has exceeded permit limits on numerous occasions[15]. Unionized ammonia nitrogen is used to blast rock. Though PolyMet did not determine what the source unionized ammonia or tritium found in the deep boreholes was, it seems likely that because of the Peter Mitchell Pit's close proximity to the proposed PolyMet mine site, the Peter Mitchell Pit is the source of contamination. The approximate fifty- year travel time of the pollutants found in the P-2 bore hole from the Peter Mitchell Pit were not used to estimate travel time for pollutants leaving the PolyMet mine pit and reaching the Partridge River, or even to calibrate the model.

In fact, bedrock groundwater flow paths have not been determined using standard methods for hydrogeologic investigations. Instead, a model has been developed that uses extremely low baseflows in the Partridge River in order to suggest that peak concentrations of contaminants will not reach surface water features for hundreds or even thousands of years. Even though data collected for PolyMet in the three hydrologic investigations between 2006 and 2007 demonstrate a strong connection between boreholes in the bedrock aquifer and the surficial aquifer and surface water (including wetlands). This information, and the results from winter flow monitoring have not been incorporated into the PolyMet project projections for surface and groundwater quality and quantity.

Groundwater contamination from the previous mining activities is still an issue near the LTV tailings basin and mine pits more than twenty years after operations have ceased. The above evidence suggests that, whatever the degree of fractures now existing in the rock, blasting at the levels proposed by PolyMet will create damage to rock masses and rock fractures over an extensive area, including the entire mine site and extensive adjacent wetlands areas (Figure 16). This evidence requires that the impacts of fractures on propagation of pollutants from all mine sources be analyzed in detail and calls into question PolyMet's claims that discharge of sulfates and toxic metals from the mine site will not impact wetlands and exceed water quality standards. The impacts of vibrations and airblast on slope stability of waste rock piles are not discussed in the SDEIS either.

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[13] Hydrogeologic Investigation – Phase II PolyMet NorthMet Mine Site RS-10. Barr Engineering. 2006

[14] RS10A –Hydrogeological – Drill Hole Monitoring and Data Collection – Phase 3. PolyMet Mining, Inc. March 2007.

[15] MPCA DMR data for MN0046981 from website "What's in My Neighborhood" (http://www.pca.state.mn.us/index.php/data/wimn-whats-in-my-neighborhood/whats-in-my-neighborhood-text-search.html) (last visited 9/4/13)

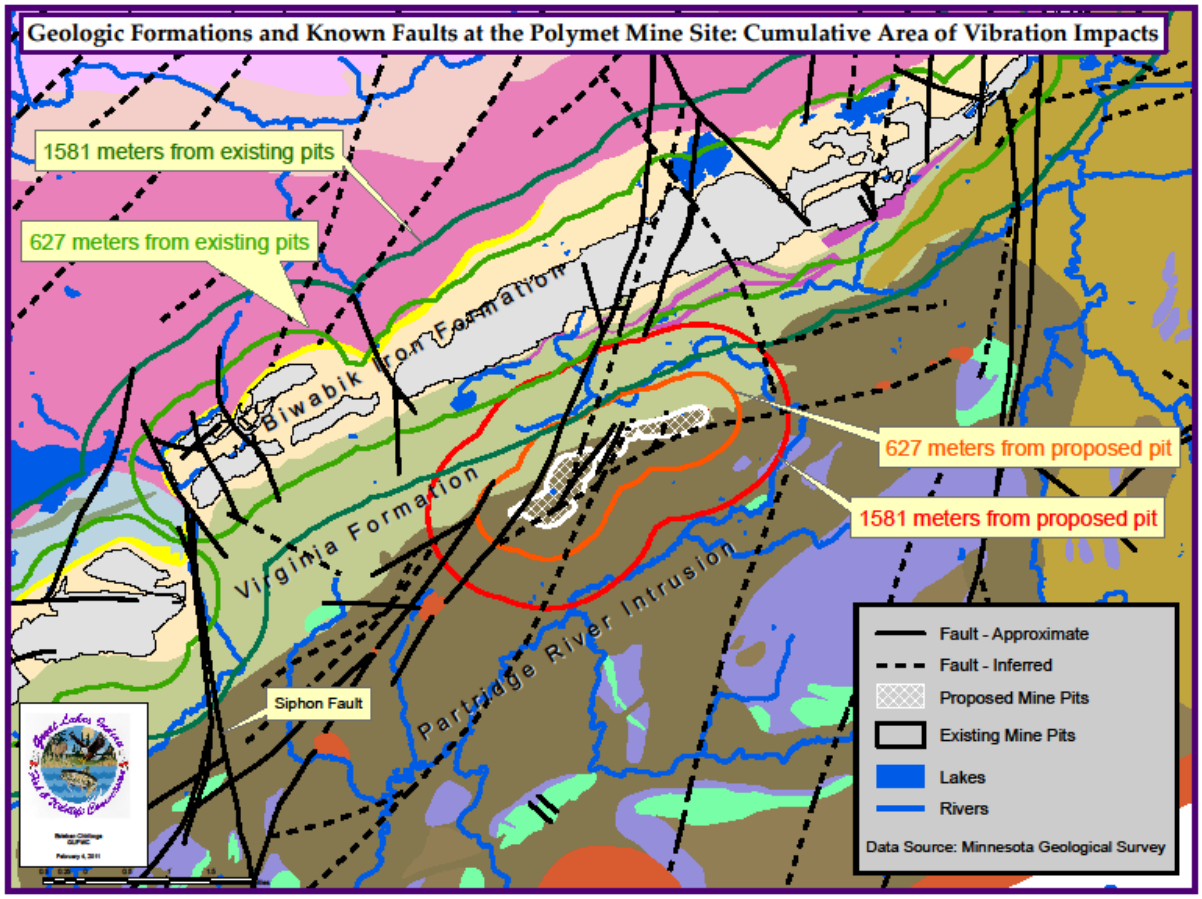

Figure 16. Cumulative Area of Vibration Impacts.

Impacts to water quality in the immediate vicinity of the project area from mining activities include:

Peter Mitchell Pit: Expansion of the Peter Mitchell Pit to the South towards the proposed PolyMet project and the in-pit disposal of Virginia Formation waste rock.

Former LTV Site (Cliffs): Dunka Pit, Area Pit 5, Tailings Basin, Area Pit 2, Area Pit 3

Mesabi Nugget: Area Pit 1, Area Pit 9, Area Pit 9S, Area Pit 6, Area Pit 2WX, Stevens Pit

Considering there are domestic wells south of the property, and pit 2WX will likely overflow to surface water features when mining has ceased, contaminant transport models for surface and groundwater need to be developed if pit 2WX or pit 6 are mined due to the presence of the Virginia Formation and the Aurora Sill.

Wetlands

The co-lead agencies confined their cumulative effects analysis for wetlands to the Partridge and Embarrass River watersheds, simply quantifying the wetland acreage change from pre-settlement conditions to the present, then projecting the estimated acres in the future based upon impacts due to the NorthMet Proposed Project. The co-lead agencies, relying upon the XP-SWMM model developed for the Partridge River, conclude that "changes in annual flow (and therefore stage) in the Partridge River would be within the naturally occurring annual variation for the Partridge River. Therefore, no potential indirect cumulative wetland effects are identified for the wetlands abutting the Partridge River.

The PSDEIS states: "The St. Louis River is located downstream of the Partridge River. Effects on flows (and, by extension, water surface elevations) generated by the NorthMet Proposed Action are anticipated to be less than those estimated for the Partridge River and within the natural variation of flow within the St. Louis River. Therefore, no potential indirect cumulative wetland effects are identified for the wetlands within the St. Louis River below the ordinary high water mark from its confluence with Embarrass River to Lake Superior."

The tribal cooperating agencies take a different approach to quantifying cumulative wetland impacts for the NorthMet Proposed Action. Referencing the alternative indirect wetland impacts analysis provided by GLIFWC for the PolyMet mine site, tribal cooperating agencies believe that cumulative wetland impacts within the St. Louis River watershed should be the scale of the analysis, and that direct and indirect wetland impacts due to hydrologic modification (ditching) should be included (Figure 17). There are 1,387,630 acres of wetlands in the St. Louis River watershed, with 1732 individual wetlands impacted by ditching, totaling 198,989 acres. Ditching has occurred in 14.3% of the wetlands in the watershed. Approximately 50% of the subwatersheds have had some degree of impact from ditching, while some have experienced ditching in nearly 100% of their wetlands. Clearly, this has a profound impact to the connected surface waters, and impacts to specific stream reaches should be assessed.

There are direct impacts to wetlands that occurred when the ditches were constructed. Those impacts depend on the length and width of each ditch. The second, and larger, set of impacts is indirect. The ditches have converted some percentage of the wetlands to upland, and changed the functions and values of another percentage of wetlands.

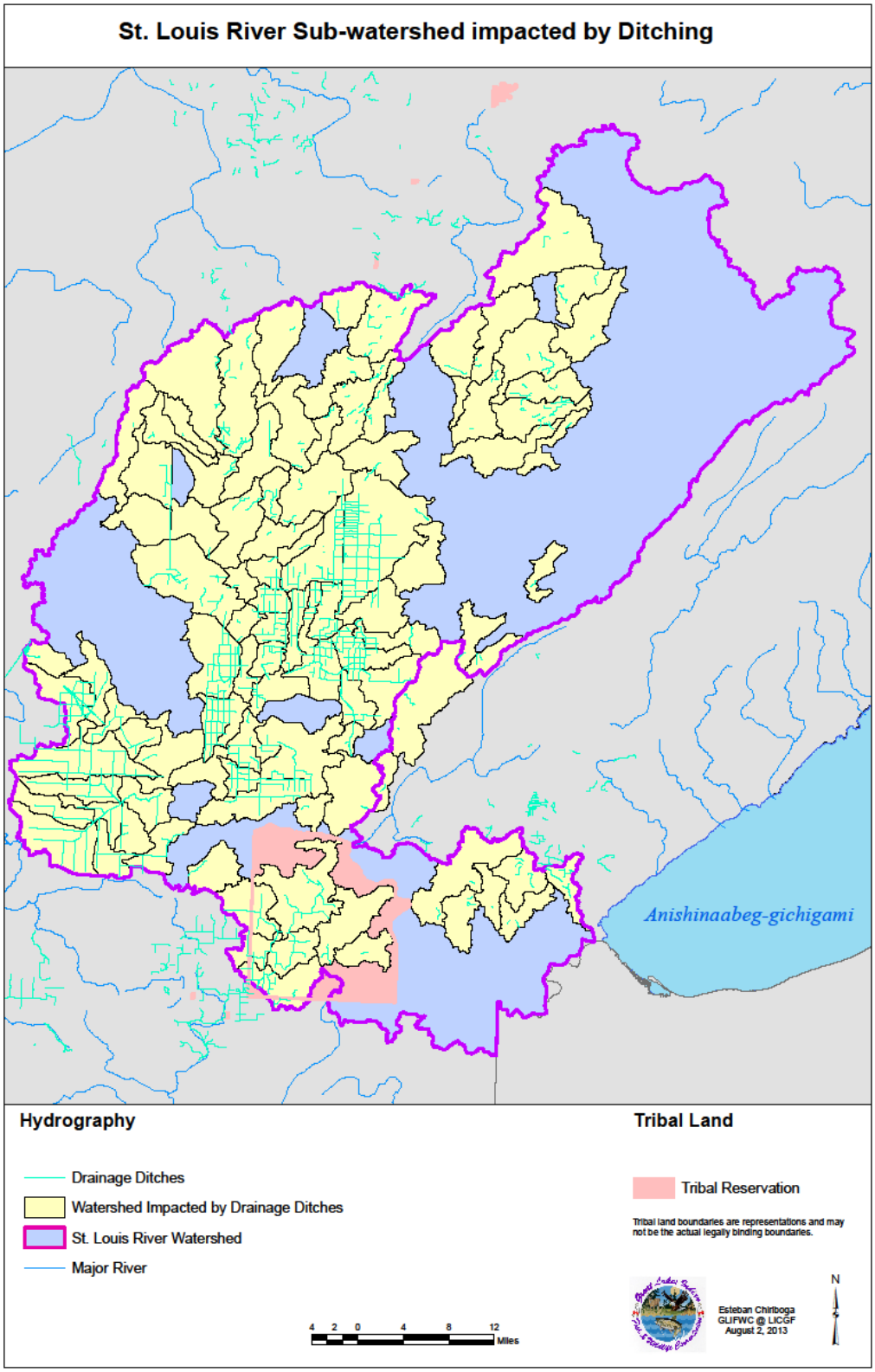
St. Louis River Sub-watershed impacted by Ditching
Anishinaabeg-gichigami
Hydrography
Drainage Ditches
Watershed Impacted by Drainage Ditches
St. Louis River Watershed
Major River
4 2 0 4 8 12
Miles
Tribal Land
Tribal Reservation
Tribal land boundaries are representations and may not be the actual legally binding boundaries.
Esteban Chiriboga
GLIFWC @ LICGF
August 2, 2013
N

Figure 17. St. Louis River Watershed Hydrologic Impacts from Ditching

Tens of thousands of acres of high quality wetlands within the St. Louis River watershed have been entirely and permanently lost to historic and current mining operations, prior to regulatory requirements for mitigation. Since the initiation of state and federal wetland mitigation requirements for permitting wetland dredge and fill activities, most mitigation has taken place outside the St. Louis River watershed and has not replaced the wetland types and functions that have been lost. Nearly 3000 additional wetland acres will be directly impacted under several reasonably foreseeable mining projects within the watershed (Figure 18).

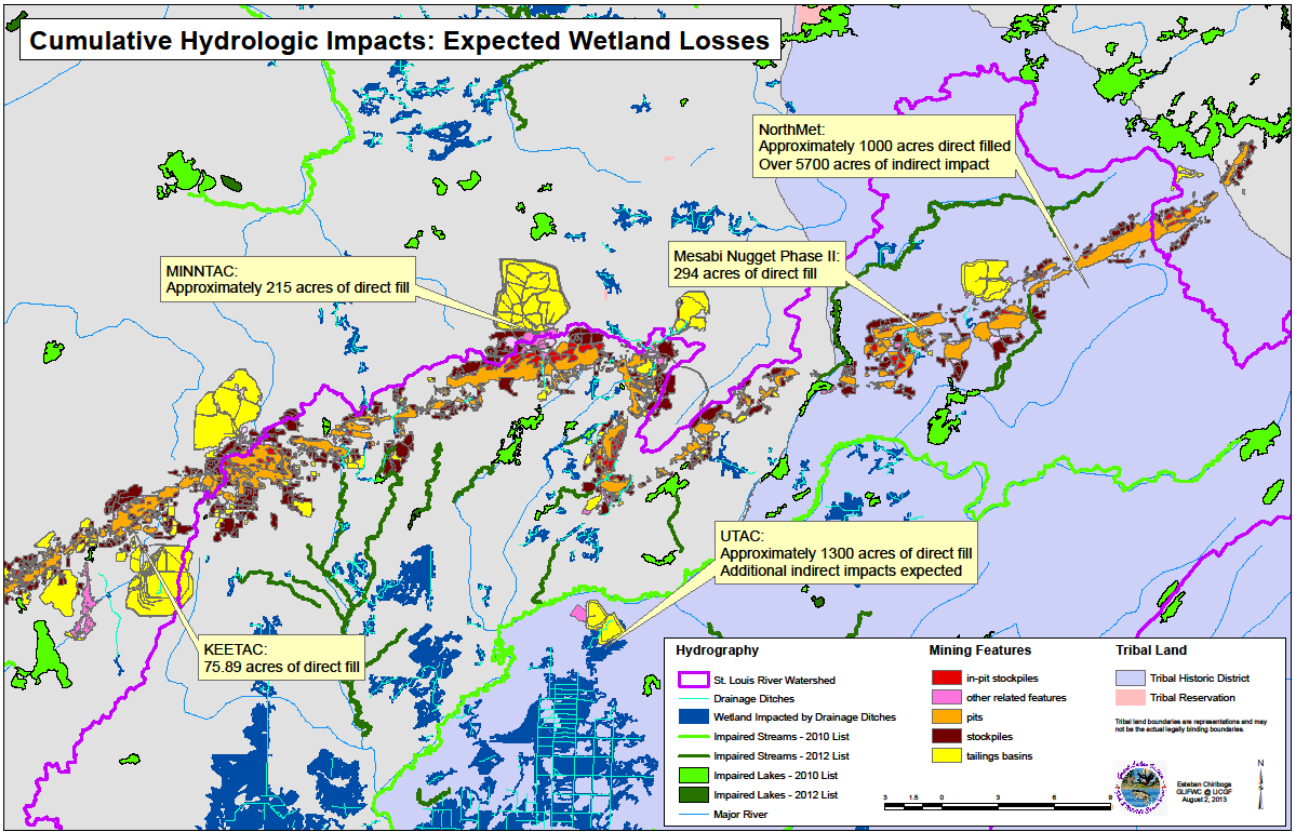

Figure 18. Cumulative Hydrologic Impacts: Expected Wetland Losses within the St. Louis River watershed

When all impacts to water quality, aquatic communities, wetlands, and hydrology are considered in a comprehensive manner, the cumulative effects on water resources are extensive (Figure 19).

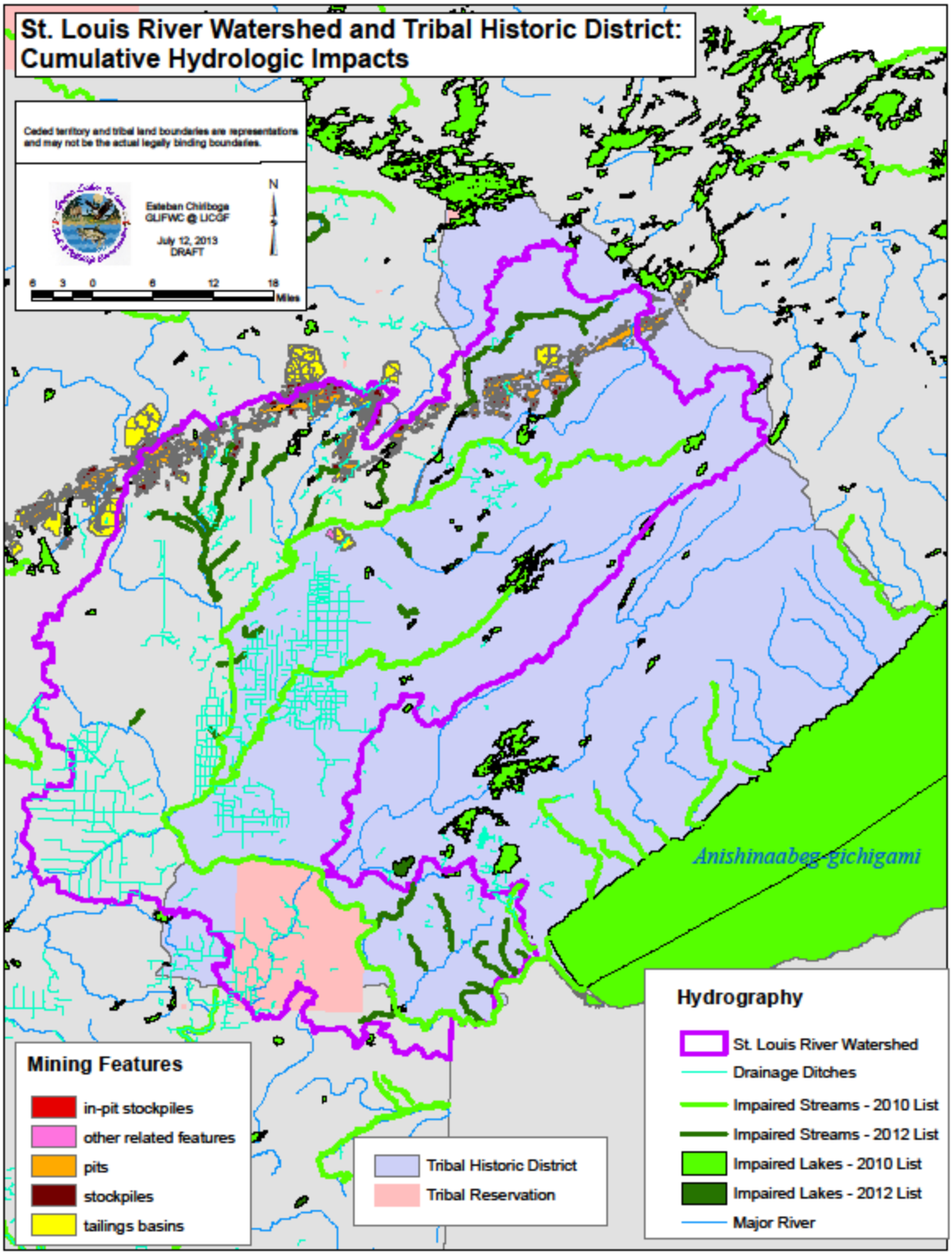

Figure 19. St. Louis River Watershed and Tribal Historic District: Cumulative Hydrologic Impacts.

Vegetation

The co-lead agencies evaluated cumulative effects on vegetation within the portion of the Mesabi Iron Range encompassed by the Nashwauk Uplands and Laurentian Uplands ecological subsections. From the preliminary SDEIS:

"Minnesota Biological Survey
The MDNR operates the MBS program, which includes spatial information from survey reports on native plant communities and rare species. Sites of Biodiversity Significance are designated and ranked by the MDNR based on the environmental conditions present, including native plant communities, rare species, and unique habitat. The MBS utilizes a four-tiered ranking system: Outstanding, High, Moderate, and Below (from highest to lowest). Sites of High Biodiversity Significance contain very good-quality occurrences of the rarest species, high-quality examples of rare native plant communities, and/or important functional landscapes (MDNR 2008a). The entire 3014.5-acre Mine Site has been characterized by the MBS as various Sites of High Biodiversity Significance due to the presence of the One Hundred Mile Swamp site, which covers 15 percent of the Mine Site, and the Upper Partridge River site, which is 85 percent of the Mine Site (MDNR 2008a)."

The tribal cooperating agencies believe a more relevant spatial reference for cumulative effects to vegetation would include the One Hundred Mile Swamp and the Headwaters Site. Additionally, the "Contributing Past, Present and Reasonably Foreseeable Actions should include the extensive mineral exploration taking place within the headwaters of the St. Louis River. The degradation and destruction of this landscape and the vegetation that provides forage and habitat for culturally important species, as well as sustenance and medicine for band members, has been a cumulative impact to cultural and natural resources since the signing of the treaty.

From Danielson and Gilbert (2002):
"The Ojibwe gather over 350 wild plant species for food, utilitarian, medicinal, ceremonial, and commercial purposes (Meeker, Elias and Heim 1993; Densmore 1928). Examples include sweet grass (*wiingashk*), white sage (*mashkiki*), basswood (*wiigob*), yellow birch (*wiinizik*), paper birch (*wiigwaas*), wintergreen (*wiinisiibag*) red-osier dogwood (*miskoobimizh*), bearberry (*miskwaabiimag*), wild sarsaparilla (*waaboozojiibik*), white water lily (*akandamoo*), bluebead lily (*odotaagaans*), Canada mayflower (*agongosimin*), swamp milkweed (*bagizowin*), wood lily (*mashkodepin*), rue anemone (*biimaakwad*), wild ginger (*namepin*), blue cohosh (*beshigojiibik*) bloodroot (*meskwiijiibikak*), black ash (*aagimaak*), yarrow (*ajidamoowaanow*), wild rose (*oginiiminagaawanzh*), Labrador tea (*waabashkikiibag*), sweet flag (*wiikenh*), wild black current (*amikomin*), wild blackberry (*odatagaagominagaawanzh*), blueberry (*miinagaawanzh*), nannyberry (*aditemin*), and highbush cranberry (*annibiminagaawashk*). Tribal members may gather wild plants, as guaranteed by their treaty rights, on all public lands within the ceded territories.

The Ojibwe have been "managing" (e.g., respecting, observing and utilizing) the land and its resources since time immemorial. However, tribal members seldom use the term "managing." Through the sharing of stories and spiritual beliefs, elders transfer a wide spectrum of skills and information to younger generations. Some scholars refer to this

information as traditional ecological knowledge and wisdom (TEKW). Berkes (1999) defines TEKW as "a cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment. TEKW does not reflect a stagnant inventory of information but rather, without disregarding past wisdom, continues to transform through time.

TEKW and contemporary ecosystem management, though not identical, share common characteristics. A report published by the Ecological Society of America Committee on the Scientific Basis for Ecosystem Management states: "Ecosystem management is management driven by explicit goals, executed by policies, protocols, and practices, and made adaptable by monitoring and research base on our best understanding of the ecological interactions and processes necessary to sustain ecosystem composition, structure, and function. In additions, "ecosystem management assumes intergenerational sustainability as a preconditions for management rather than an afterthought" (Christensen et al. 1996). Clearly, shared principles include adaptive management through observation and monitoring and an intergenerational sustainability, including the relationship and dependence of humans and all life on each other.

The tribes remind (these) land managers that, as necessitated by trust responsibility and treaty law, they must ensure the availability and sustainability of wild plant harvest. Irrevocably, the Ojibwe worldview teaches values based on an understanding that humans depend on all other earth beings (Johnston 1976)."

Further documentation of the high quality and ecological function of this landscape is found in *An Evaluation of the Ecological Significance of the Headwaters Site, Northern Superior Uplands Ecological Land Classification System Section; Laurentian Uplands Subsection Lake and St. Louis Counties, Minnesota*, March 2007):

"The Headwaters Site straddles the continental divide, with water from the Site flowing both east through the Great Lakes to the Atlantic Ocean and north to the Arctic Ocean. Paradoxically, the divide runs through a peatland. Although the peatland appears flat, water flows out of it from all sides, forming the ultimate source of rivers that eventually reach two different oceans. The Site is the headwaters of four rivers: Stony River, Dunka River, South Branch Partridge River, and the St. Louis River, which is the second largest tributary to Lake Superior…

The Headwaters Site encompasses vast peatlands on its eastern side, unfragmented upland forests in the west, and broad transition zones between them. Within the Site are two distinct areas, referred to in the document as the "Extensive Peatlands" and the "Big Lake Area," which are linked hydrologically as part of the Upper St. Louis River watershed. The Extensive Peatlands area is a mosaic of open and forested wetland communities and includes forested upland islands and peninsulas. The Big Lake Area, in the southwestern quarter of the Site, includes Big Lake and surrounding unfragmented upland forest interspersed with small wetlands.

The Headwaters Site is unique in northeastern Minnesota in several ways. The size and complexity of the peatlands in the Extensive Peatlands are unmatched in the Northern Superior Uplands Ecological Land Classification System (ECS) Section. The Sand Lake Peatland Scientific and Natural Area (SNA), established by the Wetlands Conservation Act of 1991, protects one of the 15 most significant peatlands in the state, and it is by far the largest SNA in the Section (MNDNR 1984).

The Nature Conservancy's (TNC) Superior Mixed Forest (SMF) Ecoregion Plan identifies the Sand Lake/Seven Beavers (SL7B) conservation area, including the entire Headwaters Site, as one of 51 conservation areas in the Ecoregion that best represent the ecosystems and species of the Ecoregion, and serve as a blueprint for conservation action…According to the SMF Ecoregion Plan, these conservation areas are the best opportunities for conserving the full diversity of terrestrial and aquatic ecosystems and globally rare or declining species. The SMF Ecoregion Plan identifies these areas as critical places for conserving biodiversity…and outlines the threats to conservation and conservation targets for these areas…recognizing that more detailed site planning is needed to address how to implement conservation efforts…

The Minnesota Pollution Control Agency has ranked the Upper St. Louis River watershed in the second highest category in the Lake Superior Basin for watershed integrity (Minnesota Pollution Control Agency 2003). The Headwaters Site is among the highest quality areas within the watershed. The upland forest surrounding Big Lake is among the largest, if not the largest, unfragmented, predominantly upland forest in the North Shore Highlands, Toimi Uplands, and Laurentian Uplands (NTL) ECS Subsections. The upland forest area covers 7,920 acres (including 788-acre Big Lake). This high-quality, fire-dependent forest has not been logged in recent decades, except for two stands totaling 140 acres, along the northern edge of the Site.

Covering an area roughly 11 to 12 miles (from northeast to southwest) by 7 to 8 miles (from northwest to southeast), the Headwaters Site is a mosaic of high-quality native plant communities that have functioned under relatively undisturbed conditions since the nineteenth and early twentieth century, when parts of the Site were logged and then burned by wildfires. A corridor containing a railroad grade and power line crosses this vast area, representing the only major permanent conversion of the natural landscape. Minnesota County Biological Survey (MCBS) sites bordering about two-thirds of the Site's boundary have been assigned High or Moderate statewide Biodiversity Significance (Figure 4, page 85). The lack of roads, absence of recent large-scale logging, and large size of the Site allow for natural functioning of ecological processes. These processes include disturbances such as wind, fire, and flooding, as well as plant species competition, nutrient cycling, and hydrology. Natural landscape patterns, such as patch size of the various plant communities, have not been altered, in comparison with most other parts of northeastern Minnesota (White and Host 2003). Minimal recent human disturbance also results in a landscape with very few populations of exotic or invasive species.

The predominant upland forest native plant community in the Big Lake Area is Aspen – Birch Forest [FDn43b], with inclusions of Upland White Cedar Forest [FDn43c] and White Pine – Red Pine Forest [FDn43a] (Figure 5, page 87). Isolated wetlands within the Big Lake

Area's upland forest support a variety of native plant communities, including Northern Poor Conifer Swamp [APn81], Northern Rich Spruce Swamp (Basin) [FPn62], White Cedar Swamp (FPn63a), Northern Alder Swamp [FPn73a], and Black Ash - Conifer Swamp [WFn64a]…

The Extensive Peatlands are composed of a complex of native plant communities, including Northern Cedar Swamp [FPn63]; Northern Rich Spruce Swamp (Basin) [FPn62]; Northern Alder Swamp [FPn73]; Northern Rich Tamarack Swamp (Water Track) [FPn81]; Northern Rich Fen (Water Track) [OPn91]; Northern Rich Fen (Basin) [OPn92]; Northern Shrub Shore Fen [OPn81]; Northern Spruce Bog [APn80]; Northern Poor Conifer Swamp [APn81]; Northern Open Bog [APn90]; and Northern Poor Fen [APn91]. The many upland islands in this portion of the Site provide additional native plant community diversity, supporting community types in the Northern Dry-Mesic Mixed Woodland [FDn33] and White Pine-Red Pine Forest [FDn43] classes…

The Headwaters Site supports healthy known populations of eight state-listed plant species, all of which are listed as Special Concern (SPC) in Minnesota: coastal sedge *(Carex exilis)*, Michaux's sedge *(Carex michauxiana)*, English sundew *(Drosera anglica)*, bog rush *(Juncus stygius),* small green wood orchid *(Platanthera clavellata),* Lapland buttercup *(Ranunculus lapponicus)*, sooty-colored beak rush *(Rhynchospora fusca)*, pedicelled woolgrass *(Scirpus cyperinus/S. pedicellatus)*, and Torrey's mannagrass *(Puccinellia pallida)*...The unfragmented complex of high-quality native plant communities within and across the Site's landforms provide excellent habitat for a wide variety of animal species distinctive of the landscape, including moose, gray wolf, sandhill cranes, American bitterns, boreal and great gray owls, and numerous amphibians, butterflies, and small mammals.

In 2005 and 2006 the Minnesota County Biological Survey of the MN DNR conducted rare plant and native plant community fieldwork, mapped the native plant communities and completed this Ecological Evaluation of the Headwaters Site. Based on the natural features and conditions revealed through this recent work and that of others since the 1980s, MCBS recommends the primary management objective for the Headwaters Site be to protect, enhance, or restore ecological processes and native plant community composition and structure. In accordance with this objective, the site or portions of the site may be identified by landowners or land management agencies for conservation activities such as special vegetation management, including ecologically based silviculture and forest development activities, or for designation as a park (city, county, state, or private), research natural area, non-motorized recreation area, scientific and natural area, or other reserve. This Ecological Evaluation has been written to characterize the ecological significance of the MCBS Site as a whole and to serve as a guide for conservation action by the various landowners.

MANAGEMENT RECOMMENDATIONS

Overview

The Headwaters Site is a large, natural area with features of widely recognized statewide ecological and biological significance. These include:

- one of the 15 most significant peatlands in the state (MN DNR 1984, Wright et al. 1992);
- the largest SNA in the Northern Superior Uplands Section;

- one of the largest, unfragmented, predominantly upland forest patches in the Laurentian Uplands,
- Toimi Uplands, and North Shore Highlands subsections;
- an ecologically functional mosaic of high quality native plant and animal communities;
- a concentration of excellent occurrences of rare species populations;
- support of species with large home ranges;
- six state-designated old-growth stands;
- remote, undeveloped lakes.

The documented condition and quality of the aquatic and vegetation resources within this headwaters region of the St. Louis River watershed meet the resource-based threshold of an Aquatic Resource of National Importance, under the Memorandum of Agreement reached by the EPA and the US Army Corps of Engineers in 1992[16].

Wildlife

The word "moose" does not appear at all in the SDEIS cumulative effects analysis, despite consistent concerns raised by tribal cooperating agency staff to co-lead agency staff during the environmental review process. As of August 19, 2013, moose are now proposed to be listed as a MNDR species of concern.

The tribal profile for the Grand Portage Band, states the unique importance of this species:

"Moose are the primary subsistence species for the Grand Portage Band and define the subsistence culture."
http://www4.nau.edu/tribalclimatechange/tribes/greatlakes_lschippewa.asp

From the Fond du Lac Wildlife Biologist: "In my experience at FDL, moose have always had a loyal core of hunters who pursue moose every year. Primarily for meat, but some for hide, bone and antler related crafts. I think also for the camaraderie, family traditions, etc – same as the rest of us for deer or duck camp. For the last couple of years at least, FDL has been supplying other bands with moose hides for drums.

Until very recently, the demand for moose hunting opportunities at FDL has always been greater than the supply. It's unique among locally hunted or trapped wildlife species that way. As the moose population has rapidly dwindled in the last couple of years, I believe more and more potential moose hunters are deciding it's not worth the effort.

Of all wildlife species, moose has required the most back and forth discussions between staff, legal counsel and the DNR regarding co-management of resources within the 1854 Ceded Territory. This again is a supply and demand issue, and reflects the relatively low density at which moose populate the landscape – even when times were good. -My program invests more effort and money in annual population surveys of moose than any other wildlife species."

[16] Clean Water Act Section 404(q) Memorandum of Agreement, Part IV (August 11, 1992)

The rationale for a comprehensive cumulative impacts analysis for moose can be found in the MDNR SONAR proposing listing of moose as a species of special concern:
(p. 21) "Between 1990 and 2000, the northwestern Minnesota Moose population underwent a substantial decline, and a 2007 Minnesota DNR aerial survey determined that as of that date, fewer than 100 Moose comprised the northwestern population. Aerial surveys currently estimate the northeastern Minnesota population at roughly 4,230 individuals. The northwestern Minnesota Moose population decline occurred in less than a decade. Recent surveys document a slow decline in the northeastern Minnesota Moose population.

"Increased temperatures are likely to increase heat stress and lead to increased mortality within the state's remaining Moose populations. Changes in land ownership and changes in forest management practices within the state's Moose range may be having a significant adverse effect on the quantity and quality of the species' habitat within the state, and particularly on thermal refuges in warmer weather. The state's northeastern Moose population has not shown as rapid a decline, but is very likely to be dramatically impacted by rising temperatures resulting from climate change. This will likely lead to a marked decline in this population within the foreseeable future."

From the *Report to the Minnesota Department of Natural Resources(DNR) by the Moose Advisory Committee (18 August 2009)*:
"In MN, moose habitat can be characterized as young forest stands, older forest stands with gaps of regenerating forest, wetlands, muskeg, marsh, riparian areas and brushlands with abundant deciduous browse within reach of moose and adequate winter and summer thermal cover. Functionally, habitat provides forage and cover. Moose forage has a primarily deciduous browse component and a seasonal aquatic component. Cover has several potential components for moose: protection from heat, protection from deep snow, moderation of cold temperatures, predator avoidance and presence of calving locations. In addition to the functional aspects of habitat, spatial distribution of habitat must also be considered at a variety of scales (from subhome range to the landscape level).

"As moose are increasingly challenged by warmer temperatures and changing precipitation patterns due to climate change, changes in land ownership and changes in forest management practices that occur within MN moose range have the potential to significantly affect the quantity, quality, and distribution of moose habitat. Examples include but are not limited to: habitat fragmentation due to expected and occurring ownership changes and shifting landowner objectives, changes in the extent of forest management due to national and state economic effects on the primary wood- using industry in Minnesota, and increased harvesting of smaller diameter trees and brush used by moose for browse as the demand for woody biomass increases. Focused management to provide high quality habitat (forage and cover) may be necessary to slow population declines and maintain or recover moose in appreciable numbers in Minnesota."

A cumulative impacts analysis must be done for this species of concern that it is of particular cultural importance to the Bands.

Air

Fugitive dust:

The tribal cooperating agencies believe that wind-blown dust particles containing sulfate compounds that are emitted from mining and beneficiation activities could contaminate wetlands, lakes, and streams near the project site and could cause harm to the Species of Special Concern that have been found in this area and to the animals that depend on these plants for food. While the PSDEIS attempts to address this issue, this is the first time details of this analysis have been available for review, and the tribes have identified some areas that require more work. The tribes do not agree with the assumption that only those areas showing model-estimated deposition rates greater than 100% of background deposition will be impacted. The choice of the "100% of background" level of deposition appears to be arbitrary and is not supported by any documentation. Further, the modeled deposition rates do not include the effects of contamination to wetlands and water bodies that may occur through other mechanisms, such as pit leaks and seepage, nor how additional sulfate will impact waters that are already experiencing elevated sulfate levels, with regard to the growth of wild rice. The work that has been done so far in this section does not meet the definition of a cumulative review.

The text describing this analysis is also unclear in places, as described below. In addition, tribal cooperating agency air staff members were not consulted regarding the impact of fugitive dust on historic properties and the definition of intra-property APE, especially with regard to mercury or acid dust (See page 4.2.9-9 of the PSDEIS).

All figures and page numbers cited below refer to the PSDEIS.

Misleading Description

- While areas of fugitive dust deposition may not exceed the ambient air quality standard beyond the property boundary, as stated in the PSDEIS, this information is irrelevant with regard to the tribes' concerns regarding sulfide dust, because there is no ambient air quality standard that is applicable to sulfide dust. Therefore, statements of this nature should be removed.

Acid and Metallic Dust

- Figure 5.2.3-23 (PSDEIS) shows that there are indeed potential indirect impacts to wetlands outside of the ambient air boundary due to deposition of dust. Figure 4.2.9-3 corroborates this claim by showing that the Fugitive Dust Area of Potential Effects extends well beyond the plant site.

- Page 5.2.3-6 lists the fugitive sources that were modeled for deposition. Rail cars and tailings basins were not included. Section 5.2.3.2.2 (page 5.2.3-58) states that the air IAP group determined that emissions from railcars would be coarse in nature and would not be dispersed to any great extent; therefore these emissions were not modeled. The section also states that "Based on this conclusion, air modeling of potential release of dust from railcars will not be performed because the potential wetlands effects would not be significant". The analysis also assumes "that all spillage of the coarse material would occur in a 2-meter-wide strip on both sides of the center line of the railway over the entire haul distance." While the dust may settle near the tracks, there is no evidence that it will not subsequently disperse and cause impacts. The dust can easily be spread through run-off.

- Tailings basin emissions were not modeled. Pages 5.2.3-50 and 5.2.3-51 and page 5.2.3-74 discuss fugitive dust somewhat, but do not make it clear whether "dust" is meant to address the acidic composition of the dust, or some other component. There are also contradictory statements on page 5.2.3-51: "All of the receptor nodes with the highest model-estimated deposition rates were located within the ambient air boundary" versus "Of the 234 acres of wetlands, 228 acres (97%) would be located within the Mine Site ambient air boundary". "97%" does not equal "all"; apparently 6 acres of wetlands with the highest model-estimated deposition rates are outside of the ambient air boundary.

- Figure 5.2.3-17 indicates that the Partridge River could be impacted by fugitive dust, however this is not stated or addressed in the text.

- From page 5.2.3-51 "The potential release of dust from railcars transporting ore from the Mine Site to the Plant Site was addressed in an Air Quality IAP Workgroup that concluded potential wetland effects would not be significant and, therefore, air modeling was not performed (PolyMet 2013b). The tribal cooperating agencies have not been provided with any report that was generated by that workgroup, nor do they have any information about how that conclusion was reached. Also, "Of the 19,914 acres of wetlands identified within the Mine Site receptor grid, deposition modeling results indicated that 234 acres of wetlands could be potentially indirectly affected (modeled metal deposition rates greater than 100% of the background". It is unclear whether modeling was performed for both metals and sulfide dust, and whether the results discussed on page 5.2.3-74 are for metals or sulfide dust. While Figures 5.2.3-16, 5.2.3-17, 5.2.3-22, and 5.2.3-23 differentiate between metals or dust modeling results, the discussion needs to be clearer.

- There are a number of unclear or incorrect statements under the heading *Fugitive Dust/Metals and Sulfide Dust Emissions* on page 5.2.3-74. Initially, the section states that "all receptors have model-estimated dust deposition of 50% or less of the effects-level background of 365 g/m^2/yr" but the next sentence states that "at the Plant Site, there would be two locations showing model-estimated deposition rates greater than 100% of background deposition". These two statements are contradictory.

- It is not clear which metals were modeled and whether the background concentrations mentioned (365 g/m^2/yr) was for metals or sulfide dust. There is no explanation for the origin of this background concentration and how the metals concentrations in dust were obtained. There is also no explanation of why 100% of background deposition was chosen as an indicator of whether potential effects could occur. To our knowledge, no discussion of this modeling or the assumptions contained within it was conducted with tribes or the co-leads before the PSDEIS was released.

- This section also indicates that the "southern and western two-thirds of the basin" shows model-estimated deposition rates greater than 100% of background deposition (exactly what constituent is being discussed is not clear). However, this same paragraph goes on to state that only 193.9 acres of wetland out of 25,846 could be potentially indirectly affected. These two statements appear to contradict one another. Without knowing what constituent is being discussed, it is hard to know which figure (5.2.3-16, 5.2.3-17, 5.2.3-22 or 5.2.3-23) corresponds to the text. Also, the yellow highlighted area on Figure 5.2.3-23, which indicates the "extent of the highest estimated deposition receptors with deposition of 100% of background", appear to cover a much larger area than 193.9 acres out of 25,846 total acres.

- The paragraph also states that "approximately 90% of the receptor nodes with the highest model estimated deposition rates are located within the ambient air boundary". It is impossible to verify this statement, because a map showing the location of the receptor nodes does not seem to have been included. If this statement is true, it overlooks that fact that 90% of the ***area*** predicted to be impacted does not lie within the ambient air boundary - only about 60% does, judging from Figure 5.2.3-23.

- The tribal cooperating agencies do not agree with the statement that "no potential indirect wetland effects from fugitive dust to Second Creek would occur" (page 5.2.3-74). A portion of Second Creek appears within the area predicted to experience deposition of 100% of background.

- Chapter 5's discussion of fugitive sulfide dust calls for future wetlands monitoring where predicted deposition will exceed 100% of the background value (first full paragraph on page 5.2.3-51). This monitoring should look at water chemistry, hydrology, soil color, texture, and composition and should take place annually for the first three years of operation and then every five years afterward. Baseline numbers should be obtained before construction starts.

- Page 5.2.4-4, *Indirect Effects* calls for water spraying areas of fugitive dust release during dry periods. Page 5.2.7-8 also calls for watering haul roads and other unpaved roads. In the case of dust that may have high acidic content, this would be a poor option, as the addition of water to the dust could simply create problems with run-off. The fugitive dust control plan also lists several monitoring options that "could" be done. These are left as vague ideas, but are not required. These options should be made more concrete.

Fibers

The tribes believe that the cumulative impacts of mineral fibers are not adequately addressed in the PSDEIS. In fact, no cumulative impact analysis of mineral fibers was performed because the PSDEIS asserts that mineral fibers will not be contacted in this project. This is a reckless assumption to make, with little evidence provided for justification, and it leaves a potentially harmful situation completely unaddressed. For example, the distance of the PolyMet project to known deposits of mineral fibers should be given in the PSDEIS. Rates of mesothelioma on the Iron Range are already alarmingly high, making it irresponsible for potential cumulative impacts to remain unaddressed. Although preliminary results from the University of Minnesota indicate that exposure to dust from today's taconite operations is "generally within safe exposure limits", it is possible that exposure to additional dust could lead to more cases of mesothelioma 30-40 years in the future, after the mine has closed. This is an issue that should unquestionably have received a cumulative impacts analysis. While the mine is expected to close in 20 years, this is not a timeframe that is relevant to either tribal concerns or to the development of mesothelioma. Tribal members live and recreate in areas close enough to the mine for this to be a source of concern. The proximity of fish, game, and culturally significant plants to the project site cause this issue to be an item of concern.

Only one year of mineral fiber monitoring in Hoyt Lakes is proposed in the PSDEIS, which the tribes believe is insufficient for detecting the potential release of fibers from portions of the formation that will be encountered during later years of operation. It is also not clear why Hoyt Lakes was chosen as a monitoring site, or if this where air dispersion modeling predicts maximum impacts. The tribes would expect to see monitoring performed for the entire life of the mine, at the site of maximum predicted impact. Since no "safe" mineral fiber concentration level has yet been specified, the tribal cooperating agencies urge the State of Minnesota to move forward to set this limit as soon as possible.

Noise

The co-lead agencies simply state that there are no other past, present, or reasonably foreseeable actions that would interact in such a way as to have a cumulative effect on the receptors identified in Sections 4 and 5 and no further evaluation of cumulative noise effects has been conducted. The tribal cooperating agencies believe it is indefensible to conclude that, amidst a "mining district" with multiple active mine facilities operating in close proximity, that there is no cumulative effect of 24 hour/day, seven days/week of heavy industrial and blasting noise on sensitive wildlife and on traditional cultural practices.

Cumulative Impacts of Noise, Vibration and Airblast Overpressure

Tribal cooperating agencies note that the noise information presented in the PSDEIS will be replaced with new data in the SDEIS. We have not been afforded the opportunity to review this information and must withhold detailed comment on the noise analysis for a later date.

With respect to cumulative impact analysis, tribal cooperating agencies do not believe that an adequate analysis has been done. Meeting ambient noise standards is a different question than assessing impacts. Impacts should be fully characterized in this document and contour maps showing overlapping noise pollution from different projects provided. Without this information, it is not possible for the public to review the cumulative impacts of noise. In addition, the cumulative impacts of mine related vibration have not been assessed. As shown in Figure 20, the cumulative effects of vibration are spatially extensive.

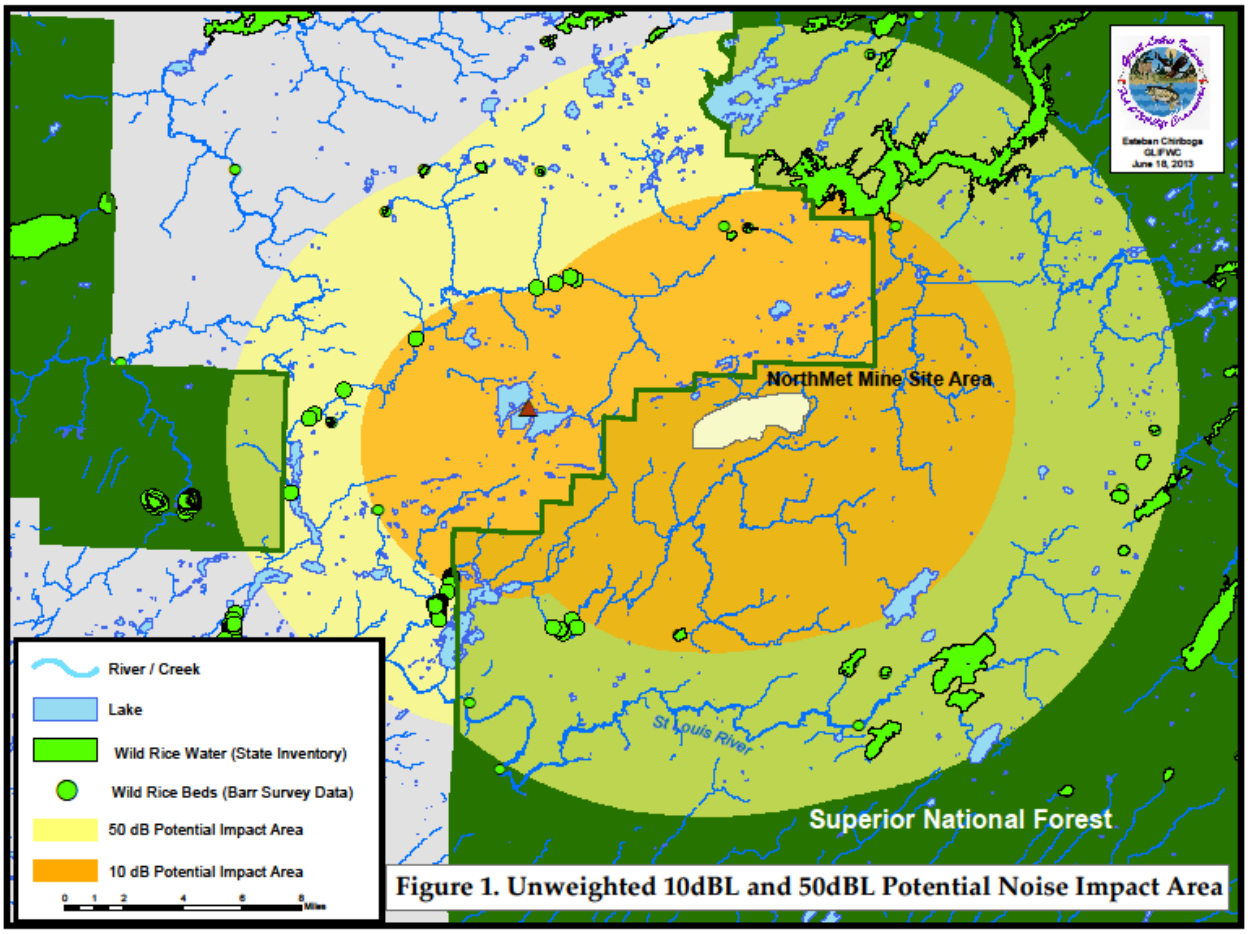

Figure 20. Unweighted 10 dBL and 50 dBL Potential Noise Impact Area

Tribal cooperating agencies also note that the noise, vibration, and airblast overpressure analysis confuses baseline noise levels with existing conditions and assumes they are the same thing. Baseline noise levels in the SDEIS should be natural noise levels that do not include existing mine operations such as Northshore. In other words, baseline is the pre-mining condition. Existing conditions are the noise levels currently recorded at the site of the proposed mine which include any contributions from the Northshore mine, the Dunka road, etc. The analysis would then use both of these pieces of information to assess the effects of the project as a single entity and in combination with other projects in the cumulative section. The lead agencies have indicated that they are using existing conditions (currently measured noise levels) as background. This is not appropriate and should be corrected.

The noise data presented in the SDEIS used A-weighted decibel data (dBA). This is appropriate when considering the effects of noise on humans because it focuses on the frequencies that the human ear can perceive. However, this weighting is not appropriate when assessing the effects on animals because they can perceive different, and often greater, ranges of frequencies than humans. The United States Department of Transportation (USDOT) has

developed a document[17] describing the effects of noise on animal populations. In general the document indicates that the sensitivities of various groups of wildlife can be summarized as:

- Mammals < 10 Hz to 150 kHz ; sensitivity to -20 dB
- Birds (more uniform than mammals) 100 Hz to 8-10 kHz; sensitivity at 0-10 dB
- Reptiles (poorer than birds) 50 Hz to 2 kHz; sensitivity at 40-50 dB
- Amphibians 100 Hz to 2 kHz; sensitivity from 10-60 dB

Figure 21 indicates the noise area of impact for wildlife. The noise contours are unweighted decibel values (dB). A more complete analysis of these impacts in the SDEIS document for the NorthMet project is needed. Known locations of wild rice are included in the map because it is an important source of food for waterfowl. We also note that the entire area of impact is important habitat for Canada Lynx.

As illustrated in Figures 21 and 22, the impacts of noise, airblast and ground vibration overlap in a large area surrounding the mine site. Figure 21 (Cumulative Impacts on Wildlife) also provides the location of the remaining wildlife corridors in the area. The wildlife corridor immediately northwest of the mine site would be cumulatively affected by noise (10dBL and 50 dBL) airblast overpressure and ground vibration. These impacts when thought of in the context of its proximity to the mine site, wetland destruction and fragmentation of the 100 mile swamp lead to a conclusion of a severe and significant impact to this corridor. Figure 22 (Cumulative Impacts on Humans) indicates areas of tribal significance that are affected.

[17] *Synthesis of Noise Effects on Wildlife Populations*, USDOT Publication No. FHWA-HEP-06-016, September 2004

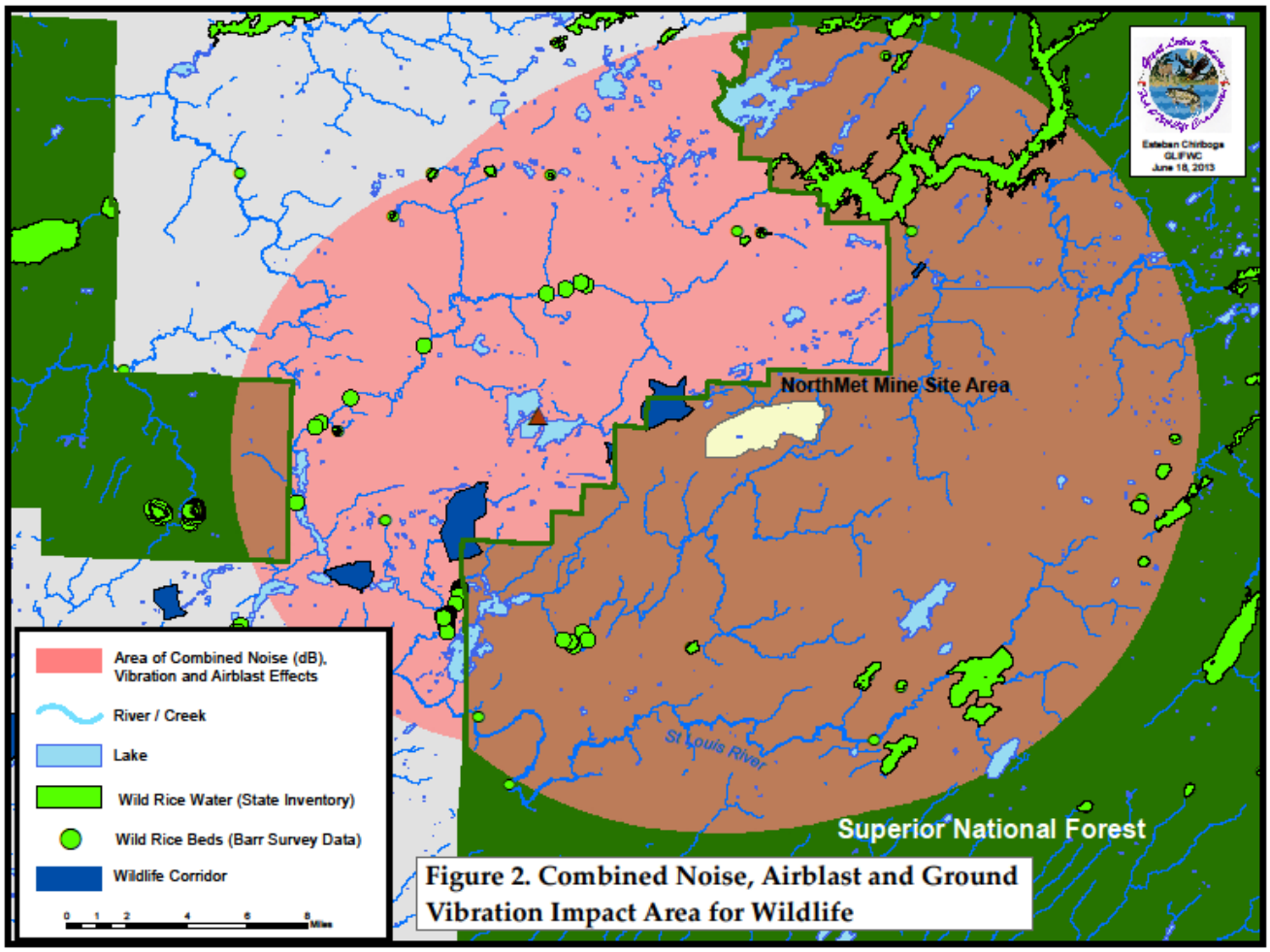

Figure 21. Combined Noise, Airblast and Ground Vibration Impact Area for Wildlife

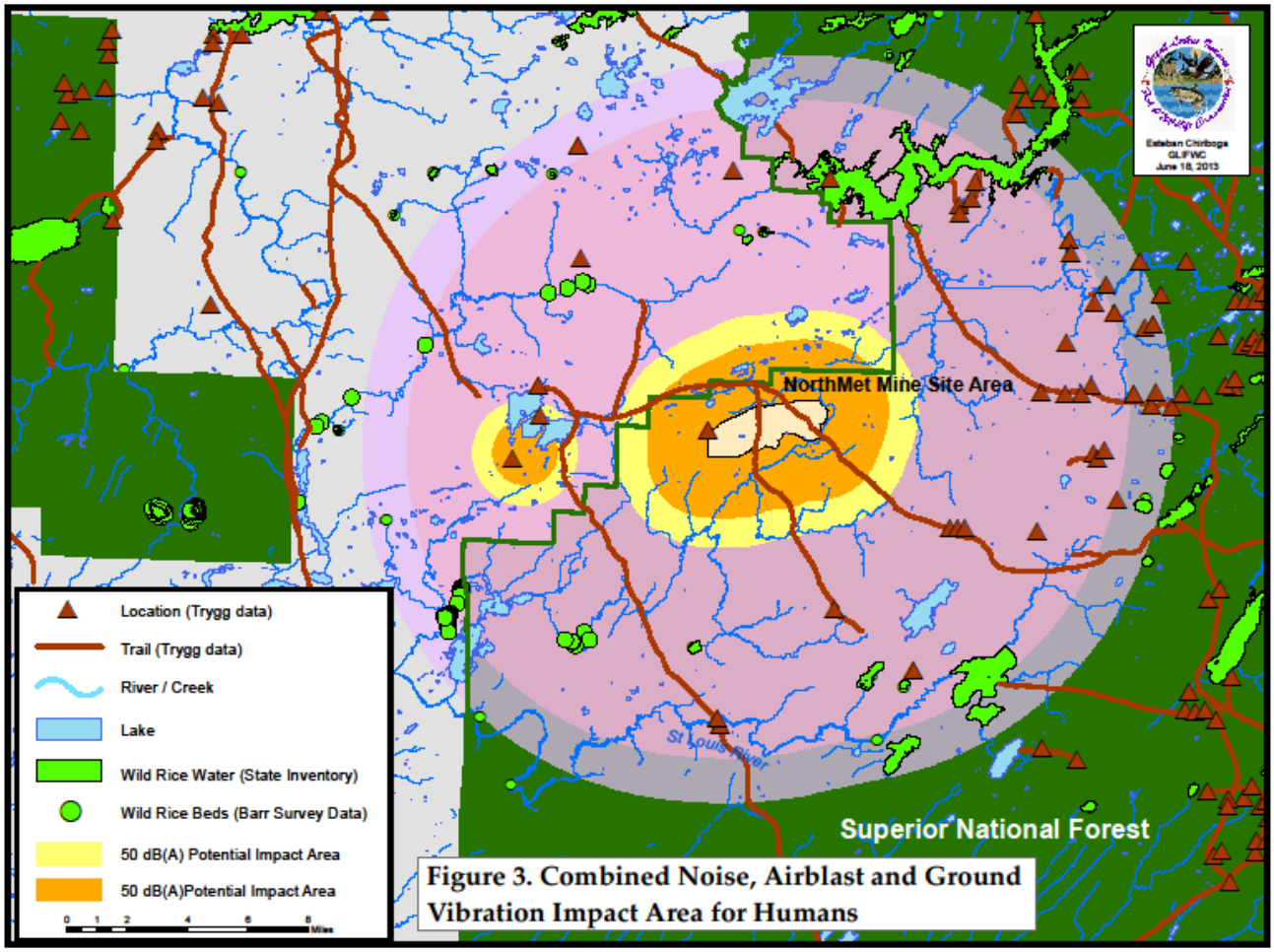

Figure 22. Combined Noise, Airblast and Ground Vibration Impact Area for Humans

No Action Alternative

A December 3, 2008 memo from NTS to the MPCA regarding the Area of Concern (AOC) Summary for the VIC Projects on the Cliffs Erie Property shows twenty-nine AOCs within the Project area. Only three AOCs have been remediated. Twenty of the remaining twenty-six sites' status is listed as "Area within property under Contract for Sale with PolyMet. No actions have been taken with regard to this site."

Some of those sites include: "Oily Waste Disposal Area, Private Landfill, Dunka WTP Sludge, Tailings Basin Reporting, Transformers, Emergency Basin, Cell 2W Salvage Area, Hornfels..." It also appears that there has not been a brownfield/superfund site investigation for the properties PolyMet intends to acquire for the Project area to assess existing contamination. Therefore, critical information to determine cumulative impacts at the site are not included in the SDEIS, and natural background water quality cannot be differentiated from existing contamination requiring remediation.

According to CEQ guidelines:

"No action" in such cases would mean the proposed activity would not take place, and the resulting environmental effects from taking no action would be compared with the effects of permitting the proposed activity or an alternative activity to go forward.

Where a choice of "no action" by the agency would result in predictable actions by others, this consequence of the "no action" alternative should be included in the analysis. For example, if denial of permission to build a railroad to a facility would lead to construction of a road and increased truck traffic, the EIS should analyze this consequence of the "no action" alternative."

Based on the above CEQ guidelines, it is clear that activities that will occur under the Cliffs Consent Decree should be included in modeling of a No Action alternative. Unfortunately not only are the consent decree activities not included, but the fact that it will be precipitating on the tailings basin for the foreseeable future has not been included in the No Action modeling. This is evident by the model results that show stable levels of chloride coming from the basin for the next 200 years (Figure 23) when there is no ongoing source for chloride. With no source for new chloride, rainwater will gradually dilute the residual chloride in the basin and levels will drop. The PSDEIS claims that the basin's water quality has stabilized and that the current conditions will not change over time. The claim of chemical stability is based on basin pond water sampling for only 4 years (2001 – 2004, PSDEIS Table 4.2.2-23).

Since there has been no water quality data collected in the basin pond for 9 years it is reasonable to assume that the past 9 years of precipitation has diluted the water chemistry in the basin pond, and that eventually the more dilute water will percolate through the basins and be discharged at the toe. If chemical stability is to be assumed, more recent data on basin pool water chemistry is needed. While the CEQ makes it clear that a blind "continuation of existing conditions" model is inappropriate as a No Action alternative, a "continuation of existing conditions" model that ignores simple environmental processes such as precipitation is even less appropriate.

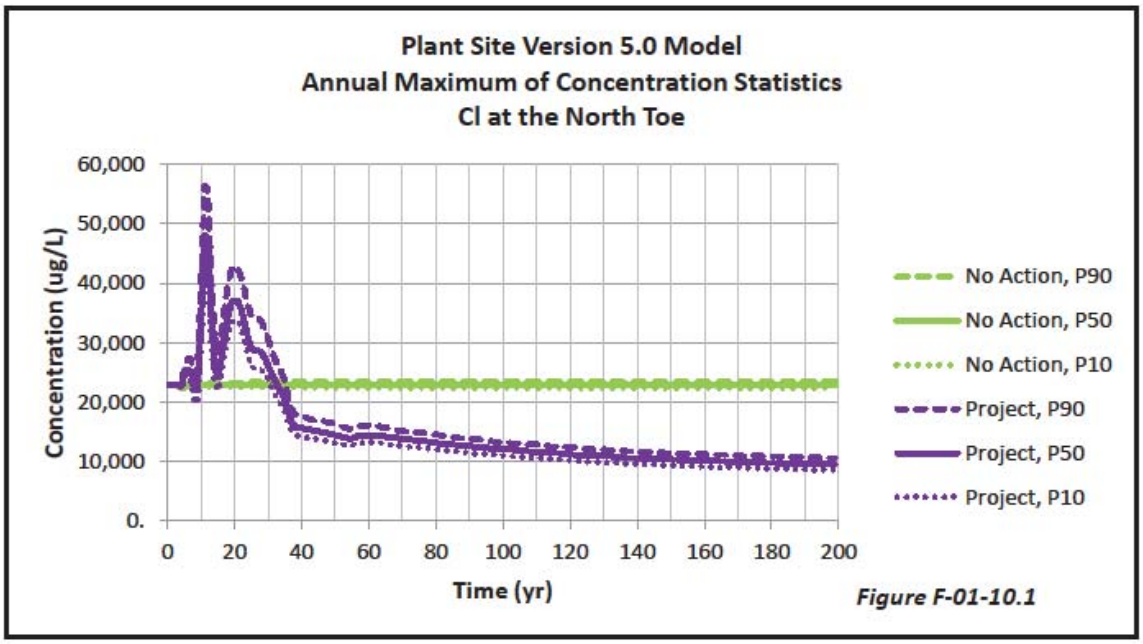

Figure 23. Annual Maximum of Concentration Statistics: Chloride at the North Toe.

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Proposed Transport of Ore

GLIFWC staff disagrees that the amount of ore that could escape from rail cars would be "small." Taconite pellets currently litter the railroad right-of-way between the plant site and the proposed mine site, confirming that spillage from rail cars does occur (attached Figure 1). Second, fugitive dust escaping through these gaps is also a concern. Given the duration of this proposed project and the large quantity of materials to be moved, approximately 228 million tons of ore and 394 million tons of waste rock, there will be tracking, dusting, and spillage of material that has been demonstrated to leach contaminants when exposed to air and water. Even a loss of only one thousandth of one percent (0.001%) of the extracted material to tracking, dusting or spillage would result in 6,220 tons of fine leachable material being released into the environment. Our experience with a much smaller, shorter duration, sulfide mine in Wisconsin (Flambeau Mine) indicates that tracking and dusting of ore and waste rock, even at a level that is unnoticed during operations, can result in soil and runoff contamination that exceeds standards.

Transport of ore between mine site and processing plant would be done by rail using the rail cars previously used by LTV. These cars are not sealed and will readily spill a fraction of the approximately 228 million tons of ore they are transporting. Attached are pictures of the cars proposed for transporting the sulfide ore (Figures 2 and 3). The rail line between the mine and the processing plant is approximately 8 miles long, 1 mile of which is over wetlands, and crosses over at least 3 creeks. The current proposal to use existing rail cars for ore haulage raises concerns about impacts to biotic endpoints along the rail corridor. Given the design and current condition of the rail cars proposed for transport an ecologically significant amount of spillage could occur into these streams, wetlands and their watersheds. Because transport will deposit some level of ore and ore dust along the rail line, methods for control of contaminated runoff from along the rail line must be developed and implemented in the mine plan.

The PSDEIS states that rail maintenance crews can collect spilled debris along the rail track. The material of significant concern would be too small to pick up. GLIFWC staff is unsure how ore debris can be visually distinguished by rail track maintenance crews from other rocks and ore that litter the embankments. In addition, spillage of fine ore pieces and dust (the most leachable sizes) into the wetlands and creeks that are located along the rail line could not be easily identified and recovered. It is reasonable to assume that some acid drainage and metal leaching would occur along the waterbodies located along the rail line.

GLIFWC staff does not believe that the method described in the PSDEIS to segregate fines in the center of the rail car is realistic. GLIFWC has suggested incorporating new rail cars with sealed compartments as a mitigation measure but that alternative has not been included in the PDEIS.

Finally, The PSDEIS states that monitoring of the creeks that could be affected by ore dust deposition will be done. We agree that this is important. However, monitoring would only detect impacts after that have already occurred. The example of the Flambeau mine illustrates that cleanup of ore dust contamination in an aquatic environment is a long and difficult process. A serious examination of the issue of fugitive dust from rail cars should be conducted and included in the DEIS and mitigation options that require the use of sealed rail cars to transport ore from the mine site to the plant site are needed.

Figure 1. Spilled taconite pellets on a bridge above the Partridge River.

Figure 2. Gap in the side hinge of the rail car.

Figure 3. Rail cars proposed for use at the NorthMet project.

Perpetual Maintenance and Water Treatment at the NorthMet Project

The lead agencies position on post closure maintenance and water treatment needs in the SDEIS states:

"Both mechanical and non-mechanical treatment will require periodic maintenance and monitoring activities. Modeling predicts that treatment activities will be a minimum of 200 years at the mine site and 500 years at the plant site. While long term, these time frames for water treatment are not necessarily perpetual. The owning company would be held accountable to maintenance and monitoring required under permit and would not be released until all conditions have been met"

GLIFWC staff disagrees with the characterization of long term maintenance for the NorthMet project. The notion of water treatment and maintenance for hundreds of years, supported by financial assurance instruments that must also be available for hundreds of years, is illogical. Specific flaws in the rationale presented by the lead agencies in the SDEIS follow.

The NorthMet Project is a Perpetual Water Treatment and Maintenance Project

In the statement above, the lead agencies attempt to say that the proposed project does not necessarily require perpetual treatment. That statement is only true if a narrow definition of "perpetual" is used. The term perpetual is used in several ways. These are:

per·pet·u·al
adj.
1. Lasting for eternity.
2. Continuing or lasting for an indefinitely long time.
3. Instituted to be in effect or have tenure for an unlimited duration: a treaty of perpetual friendship.
4. Continuing without interruption.
5. Flowering throughout the growing season.

In the SDEIS the lead agencies are strictly using the term as defined in #1 above. While it is true that it is not likely that water treatment and maintenance needs of the NorthMet project will last for eternity, we believe that definition #2 above is a more realistic use of the term. The project has predicted minimum water treatment timeframes (200 years at the mine site and 500 years at the plant site), but no modeling has been done that would give an indication of when water quality standards would be met without treatment. It could be hundreds of years or thousands. In fact, water treatment needs for the NorthMet project will be required for an indefinite period of time.

The lead agency rationale also ignores a part of the project that will require perpetual maintenance under definition #1 above. The hydrometallurgical residue facility is proposed to

contain tailings generated from the hydrometallurgical beneficiation process. These tailings are the most heavily contaminated materials that would be produced at the site and must be separated from the surrounding aquatic environment. This facility has a double liner and cover system that will likely be an effective containment system in the short term. But, given time, this containment system, like all human-made structures, will degrade and fail. No human-made structure has lasted forever, so it is illogical to assume that this facility will. Therefore, this facility will need maintenance, repair and monitoring in perpetuity.

There are many engineered features that will be needed to be maintained in perpetuity (as defined in #2 above). These include the water treatment plants at the mine and plant sites, the water capture and pumpback systems at the flotation tailings basin, the category 1 stockpile cover system, the hydrometallurgical tailings facility, the overflow control structure at the west pit lake, etc. The SDEIS also includes a goal to transition from mechanical water treatment (water treatment plant using reverse osmosis) to non-mechanical methods such as constructed wetlands, permeable reactive barriers, etc. The SDEIS does not provide detail on the passive systems, because it states that their effectiveness would have to be demonstrated at a later date. However, available literature indicates that non-mechanical systems require periodic maintenance as well. Therefore, the hypothetical transition to a non-mechanical treatment method does not eliminate the need for perpetual maintenance.

Minnesota Rule 6132.3200, regarding closures and postclosure maintenance of mines, states that the goal of closure and reclamation is that "[t]he mining area shall be closed so that it is stable, free of hazards, minimizes hydrologic impacts, minimizes the release of substances that adversely impact other natural resources, and is maintenance free." Because perpetual maintenance will be required at the hydrometallurgical residue facility, as well as at the numerous engineered features listed above, the position of GLIFWC staff is that this project does not meet this goal.

The Assumption that PolyMet Will Exist Decades or Centuries after Closure is Not Logical

The lead agency statement above assumes that the mining company will exist for decades or centuries after closure. This is not a realistic assumption. Historically, mining companies are temporary entities that disband soon after a mine project comes to an end. The most reasonable scenario for long term closure is that a state or federal agency will be responsible for monitoring, maintenance, and cleanup activities because a mining company cannot be held accountable if it no longer exists. Similarly, the assumption that financial assurance instruments can be developed to ensure that funds will be available centuries from now is not logical. The State of Minnesota has existed for 155 years. The United States of America has existed for 237 years. The notion that a mining company and financial assurance instruments will be available to work on a mine site 500 years from now is not believable.

The Assumption that Water Quality Standards will be met is Not Logical

Throughout the SDEIS, the Co-Lead agencies state that they expect the proposed project to meet all applicable water quality standards. This expectation is based on modeling and GLIFWC does not believe that the modeling is robust enough to support such a statement. However, even assuming that the modeling accurately represents the real future of the project, it is illogical to assume that standards will be met because the modeling assumes effective operation of water capture and treatment facilities. As stated above, the idea that water treatment plants will operate for hundreds of years is not believable. Therefore, the statement that water quality standards will be met is also not believable.

Executive Summary

Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 1	GLIFWC	ES Executive Summary-NorthMet Project Proposed action	As with the first 2 bullets, the third bullet should indicate the length of time that post-closure maintenance and water treatment would last. Therefore, it should indicate that water treatment and maintenance of permanent facilities would be required in perpetuity.	Text edited to reflect that the closure objective is to provide mechanical and non-mechanical treatment for as long as necessary to meet regulatory standards at evaluation locations in groundwater and surface water. Both mechanical and non-mechanical treatment will require periodic maintenance and monitoring activities. Modeling predicts that treatment activities will be a minimum 200 years at the Mine Site and a minimum of 500 years at the Plant Site. While long-term, these time frames for water treatment are not necessarily perpetual. The owning company would be held accountable to maintenance and monitoring required under permit and would not be released until all conditions have been met.	GLIFWC does not agree with the language in the co-lead disposition. Provide a link to the Perpetual care language in the appendix.
GLIFWC 2	GLIFWC	ES Executive Summary	The description of the history of the 2009 DEIS and the need for the SDEIS is not accurate. The reason for the development of a supplemental document and the continuation of the NEPA process is the the EPA gave the 2009 DEIS the lowest possible rating. The EPA found the project to have unacceptable environmental consequences and found that the DEIS failed in its purpose of accurately describing the project and the potential environmental impacts.	The EU-3 rating is discussed in section 1.2.2. "This process culminated in October 2009, with the publication of the NorthMet Project Draft EIS (DEIS) that analyzed the project as it was then designed proposed by PolyMet. After issuing the DEIS, the Co-lead Agencies, responding to public, other federal (including US EPA) and state agency and tribal comments and concerns, analyzed an alternative design that sought to resolve several major environmental concerns and permitting barriers."	ok
GLIFWC 3	GLIFWC	ES Executive Summary	Map is misleading. The area labeled Mesabi Iron Range / Historic mining district encompases areas that have never been mined and are outside the geologic formations where iron mines have operated. It suggests that the NorthMet mine site is part of a mined area which is not correct. The GIS layer depicting all the mine features on the range (pits, tailings basins, etc) should be used instead.	Text editited. This is now called "General Mesabi Iron Range-Historic Mining".	GLIFWC staff disagree with the disposition. We maintain that the figure is misleading.
GLIFWC 4	GLIFWC	ES Executive Summary	Describes the NorthMet deposit as low-medium quality. We disagree with this characterization. The deposit had a low ore grade compared to most other ore bodies in the Great Lakes region. It should be characterized only as low quality.	It is ERM's professional judgment that the NorthMet Deposit should be classified as low-medium grade. Classification of the ore-body in simplified terms is relative and subjective and does not have any implications to the economic viability of the resource, nor does it influence the environmental evaluation presented in Chapter 5. Full description of the mineral resource may be found in PolyMet's 43-101 document. No text edit.	We disagree. In GLIFWC's professional judgement the deposit should only be described as low quality.

Executive Summary

Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 5	GLIFWC	ES Executive Summary - Closure and Post-Closure Maintenance	Text should state that water treatment would be perpetual .	Text edited to reflect that the closure objective is to provide mechanical and non-mechanical treatment for as long as necessary to meet regulatory standards at evaluation locations in groundwater and surface water. Both mechanical and non-mechanical treatment will require periodic maintenance and monitoring activities. Modeling predicts that treatment activities will be a minimum 200 years at the Mine Site and a minimum of 500 years at the Plant Site. While long-term, these time frames for water treatment are not necessarily perpetual. The owning company would be held accountable to maintenance and monitoring required under permit and would not be released until all conditions have been met. Text clarified.	GLIFWC does not agree with the language in the co-lead disposition. Provide a link to the Perpetual care language in the appendix.
GLIFWC 6	GLIFWC	ES Executive Summary - Closure and Post-Closure Maintenance	Should state that because water treatment would be perpetual, maintenance and monitoring needs would also be perpetual.	Text edited to reflect that the closure objective is to provide mechanical and non-mechanical treatment for as long as necessary to meet regulatory standards at evaluation locations in groundwater and surface water. Both mechanical and non-mechanical treatment will require periodic maintenance and monitoring activities. Modeling predicts that treatment activities will be a minimum 200 years at the Mine Site and a minimum of 500 years at the Plant Site. While long-term, these time frames for water treatment are not necessarily perpetual. The owning company would be held accountable to maintenance and monitoring required under permit and would not be released until all conditions have been met. Text Clarified.	GLIFWC does not agree with the language in the co-lead disposition. Provide a link to the Perpetual care language in the appendix.
GLIFWC 7	GLIFWC	ES Executive Summary	What are environmental evaluation criteria? We assume that in many instances these criteria are also standards (eg. Water quality, noise, etc.) When legal standards are the same as environmental evaluation criteria, the term "standard" should be used throughout the document.	Environmental evaluation criteria is the framework selected for use in this NEPA EIS. Discussion of "standards" is a part of the regulatory/permitting process. No text edit.	GLIFWC disagrees with the disposition. We maintain that the language in the SDEIS should be clarified
GLIFWC 8	GLIFWC	ES Executive Summary - NorthMet project effects on water resources section	We disagree that current operating mines are subject to strict environmental rules. Historically, enforcement of water quality standards on these mines has been lax. Sentence should be removed.	Paragraph deleted. The stringency of environmental rules is open to interpretation. Edited as requested.	ok

Executive Summary

Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 9	GLIFWC	ES Executive Summary - NorthMet project effects on water resources section	This discussion is misleading. Compliance with water quality standards for this project is only possible with successful operation of water capture and treatment facilities in perpetuity. The section should state that without perpetual treatment, water quality standards would be excceeded. In addition the decreases in concentrations for some solutes after the project is built may be artifacts of incorrect modeling assumptions. We will provide more detail in the water sections.	See response for GLIFWC 5 & 6. Will consider revisions to text accordingly.	GLIFWC does not agree with the language in the co-lead disposition. Provide a link to the Perpetual care language in the appendix.
GLIFWC 10	GLIFWC	ES Executive Summary	The PSDEIS discussion on mercury states that there is a great deal of uncertainty on these mercury issues. Therefore it is not appropriate for the executive summary to present these results as definitive. See GLIFWC mercury attachment for more information.	No text edit recommended because ES consistent with text in body of SDEIS.	GLIFWC disagrees with the disposition. Provide a link to the mercury section in the appendix.
GLIFWC 11	GLIFWC	ES Executive Summary - NorthMet project effects on water resources section	There are wetlands within the mine project area that will be severely impacted by several different types of mine related effects (fragmentation+drawdown+air deposition). While these wetlands will not be filled, the Corps should require up-front mitigation for them. More information is in GLIFWC wetland attachment.	A wetland monitoring plan would be developed and implemented if the NorthMet project is permitted. The plan would require wetland hydrology monitoring, vegetation monitoring, and wetland water quality monitoring to identify if indirect wetland impacts occur during implementation of the project. If indirect wetland impacts resulting from the project are determined by the monitoring program, compensatory wetland mitigation would be required for those indirect wetland impacts. Fragmented wetlands are classified as indirect impact; however, fragmented wetlands are included in upfront mitigation. Total upfront mitigation is for the 912.5 acres of direct effects and 26.4 acres of fragmented wetlands (indirect effect). Tables have been revised to reflect this. Text clairifed.	GLIFWC disagrees with the disposition. Provide a link to the wetland section of the appendix.
GLIFWC 12	GLIFWC	ES Executive Summary - NorthMet project effects on water resources section	Disagree with this paragaraph.The conclusions written here are based on fatally flawed modeling of surface and groundwater hydrology for the Partridge River watershed. The statements in the paragraph are unsupported.	No change to SDEIS text recommended because subject experts believe that the hydrology for the Partridge River watershed was properly characterized. No text edit.	GLIFWC disagrees with the disposition. Provide a link to the hydrology section of the appendix.
GLIFWC 13	GLIFWC	ES Executive Summary - NorthMet project effects on water resources section	We disagree with the assumption that constituents exceeding water quality standards in the Embarrass River area are natural in origin. It is an accepted fact that tailings basin seepage water has saturated the aquifer in the area. Therefore, the constituent loads exceeding standards are the result of historic mining operations and seepage from the LTV tailings basin.	There is no mention of constituents natural in origin, so no change warranted. No text edit.	ok

Executive Summary

Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 14	GLIFWC	ES Executive Summary - NorthMet project effects on biological resources section	The discussion on restoration of Lynx habitat at the mine site is misleading. The open water feature at the mine site is the re-flooded west pit. The water in the pit is expected to be contaminated and in need of treatment for centuries. In addition, there will be fencing around the pit lake. The speculative language about restoring lynx habitat should be removed.	Edited as requested. "Restoration of disturbed areas as part of mine closure would potentially create lynx habitat, although this successional process could take decades."	ok
GLIFWC 15	GLIFWC	ES Executive Summary- NorthMet project effects on cultural and socioeconomic resources section	Just because a site is not eligible for listing does not mean that it will not be impacted. The conclusion of no impact should be removed or rewritten.	Deleted second half of the second sentence. Text clarified.	ok
GLIFWC 16	GLIFWC	ES Executive Summary- NorthMet project effects on cultural and socioeconomic resources section	A paragraph discussing natural resources as cultural resources from the tribal perspective is needed in this section. Impacts to natural resources are an impact to Ojibwe culture.	Added sentence where appropriate. "Natural resources and the lands on which they are gathered are important to the Bands for a number of reasons, including cultural, spiritual, and/or historic meanings, and will be considered under federal agency tribal trust responsibilities as outlined above and also as cultural resources under NEPA."	ok
GLIFWC 17	GLIFWC	ES Executive Summary- NorthMet project effects on cultural and socioeconomic resources section	Information on the negative socioeconimic effects of mining is conspicuously absent. Extensive information has been provided as part of the socioeconomic IAP. A fair representation of possible benefits AND possible negative effects of mining is expected in the executive summary.	See discussion in Section 5.2.10.14.	Additional detail is needed for section 5.2.10.14. Incorporation of the Freidenburg mining article is needed.
GLIFWC 18	GLIFWC	ES Executive Summary - Environmental Consequences of the Land Exchange section	Modeling in this PSDEIS assumes that the no action alternative is a continuation of existing consitions. Therefore, the statements in this paragraph are not carried forward into the modeling. This should be stated here.	Text to be clarified per response to GLIWFC comment 144.	The co-lead disposition does not provide enough information for us to remove our comment. Provide a link to hydrology section in the appendix.
GLIFWC 19	GLIFWC	ES Executive Summary - Environmental Consequences of the Land Exchange section	The phrase "smaller net gains in environmental resources" is not a supported assumption. The Superior N.F. has indicated that the land exchange is a real estate transaction only and that specific environmental resources are not necessarily a part of that transaction. The assumption of environmental gain should be removed.	Edited as requested. "In comparison to the combined Proposed Action, the combined Alternative B (NorthMet Project Proposed Action and Land Exchange Alternative B) would have the same direct impacts from the NorthMet Project Proposed Action, but would convey fewer lands through the land exchange. Removed "resulting in similar net gains in environmental resources"."	ok
GLIFWC 20	GLIFWC	ES Executive Summary - Table 1	99.9% water capture number is not supportable. Other areas of the document say 90% or 93% based on the location where water is captured. In all cases, there should be a range describing water capture ammounts. 99.9% is neither correct not plausible.	Edited as requested. "Greater than 90% of water would be captured and treated to meet effluent limits set to protect water quality standards."	ok
GLIFWC 21	GLIFWC	ES Executive Summary - Table 1	The conclusion that mercury loading will decrease is not supportable. See GLIFWC mercury attachment.	The aquatic species summary points in the SDEIS table have been revised and does no longer include the mercury loading conclusion commented on.	ok
GLIFWC 22	GLIFWC	ES Executive Summary - Table 1	Need aditional bullet stating: loss of carbon sink and release of stored carbon through wetland desctruction. For proposed action and alternative B.	Acknowledge partial loss of carbon sink and release of stored carbon from wetlands destruction. Suggested text change. "Wetland mitigation plan will be implemented to offset increased carbon dioxide emissions to extent practicable." Text clarified.	Disagree. Wetland mitigation will not offset the emission of carbon from the peat rich wetlands at the 100 mile swamp.

Executive Summary

Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 23	GLIFWC	ES Executive Summary - Table 1	For noise and vibration bullet delete text describing effects to nearest receptors. Using receptors limits the impact analysis - see GLIFWC noise attachment.	Edited as requested. "Noise, ground vibration, and air blast impact area/zone would be limited to 11,456, 11,469, and 11,334 acres, respectively. The BWCAW, which is 20 miles away, is outside the maximum area of audibility (247,613 acres)."	GLIFWC has concerns about the analysis. Provide a link to the cumulative impact section in the appendix.
GLIFWC 24	GLIFWC	ES Executive Summary - Table 1	add: increase in cumulative destruction of trail network and Mesabe Widjiu	No text edit, The existing text address the Mesabe Widjiu	The comment applies to a cumulative effects analysis which is, in our opinion, inadequate in the PSDEIS. Provide a link to the cumulative effects section of the appendix
GLIFWC 25	GLIFWC	ES Executive Summary	The PSDEIS concludes that "Based on the results of the modeling and impacts analysis, the Northmet Project Proposed Action would not exceed applicable environmental evaluation criteria." Due to a general lack of understanding of mercury dynamics in the St. Louis River watershed, this conclusion is not defensible with regard to mercury. See the supplemental document "Great Lakes Indian Fish and Wildlife Commission (GLIFWC) Comments Related to Mercury" [Comment 1] for additional rationale.	Text clarified in SDEIS. See response to GLIFWC 195	GLIFWC disagrees with the co-lead disposition. Provide a link to the mercury section in the appendix.
GLIFWC 26	GLIFWC	ES Executive Summary	The executive summary should clearly state that the proposed NorthMet project requires perpetual water treatment and perpetual maintenance. Therefore, the proposed project violates Minnesota Rule 6132.3200 regarding closure and postclosure maintenance of mines. This rule states that the goal of closure and reclamation is that "The mining area shall be closed so that it is stable, free of hazards, minimizes hydrologic impacts, minimizes the release of substances that adversely impact other natural resources, and is maintenance free." This language should be inserted into the executive summary. In addition Rule 6132.3200 states that "No release from the permit to mine under part 6132.4800 shall be granted for those portions of the mining area that require postclosure maintenance until the necessity for maintenance ceases." Since maintenance would never cease under the project, the executive summary should indicate that the applicant would never be released from the permit to mine.	Text edited to reflect that the closure objective is to provide mechanical and non-mechanical treatment for as long as necessary to meet regulatory standards at evaluation locations in groundwater and surface water. Both mechanical and non-mechanical treatment will require periodic maintenance and monitoring activities. Modeling predicts that treatment activities will be a minimum 200 years at the Mine Site and a minimum of 500 years at the Plant Site. While long-term, these time frames for water treatment are not necessarily perpetual. The owning company would be held accountable to maintenance and monitoring required under permit and would not be released until all conditions have been met.	GLIFWC does not agree with the language in the co-lead disposition. Provide a link to the Perpetual care language in the appendix.
GLIFWC 27	GLIFWC	ES Executive Summary- NorthMet project effects on cultural and socioeconomic resources section	The NorthMet Project Proposed Action would create up to an estimated 500 full-time direct jobs during peak construction and 360 full-time direct jobs during operations. Estimates for full-time employment were provided by NorthMet. **It is essential that throughout the SDEIS authors need to repeatly state that direct employment estimates for both construction and during operations were provided by NorthMet.	Text edited. It should be noted that these employment estimates were provided by PolyMet.	ok

Executive Summary

Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 28	GLIFWC	ES Executive Summary- NorthMet project effects on cultural and socioeconomic resources section	"These direct jobs would generate additional indirect and induced employment, estimated to be 332 additional construction phase jobs and 631 additional operations phase jobs." Indirect and Induced Effect employment numbers are calculated by IMPLAN and may be temporary, part-time, full-time, long-term or short term jobs, as IMPLAN does not differentiate between these. **It is essential that throughout the SDEIS authors need to repeatly state that Indirect and Induced Effect employment numbers are calculated by IMPLAN and may be temporary, part-time, full-time, long-term or short term jobs. See GLIFWC socioeconomics attachment for additional information.	Text edited. It should be noted that indirect and induced effect employment numbers are calculated by IMPLAN and may be temporary, part-time, full-time, long-term or short term jobs.	ok
7/	GLIFWC	ES Executive Summary- NorthMet project effects on cultural and socioeconomic resources section	The Draft Environmental Impact Statement (DEIS) prepared in 2009 stated, "Due to the estimated 20-year operating life of the facility, it is estimated that approximately 55% of labor for the operations would be non-local and would relocated to the east range; 20% would commute daily or weekly from centeres such as Duluth; and the remaining labor would be local" DEIS (page 4.10-15). The Executive Summary needs to clearly identify the number of jobs projected to be filled by "local residents" in St. Louis County rather than the broad Arrowhead Region. See GLIFWC socioeconomics attachment for additional information.	The DEIS definition of "local" appears to be limited to the East Range, essentially the nearby towns and cities in St. Louis County alone. By comparison, the PSDEIS clearly states that "local" workers--those who would commute daily or weekly--would come from a very wide commute shed, given the willingness of workers in this region to commute relatively long distances. The definitions of "local" are very different; therefore, no change is needed.	ok

Chapter 1

Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 30	GLIFWC	1.1.2 Land Exchange	Map is misleading. The area labeled Mesabi Iron Range / Historic mining district encompases areas that have never been mined and are outside the geologic formations where iron mines have operated. It suggests that the NorthMet mine site is part of a mined area which is not correct. The GIS layer depicting all the mine features on the range (pits, tailings basins, etc) should be used instead.	Map is intended to show general area of the Mesabi Iron Range. Figure Key edited to now read, "General Mesabi Iron Range - Historic Mining"	GLIFWC staff disagree with the disposition. We maintain that the figure is misleading.
GLIFWC 34	GLIFWC	1.2.2 Cooperating Agencies	Please insert the following text for GLIFWC participation: GLIFWC staff did not participate in the development of the language in the SDEIS or the referenced technical documents.	Text edit made. New text reads "The Great Lakes Indian Fish and Wildlife Commission (GLIFWC) and the 1854 Treaty Authority have assisted the Bands in their roles as Cooperating Agencies"	ok
GLIFWC 31	GLIFWC	1.3 Purpose And Need	The first 4 bullets are the mining companies' purpose and need and not the purpose and need of the agencies involved. A title is needed making this clear. Question: This is a document from the lead agencies. Does the applicants purpose belong here?	The Co-lead Agencies developed this language for insertion into the SDEIS. As such, it is appropriately placed.	ok
GLIFWC 32	GLIFWC	1.7 Pollutants Of Interest	There is absolutely no scientific doubt that GHG in the atmosphere have, and will continue to change climate conditions. Text should be corrected.	Text not edited, use of "may" and "can" is intended to be consistent with the rest of this section.	GLIFWC staff disagree with the disposition. The text may be consistent with the section but it is inconsistent with accepted scientific knowledge.
GLIFWC 33	GLIFWC	1.7 Pollutants Of Interest	There is absolutely no scientific doubt that sulfate has, and will continue to negatively impact wild rice. There is absolutely no scientific doubt that sulfate has, and will continue to contribute to mercury methylation. Correct the text.	Text not edited, use of "may" and "can" is intended to be consistent with the rest of this section.	GLIFWC staff disagree with the disposition. The text may be consistent with the section but it is inconsistent with accepted scientific knowledge.

Chapter 3

Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 35	GLIFWC	3.1.1.3 Mine Operations Overview	Describes the NorthMet deposit as low-medium quality. We disagree with this characterization. The deposit had a low ore grade compared to most other ore bodies in the Great Lakes region. It should be characterized only as low quality.	It is ERM's professional judgment that the NorthMet Deposit should be classified as low-medium grade. Classification of the ore-body in simplified terms is relative and subjective and does not have any implications to the economic viability of the resource, nor does it influence the environmental evaluation presented in Chapter 5. Full description of the mineral resource may be found in PolyMet's 43-101 document. No changes to text.	We disagree. In GLIFWC's professional judgement the deposit should only be described as low quality.
GLIFWC 46	GLIFWC	3.2.2.4 Financial Assurance	EPA recommends that 10 to 25% of financial assurance be made available as cash. This should be added to the section. In addition, an explanation of how the state will financially assure a perpetual treatment project is required. Specifically, the state must financially assure in perpetuity: 2 RO water treatment plants, perpetual monitoring of water quality for the 2 tailings basins, west pit outflow, and groundwater points of compliance. Perpetual maintenance would be required at both tailings facilities for water quality, water capture, flow augmentation system, and geotechnical stability, the Cat 1 stockpile and the water level controls at the west pit.	Financial assurance costs, instruments, and duration will be determined in the MDNR Permit to Mine permitting process. Financial assurance can be required indefinitely and can include self-sustaining instruments such as trust funds.	The co-lead disposition is not realistic. Provide a link to the perpetual care language in the appendix.
GLIFWC 37	GLIFWC	3.1.2 Land Exchange Overview	Information in this paragraph is incorrect. As previously commented, federal lands are not within the historic mesabi range. Federal lands are not surrounded by private lands. Rather they are connected to other Superior National Forest lands on the south and east. Finally, the land exchange would unite surface and mineral rights for the mine site lands but not for the parcels that would enter the federal estate. Those surface and mineral ownerships would still be severed. The text should be clarified.	Edited sentences... "The federal lands are located adjacent to historic mining projects on the Mesabi Iron Range and are almost surrounded by privately held land used for mining and other industrial purposes; portions of the east and southwest areas of the federal lands are bordered by Superior National Forest lands." "in the area" to "on the federal lands"	ok
GLIFWC 40	GLIFWC	3.2.2.1.9 Water Management	Information on the length of time that the facility would need to operate should be included	This section is specific to the operational phase of mining. Long term management is discussed in section 3.2.2.1.10	ok

Chapter 3

Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 38	GLIFWC	3.2.2.1.7 Overburden And Waste Rock Management	Should state that Cat 1 stockpile will require some maintenance in perpetuity.	Table 3.2-7 states that from Year 20+ there would be maintenance. Maintenance activities would continue throughout reclamation and post-reclamation, for as long as necessary to meet regulatory standards.	GLIFWC believes the disposition is incomplete. Provide a link to perpetual care section in the appendix.
GLIFWC 39	GLIFWC	3.2.2.1.8 Engineered Water Controls	Throughout the section, information on post closure maintenance needs and length of time operation is needed should be included for all engineering controls.	This section is specific to the operational phase of mining. Long term management is discussed in section 3.2.2.1.10	ok
GLIFWC 42	GLIFWC	3.2.2.1.10 Reclamation And Long-term Closure Management	Last paragraph should explicitly state that erosion repair, and removal of woody species from the stockpile cover system would need to be perpetual. This would also include monitoring and inspections of the facility.	Maintenance activities would continue throughout reclamation and post-reclamation, for as long as necessary to meet regulatory requirements.	GLIFWC believes the disposition is incomplete. Provide a link to perpetual care section in the appendix.
GLIFWC 50	GLIFWC	3.2.2.1.10 Reclamation And Long-term Closure Management	Insert text stating that water quality modeling suggests water treatment would need to occur for over 500 years in order to meet water quality standards.	The Closure objective is to provide mechanical and non-mechanical treatment for as long as necessary to meet regulatory requirements at evaluation locations in groundwater and surface water. Both mechanical and non-mechanical treatment will require periodic maintenance and monitoring activities. Modeling predicts that treatment activities will be a minimum 200 years at the Mine Site. While long-term, this time frame for water treatment is not necessarily perpetual. Added text to section 3.2.2.1.10 to this effect.	GLIFWC does not agree with the language in the co-lead disposition. Provide a link to the Perpetual care language in the appendix.
GLIFWC 51	GLIFWC	3.2.2.2.4 Use During Operations	We disagree with the characterization that ore dust releases from rail cars is not a significant issue. See GLIFWC rail car attachment.	Air quality for the NorthMet Project is evaluated in Section 5.2.7. Due to the size of the ore rock being transported, the design of the railcars, and the short distance of transport from the Mine Site to the Plant Site, the ore fines are expected to be coarse in nature. Thus, no significant reactive airborne fugitive dust from the rail transport is expected	GLIFWC does not agree with the language in the co-lead disposition. Provide a link to the rail car section in the appendix.

Chapter 3

Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 36	GLIFWC	3.1.1.7 Project Closure Overview	This section states that post closure monitoring and maintenance would continue until features were "deemed environmentally acceptable in a self sustaining and stable condition" Water treatment and facility maintenance at the site are perpetual. Therefore this statement would never happen. It is misleading to suggest otherwise.	Text edited to reflect that the closure objective is to provide mechanical and non-mechanical treatment for as long as necessary to meet regulatory standards at evaluation locations in groundwater and surface water. Both mechanical and non-mechanical treatment will require periodic maintenance and monitoring activities. Modeling predicts that treatment activities will be a minimum 200 years at the Mine Site and a minimum of 500 years at the Plant Site. While long-term, these time frames for water treatment are not necessarily perpetual. The owning company would be held accountable to maintenance and monitoring required under permit and would not be released until all conditions have been met.	GLIFWC does not agree with the language in the co-lead disposition. Provide a link to the Perpetual care language in the appendix.
GLIFWC 53	GLIFWC	3.2.2.3.9 Transport Of Consumables And Products	There is no information provided on outgoing rail routes from the mine site. A map of these rail routes is requested.	The railway between the Mine Site and Plant Site is shown in Figure 3.2-4 and 3.2-20. Railway beyond the project area is outside of the scope of the SDEIS	GLIFWC disagrees. Regional transportation routes have been raised as issues in the past and there is the potential for environmental impacts along those routes based on impacts at other mine sites.
GLIFWC 54	GLIFWC	3.2.2.3.10 Engineered Water Controls	Section indicates that a water containment system exists on the south side. Please add that system to figure 3.2-27	Removed south side containment system from text.	ok
GLIFWC 55	GLIFWC	3.2.2.3.10 Engineered Water Controls - figure 3.2-28	Legend should be updated to describe the red and yellow lines on the outside of the berm.	The red and yellow lines do not add value to the figure and have been removed	ok

Chapter 3

Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 44	GLIFWC	3.2.2.3.12 Reclamation And Long-term Closure Management	It should be clearly statated that inspection and periodic water collection at the hydrometallurgical residue facility would need to be perpetual.	The Closure objective is to provide mechanical and non-mechanical treatment for as long as necessary to meet regulatory standards at evaluation locations in groundwater and surface water. Both mechanical and non-mechanical treatment will require periodic maintenance and monitoring activities. Modeling predicts that treatment activities will be a minimum 200 years at the Mine Site and a minimum of 500 years at the Plant Site. While long-term, these time frames for water treatment are not necessarily perpetual. Text has been added to section 3.2.2.3.12 to reflect this.	GLIFWC does not agree with the language in the co-lead disposition. Provide a link to the Perpetual care language in the appendix.
GLIFWC 45	GLIFWC	3.2.2.3.12 Reclamation And Long-term Closure Management - post-reclamation activities	A clear statement that perpetual water treatment, either active or passive, is required for the project to comply with water quality standards. In addition, the section should state that passive treatment is speculative.	The Closure objective is to provide mechanical and non-mechanical treatment for as long as necessary to meet regulatory standards at evaluation locations in groundwater and surface water. Both mechanical and non-mechanical treatment will require periodic maintenance and monitoring activities. Modeling predicts that treatment activities will be a minimum 200 years at the Mine Site and a minimum of 500 years at the Plant Site. While long-term, these time frames for water treatment are not necessarily perpetual. Text has been added to section 3.2.2.3.12 to reflect this.	GLIFWC does not agree with the language in the co-lead disposition. Provide a link to the Perpetual care language in the appendix.

Chapter 3

Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 56	GLIFWC	3.2.2.3.12 Reclamation And Long-term Closure Management	Include information about long term maintenance needs and lenghth of time that water treatment is needed.	The Closure objective is to provide mechanical and non-mechanical treatment for as long as necessary to meet regulatory standards at evaluation locations in groundwater and surface water. Both mechanical and non-mechanical treatment will require periodic maintenance and monitoring activities. Modeling predicts that treatment activities will be a minimum 200 years at the Mine Site and a minimum of 500 years at the Plant Site. While long-term, these time frames for water treatment are not necessarily perpetual. Text has been added to section 3.2.2.3.12 to reflect this.	GLIFWC does not agree with the language in the co-lead disposition. Provide a link to the Perpetual care language in the appendix.
GLIFWC 47	GLIFWC	3.2.2.4.3 Cessation Of Financial Assurance	The NorthMet project is a perpetual maintenance and water treatment project. This should be clearly stated in this section. Therefore, there is a significant financial assurance component that the applicant will never be able to recover. Finally, a clear statement that the state of Minnesota will ultimately be responsible for conducting any long term maintenance and/or cleanup because it is not realistic to assume that this mining company will exist past closure.	The Closure objective is to provide mechanical and non-mechanical treatment for as long as necessary to meet regulatory standards at evaluation locations in groundwater and surface water. Both mechanical and non-mechanical treatment will require periodic maintenance and monitoring activities. Modeling predicts that treatment activities will be a minimum 200 years at the Mine Site and a minimum of 500 years at the Plant Site. While long-term, these time frames for water treatment are not necessarily perpetual. Text has been added to section 3.2.2.3.12 to reflect this. Financial assurance can be required indefinitely and can include self-sustaining instruments such as trust funds.	GLIFWC does not agree with the language in the co-lead disposition. Provide a link to the Perpetual care language in the appendix.
GLIFWC 41	GLIFWC	3.2.2.1.10 Reclamation And Long-term Closure Management	Description of long term maintenance needs for the west pit lift station is needed.	The West Pit Lift station would be maintained as per needed in accordance with the reclamation plan, similarly as the WWTF would. Appropriate details would be provided for permitting	GLIFWC does not agree with the language in the co-lead disposition. Provide a link to the Perpetual care language in the appendix.

Chapter 3

Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 49	GLIFWC	3.2.2.1.10 Reclamation And Long-term Closure Management	Describe long term maintenance and monitoring needs for the stormwater ponds and outlet control structures next to the Dunka Rd.	The detailed maintenance and monitoring needs for outlet structures would be provided in the Reclamation Plan as required for permitting	GLIFWC does not agree with the language in the co-lead disposition. Provide a link to the Perpetual care language in the appendix.
GLIFWC 52	GLIFWC	3.2.2.1.10 Reclamation And Long-term Closure Management	A table describing in detail the long term maintenance, monitoring, and treatment needs is requested.	The following section provide more detail that what could be portrayed in a table. Please refer to the text.	GLIFWC does not agree with the language in the co-lead disposition. Provide a link to the Perpetual care language in the appendix.
GLIFWC 43	GLIFWC	3.2.2.3.10 Engineered Water Controls	How long would the tailings basin water collection and treatment system operate in post closure?	The Closure objective is to provide mechanical and non-mechanical treatment for as long as necessary to meet regulatory standards at evaluation locations in groundwater and surface water. Both mechanical and non-mechanical treatment will require periodic maintenance and monitoring activities. Modeling predicts that treatment activities will be a minimum 200 years at the Mine Site and a minimum of 500 years at the Plant Site. While long-term, these time frames for water treatment are not necessarily perpetual. Text has been added to section 3.2.2.3.12 to reflect this.	GLIFWC does not agree with the language in the co-lead disposition. Provide a link to the Perpetual care language in the appendix.

Chapter 3

Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 48	GLIFWC	3.2.3.3 Development Of The Northmet Project Proposed Action - table 3.2-16	"capture and treatment of virtually all groundwater…" is not realistic or correct. Change to capture and treatment of "most" groundwater…	Groundwater containment with slurry walls and permeable trenches has been routinely performed at mine and industrial sites over the last 50 years. There are hundreds of currently operating systems. When geologic conditions are favorable (particularly the presence of a low permeability basal unit that can be keyed into), it is typical to achieve greater than 90 percent groundwater capture. At the Mine and Plant Sites, the geologic conditions are favorable due to the presence of low permeability bedrock. Performance modeling of the containment systems performed by PolyMet and reviewed by the Co-Leads provides strong evidence that the capture efficiency will be greater than 90 percent. the bullet point has been updated to reflect this.	ok
GLIFWC 59	GLIFWC	3.2.3.4.1 Underground Mining Alternative	GLIFWC staff disagree with the lead agency position paper on the underground alternative. See GLIFWC underground mining attachment for more information (will be provided by July 3rd)	The Co-leads have eliminated the Underground Mining Alternative based on the rational provided in section 3.2.3.4.1.	GLIFWC does not agree with the language in the co-lead disposition. Provide a link to the underground mine alternative section in the appendix.
GLIFWC 60	GLIFWC	3.2.3.4.2 West Pit Backfill	GLIFWC staff disagree with the lead agency position paper on the west pit backfill alternative. See GLIFWC backfill attachment for more information (will be provided by July 3rd)	The Co-leads have eliminated the West Pit Backfill Alternative based on the rational provided in section 3.2.3.4.2.	GLIFWC does not agree with the language in the co-lead disposition. Provide a link to the west pit backfill section in the appendix.

Chapter 3

Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 57	GLIFWC	3.3.2.1 Federal Lands Proposed For Exchange	As previously commented, the mine site is not located within the historic mesabi iron range and the property is not surrounded by industrial lands. Correct the text.	Edited sentences... "The federal lands are located adjacent to historic mining projects on the Mesabi Iron Range and are almost surrounded by privately held land used for mining and other industrial purposes; portions of the east and southwest areas of the federal lands are bordered by Superior National Forest lands." "in the area" to "on the federal lands"	ok
GLIFWC 61	GLIFWC	3.3.2.1 Federal Lands Proposed For Exchange	As previously commented, the federal lands are not within the historic mining district and are not surrounded by private land used for mining	Edited sentences... "The federal lands are located adjacent to historic mining projects on the Mesabi Iron Range and are almost surrounded by privately held land used for mining and other industrial purposes; portions of the east and southwest areas of the federal lands are bordered by Superior National Forest lands." "in the area" to "on the federal lands"	ok
GLIFWC 58	GLIFWC	3.3.2.2 Non-federal Lands Proposed For Exchange	Section should indicate that all lands that would enter the federal estate have severed mineral and surface ownership.	Added sentence… "All of the non-federal lands except Tract 4 have severed mineral and surface ownership."	ok
GLIFWC 62	GLIFWC	3.3.2.2 Non-federal Lands Proposed For Exchange	Section should state that the lands entering the federal estate would still have severed surface and mineral ownership and therefore future mining cannot be ruled out.	Added sentence… "All of the non-federal lands except Tract 4 have severed mineral and surface ownership."	ok
GLIFWC 63	GLIFWC	3.3.3.3.6 Underground Mining Alternative	GLIFWC disagrees with the elimination of the underground alternative for further consideration in the SDEIS. The only reason for a land exchange is the fact that the applicant has chosen a surface mining operation. The development of an underground project that takes advantage of the entire mineraized zone should be analyzed. See GLUFWC underground mine attachment for more detail.	Feasibility analysis of an underground mining alternative was based on the mineralized zone as defined in accordance with National Instrument 43-101. The Underground Mining Alternative was eliminated from further analysis because it would not be economically viable and would not meet the purpose and need.	GLIFWC does not agree with the language in the co-lead disposition. Provide a link to the underground mine alternative section in the appendix.

Chapter 4.2

Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
4.2.2 Water Resources					
GLIFWC 104	GLIFWC	4.2.2 Water Resources - Table 4.2.2-29	The values in this table for PM-12 are different than the values used in "Calibration of the Existing Natural Watershed at the Plant Site v4 MAR2012", why? For example SO4 in Table 4.2.2-29 gives average So4 as 6.9 mg/L while "Calibration of the Existing Natural Watershed at the Plant Site v4 MAR2012" page 38 reports 4.34 mg/L. Manganese in Table 4.2.2-29 reports an average of 365 mg/L while "Calibration of the Existing Natural Watershed at the Plant Site v4 MAR2012" page 36 reports 158 mg/L. Why?	The values in Table 4.2.2-29 will be confirmed and updated as appropriate in the SDEIS.	Will the Goldsim model be recalibrated with the updated data in Table 4.2.2-29? If not, why?
GLIFWC 72	GLIFWC	4.2.2.3.2 Surface Water Resources - Embarras River WQ section	The first section is not correct. The river is on the draft 2012 303d list. See GLIFWC figure 3 in wild rice attachment. The section should also indicate that the wild rice standard is being exceeded in the Embarrass river because of effluent from the tailings basin and area 5 pits.	Text revised to clarify the current status of 303(d) listings.	ok
GLIFWC 68	GLIFWC	4.2.2.2.2 Surface Water	The XP-SWMM modeling is fatally flawed **because it is incapable of predicting even current baseflow conditions. If it is incapable of predicting current water quantity it will not accurately predict future water quantity conditions, a much more difficult task. It is therefore, not suitable for use in the SDEIS to predict future conditions**. See GLIFWC hydrology attachment.	We believe the XP-SWMM modeling is acceptable for use in the SDEIS. The 20 year old data is acceptable as there haven't been any significant changes within the watershed. We believe the assumptions used were reasonably conservative. Additional detail is provided in the water sections of the SDEIS, and further rationale is provided in the Water Data Packages.	GLIFWC disagrees with the co-lead disposition. The portion of the comment in bold has not been answered. Provide a link to the hydrology section in the appendix.
GLIFWC 69	GLIFWC	4.2.2.2.2 Surface Water	Section states that the old gauge represents current flows. We disagree. The hydrology of the Partridge river is incorrectly characterized because of the fatal flaws of XP-SWMM.	We believe the XP-SWMM modeling is acceptable for use in the SDEIS. The 20 year old data is acceptable as there haven't been any significant changes within the watershed. We believe the assumptions used were reasonably conservative. Additional detail is provided in the water sections of the SDEIS, and further rationale is provided in the Water Data Packages.	GLIFWC disagrees with the co-lead disposition. Provide a link to the hydrology section in the appendix.
GLIFWC 96	GLIFWC	4.2.2 Water Resources	Yes, as stated in the SDEIS text Northshore dewaters into partridge. So **simply subtracting the flow at the Northshore RR tracks from the flow measures further downstream will give the gain in groundwater between the RR tracks and downstream sites. Result at SW-003: 2.3 cfs, not the 0.51cfs predicted by XP-SWMM**. In additionaTable 4.2.2-9 values from XP-SWMM are obsolete values (see table 4.2.2-8).	We believe the XP-SWMM modeling is acceptable for use in the SDEIS. The 20 year old data is acceptable as there haven't been any significant changes within the watershed. We believe the assumptions used were reasonably conservative. Additional detail is provided in the water sections of the SDEIS, and further rationale is provided in the Water Data Packages. XP-SWMM values in Table 4.2.2-9 have been revised.	GLIFWC disagrees with the co-lead disposition. The portion of the comment in bold has not been answered. Provide a link to the hydrology section in the appendix.

Chapter 4.2

Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 100	GLIFWC	4.2.2 Water Resources	high SO4 water of Wyman Cr. is entering the rice waters of the Partridge river. Given that the Partridge is already 9.1 mg/L at SW-005 the addition of high sulfate water by Wyman Cr. almost certainly causes the Partridge R. to exceed 10 mg/L. Does this exceedance influence the Polymet project in any way?	No. Under Minnesota Rules chapter 7050 discharges, either direct or indirect, must not cause violation of water quality standards in the immediate receiving waters, but also must not cause exceedances in downstream waters that have more stringent water quality standards. No discharges are planned from the Mine Site during operations and reclamation. During long-term closure, West Pit water will be pumped to the Mine Site WWTF, the effluent from which will require an NPDES/SDS permit to discharge to the Partridge River. The WWTF, when it starts discharging to the PR, will be designed to meet an effluent target of <10 mg/L SO4 (RC)	ok
GLIFWC 101	GLIFWC	4.2.2 Water Resources	Tailings pond water quality was measured in 2001-2004 and has not been measured since 2004. The claim, used in the No-Action or Current Condition models that water level and quality at the basins has stabilized, can not be confirmed or refuted with such a limited & old data set. **Current data on water quality in the tailings pond must be collected to verify if the tailings basins are currently hydrologically stable.** It seems unlikely that the pond water quality would stay the same over the last 9 years given that the only water input to the system has been rainwater.	Additional water quality samples will be taken from the LTV tailings pond to confirm its water quality and the results included in the EIS.	Is water quality sampling of the tailings ponds being conducted this summer. If not when will sampling be conducted?
GLIFWC 102	GLIFWC	4.2.2 Water Resources - Legacy Groundwater Quality Issues	the title of these two paragraphs suggest that it is a discussion of general contamination, yet the text only addresses organics. The text must be expanded to discuss groundwater contamination of all types.	The discussion under Legacy Groundwater Quality Issues will be expanded to include other constituents.	ok
GLIFWC 64	GLIFWC	4.2.2.1.3 Wild Rice	There is no question that wild rice is affected by sulfate. The text should state that healthy and natural stands of wild rice are found in waters of 10 ppm sulfate or less. See GLIFWC wild rice attachment.	The text already states that 'Some research has indicated that natural wild rice thrives better in low sulfate waters.'. No text edit.	The text in the co-lead disposition is misleading. It implies that there is doubt about the negative effects of sulfate on rice by using the word "some". Provide a link to the wild rice section in the appendix.
GLIFWC 65	GLIFWC	4.2.2.1.3 Wild Rice	States that "current scientific understanding of its habitat requirements is limited". This is not correct, the habitat requirements are well known. Correct your work.	Text clarified.	ok

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Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 93	GLIFWC	4.2.2 Water Resources	"consequently, the 10 mg/L water quality standard for sulfate would not apply to this portion of the river (MPCA 2011b)." the "not" appears to be incorrect	Disagree. According to MPCA 2011a, the 10 mg/L water quality standard would not apply to this portion of the river.	GLIFWC does not agree with the MPCA determination for wild rice waters. Provide a link to the wild rice section of the appendix.
GLIFWC 94	GLIFWC	4.2.2 Water Resources	A 2010 field survey is mentioned. The pH and "salinity" data reported in Eggers 2011a, I believe to be data GLIFWC collected. No "salinity" measures were collected. The data appears to have been misunderstood. **Please contact GLIFWC concerning this data.**	Text revised to remove reference to salinity and be more consistent with Eggers 2011a.	GLIFWC collected the data. Please contact GLIFWC for proper interpretation of the data, as requested.
GLIFWC 98	GLIFWC	4.2.2 Water Resources - table 4.2.2-14	**SW-005 shows a mean value of 9.11 mg/l of SO4. an average of 9.11 indicates that at times the SO4 10mg/L standard is exceeded at SW-005.** The underlying data needs to be referenced and available.	The surface water quality data used to support the water quality modeling is in Barr 2013b (Technical Memorandum: Ongoing data collection for the NorthMet water quality modeling, aka Data Sufficiency Document, Version 3. February 25, 2013), as stated under the table.	ok
GLIFWC 99	GLIFWC	4.2.2 Water Resources - many data tables	Need sample size for the averages. otherwise the averages communicate very little information.	Tables 4.2.2-12, 4.2.2-14, 4.2.2-15, and 4.2.2-29 have been revised to include columns with detection and range data. The surface water quality data used to support the water quality modeling is in Barr 2013b (Technical Memorandum: Ongoing data collection for the NorthMet water quality modeling, aka Data Sufficiency Document, Version 3. February 25, 2013), as stated under the table.	ok
GLIFWC 103	GLIFWC	4.2.2 Water Resources - Table 4.2.2-29	Sulfate exceeds the 10mg/L standard for a substantial stretch of the Embarrass between Hwy 135 to Sabin Lake. Average SO4 at PM-13 is 31.8. Again sample size is needed in order to evaluate the information in the table. This reported average is very different than the modeled P50 (existing condition) value in figure 5.2.2-49, why?	Table 4.2.2-29 has been modified to include the number of samples for both locations. Original data is available in Barr 2013b. The calibrated water quality model PM-13 (Embarrass R. below all Mine Site loads) overestimates mean sulfate concentrations for existing conditions relative to measured values, apparently because the model does not incorporate removal of sulfate by chemical reduction processes (Barr 2012j, Section 2.2). The overall calibration of the No Action Model was approved by the Co-lead Agencies.	ok

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Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 105	GLIFWC	4.2.2 Water Resources - table 4.2.2-29	The existing water quality at PM-13 reported in this table is substantially different than the P50 values reported as (continuation of existing conditions) in chapter 5 (e.g. fig. 5.2.2-49) and substantially different from the P50 values reported as No-Action model in the modeling data package (Water Modeling Data Package Vol 2-Plant Site v9 MAR2013.pdf). This suggests that **the model is poorly calibrated and unlikely to accurately predict project impacts.**	The surface water quality model was calibrated to conditions in the Embarrass River at a location above where mining had effected water quality (i.e., location PM-12), and conditions at down-stream locations were then estimated by adding known loads (for existing conditions model) and/or possible new loads (for Proposed Action model). The predicted model range for monthly concentrations over the 200-year simulation in the Embarrass R. below all Plant Site Area loads (i.e., minimum P10 to maximum P90 concentrations at location PM-13) brackets average measured concentrations for most constituents reported in Table 4.2.2-49. The model does overestimate mean sulfate concentrations for existing conditions at PM-13 relative to measured values, apparently because the model does not incorporate removal of sulfate by chemical reduction in the river and wetlands (Barr 2012j, Section 2.2). The accuracy of this Embarrass River water-quality model, as calibrated to existing conditions, was approved by the Co-lead Agencies as adequate to support the NorthMet SDEIS.	GLIFWC disagrees with the co-lead disposition. Provide a link to the hydrology section in the appendix.

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Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 106	GLIFWC	4.2.2 Water Resources - table 4.2.2-1	The existing water quality in the Partridge reported in this table is substantially different than the P50 values reported as "continuation of existing conditions" in chapter 5 and substantially different from the P50 values reported as No-Action model in the modeling data package (e.g. Fig. K-06-24.2[SO4] and Fig. K-06-25.2 [Thallium], Water Modeling Data Package Vol 2-Plant Site v9 MAR2013.pdf . This suggests that **the model is poorly calibrated and unlikely to accurately predict project impacts.**	The surface water quality model was calibrated to conditions in the Embarrass River at a location above where mining had effected water quality (i.e., location PM-12), and conditions at down-stream locations were then estimated by adding known loads (for existing conditions model) and/or possible new loads (for Proposed Action model). The predicted model range for monthly concentrations over the 200-year simulation in the Embarrass R. below all Plant Site Area loads (i.e., minimum P10 to maximum P90 concentrations at location PM-13) brackets average measured concentrations for most constituents reported in Table 4.2.2-49. The model does overestimate mean sulfate concentrations for existing conditions at PM-13 relative to measured values, apparently because the model does not incorporate removal of sulfate by chemical reduction in the river and wetlands (Barr 2012j, Section 2.2). The accuracy of this Embarrass River water-quality model, as calibrated to existing conditions, was approved by the Co-lead Agencies as adequate to support the NorthMet SDEIS.	GLIFWC disagrees with the co-lead disposition. Provide a link to the hydrology section in the appendix.
GLIFWC 116	GLIFWC	4.2.2 Water Resources - Table 4.2.2-34	The means shown here for seeps at the toe of the basins are very different from the No-Action (continuation of existing conditions) values modeled in Water Modeling Data Package Vol 2-Plant Site v9 MAR2013.pdf. For example, Table 4.2.2-34 reports PM-10 (on the north toe) as having a mean Mn value of 100,192 mg/L, whereas Figure F-01-18.1 shows "continuation of existing conditions" as an annual maximum of 390 ug/L. at the north toe. **Aluminum is reported in Table 4.2.2-34 as a mean of 39.6 ug/L at PM-10 yet reported as a maximum for existing conditions at the north toe as 11 ug/L in Figure F-01-02.1.** These discrepancies between observed values at the north toe and the modeled existing conditions at the north toe suggests that the **Goldsim model is poorly calibrated and unlikely to accurately predict project impacts.**	The NorthMet Plant Site water-quality model used the composition of water in monitoring locations GW001, GW006, GW007, GW012, SD004, and SD026 as concentration targets for the GoldSim model (and PolyMet 2013L, Section 10.2.1 and Large Figure 5; see Figure 4.2.2-13 in this SDEIS). The overall calibration of the No Action Model was approved by the Co-lead Agencies.	GLIFWC disagrees with the co-lead disposition. Provide a link to the hydrology section in the appendix.
GLIFWC 66	GLIFWC	4.2.2.1.3 Wild Rice - Regulations section	we disagree with the MPCA's interpretation of the points of compliance. See GLIFWC wild rice attachment.	All information provided was considered when the MPCA made their recommendation.	GLIFWC does not agree with the MPCA determination for wild rice waters. Provide a link to the wild rice section of the appendix.

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Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 67	GLIFWC	4.2.2.2.1 Groundwater Resources	The 2010 field survey of wetlands focused on vegetation and plant lists. This information does not yield conclusive information on the effects that groundwater drawdown would have on a wetland. See GLIFWC wetland attachment.	No change to SDEIS text.	GLIFWC does not agree with the co-lead disposition. Provide a link to the wetland section in the appendix.
GLIFWC 70	GLIFWC	4.2.2.2.2 Surface Water	The section should state that Wyman creek has elevated sulfate at PM-5 which is likely a direct result of past mine impact. What is the effect of Wyman creek water on the wild rice standard compliance?	The fact that Wyman Creek drains an area previously mined by LTVSMC is discussed in the text preceding Table 4.2.2-15.	ok
GLIFWC 71	GLIFWC	4.2.2.3.1 Groundwater Resources	There is no question that historic contamination from the LTV tailings basin has been the most important factor in water quality in the area. Discussing natural processes and ignoring the tailings basin effluent in the discussion of existing water quality values is not appropriate.	Water quality affected by the LTV tailings is listed in Table 4.2.2-3. The baseline water quality sought wells that displayed minimal effect of LTV tailings seepage so that effects of the proposed action could be most easily compared to pre-mining conditions.	ok
GLIFWC 73	GLIFWC	4.2.2.3.2 Surface Water Resources	Uses an outdated point of compliance for the wild rice sulfate standard. Correct the text	The text will be consistent with the most recent MPCA recommendation.	ok
GLIFWC 74	GLIFWC	4.2.2.3.2 Surface Water Resources	same comment as above.	The text will be consistent with the most recent MPCA recommendation.	ok
GLIFWC 90	GLIFWC	4.2.2 Water Resources	"the portion of Upper Partridge River from river mile approximately 22 just upstream of the railroad bridge near Allen Junction, " from where to where?	Text edited.	ok
GLIFWC 92	GLIFWC	4.2.2 Water Resources - Table 4.2.2-14	**The text states that** the values in Table 4.2.2-14 are referenced to (Barr 2008f) **i.e. "PolyMet averaged available ambient water quality data to document existing conditions (Barr 2008f) " Barr 2008f is** RS74A but in that document "Table 5-3: Average baseline concentrations observed in the Partridge River" in that document shows different values. RS63 (Draft PolyMet Mining Baseline Surface Water Quality Information Report) shows individual values from 2004 but these are yet different. Where did the values in Table 4.2.2-13 come from?	Table 4.2.2-14 references Barr 2013b (Technical Memorandum: Ongoing data collection for the NorthMet water quality modeling, aka Data Sufficiency Document, Version 3. February 25, 2013), which is the cumulative repository for surface and groundwater quality data measured for the NorthMet Project. Table 4.2.2-13 cites as its source" MPCA, 2013a," http://www.pca.state.mn.us/index.php/water/index.html, which is the MPCA's web site to access water quality data.	Please clean up the text to clarify which is the source for the existing conditions.
GLIFWC 91	GLIFWC	4.2.2 Water Resources - table 4.2.2-12	sulfate is nearly exceeded by the mean at station SW-005, some readings exceed the standard. The rice standard applies there but no numeric rice standard is shown in the table	Agree. Text is revised	ok

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Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 95	GLIFWC	4.2.2 Water Resources	Yes, there is inadequate flow data for the upper Partridge. however there has been a gage on the upper Partridge at the Dunka Rd. (http://www.dnr.state.mn.us/waters/csg/site_report.html?mode=get_site_report&site=03155002) for over 2 years now. The spot flow measurements and data from that gage help clarify flow in the Partridge. **Those measures show substantially more baseflow than that predicted by XP-SWIMM. The recent data needs to be used and the models (SP-SWIMM, Modflow & Goldsim) need to be calibrated** to the more accurate flow data now available. (see GLIFWC Hydrology attachment for more information)	The difference in the base flows are very small (indistinguishable from a stage standpoint). We believe the assumptions used were reasonably conservative in terms of water quantity.	GLIFWC believes that a difference in baseflow of 200% to 300% is not "small". Provide a link to the hydrology section in the appendix.
GLIFWC 97	GLIFWC	4.2.2 Water Resources	Yes, there is uncertainty in the Northshore discharges. The DNR must require better reporting or else install a gage near Northshore's discharge. **The lack of adequate reporting of discharges and flows in the upper Partridge prevents the adequate evaluation of upper Partridge hydrology.**	Northshore is meeting the statutory requirements.	Inadequate data for this project has been a chronic problem. In particular our, and others' repeated requests for flow measurement on the Partridge River has been ignored. Why is the EIS being written with no data collected by Polymet on flows on the upper portion of the river?
4.2.3 Wetlands					
GLIFWC 75	GLIFWC	4.2.3 Wetlands - table 4.2.3-1	Text discussing limitations of the classification system should be provided. In particular, the issue of "lumping" different bog wetland types together in the Eggers and Reed system overlooks the range of connectivity that bog wetlands have with the aquifer. This oversimplification leads to masking of the effects of drawdown on bog wetlands. See GLIFWC wetland attachment.	Footnote added: All wetland classification systems have some limitations; however, wetlands identified as open bogs or coniferous bogs under the Eggers and Reed (1997) classification system were further subcategorized as either ombrotrophic (hydrology and mineral inputs entirely from direct precipitation) or somewhat minerotrophic (some degree of mineral inputs from groundwater and/or surface water runoff) (Eggers 2011a; PolyMet 2013b). Please refer to Section 4.2.3.1.2 and Section 5.2.3 for more information.	The co-lead disposition is incomplete. Provide a link to the wetland section in the appendix.
GLIFWC 76	GLIFWC	4.2.3.1.2 Hydrology Wetland Vegetation And Community Types	We disagree with the first sentence. The effect of construction, operations, reflooding and subsequent dewatering of the Northshore pits have never been investigated. Therefore the conclusion in the first sentence is not supportable.	Vegetation types at the site are indicative of pre-settlement conditions and lack hydrologic disturbance, the wetlands at mine site are stable. Following sentence was added: The vegetation types located at the Mine Site are indicative of pre-settlement conditions and lack hydrologic disturbance.	GLIFWC disagrees with the co-lead disposition. Vegetation is not a robust indicator of groundwater hydrology.

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Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 77	GLIFWC	4.2.3.1.2 Hydrology Wetland Vegetation And Community Types	There is no hydrologic data that shows that wetlands are perched. The lead agencies and the applicant have resisted suggestions by tribal agencies that the connectivity between wetland hydrology and surficial aquifer be assessed.	ERM, USACE, and Barr held a conference call to talk about the data. ERM also reviewed the source documents and added additional text on the connectivity question.	There is not enough information for us to remove our comment.
GLIFWC 78	GLIFWC	4.2.3.1.2 Hydrology Wetland Vegetation And Community Types	The "stability" of the wetlands not affected by the Northshore pits may be due to the factors listed. However the main reason for the stability is the absence of major hydrologic stressors - such as mine pits.	We disagree as groundwater would need to flow uphill for Northshore Pits to impact the surficial aquifer. Furthermore, this section is on existing conditions and the potential impact from NM project to wetlands is discuss in Chapter5.	Information developed by the MNDNR mining hydrologist show that impacts from mine pits affect can affect surficial aquifer by pirating water that would otherwise enter an unimpacted system and flow downgradient. Groundwater would not need to flow uphill for Northshore Pits to impact the surficial aquifer. Please consult a qualified hydrologist before providing further response.
GLIFWC 79	GLIFWC	4.2.3.1.2 Hydrology Wetland Vegetation And Community Types	The last sentence is not necessarily true and is an unsupported assumption. While groundwater may not be an important part of the hydrology at the surface of some wetlands at this time, that could change once stressors are introduced into the system.	Text added to refer reader to chapter 5.2.3	GLIFWC disagrees with the co-lead disposition. Provide a link to the wetland section in the appendix.
GLIFWC 80	GLIFWC	4.2.3.1.2 Hydrology Wetland Vegetation And Community Types	We disagree with the conclusion in the last sentence. There has been no data collected in these wetlands that looks at the connectivity of the surficial aquifer to the water at the surface. It is not defensible to assume that all ombotrophic wetlands at the site are perched and/or would remain perched under mine induced drawdown conditions.	See comment GLIFWC 77 According to Eggers 2011a memo, ombrotrphic peatlands (hydrology entirely from direct precipitation) would likely not be impacted by groundwater drawdown associated with mining operations. No text edit.	GLIFWC disagrees with the co-lead disposition. Provide a link to the wetland section in the appendix.

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Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 81	GLIFWC	4.2.3.1.2 Hydrology Wetland Vegetation And Community Types	The first sentence is not supported. As indicated in the paragraph, the pump test did show some connectivity. Furthermore, a 30 day pump test does not produce the same degree of drawdown pressure as a 20 year mine project with 600 feet deep pits. Finally, the effects are likely to differ from one wetland to another. The sweeping conclusions in the bullet should be removed.	Edit bullet point… "• There is a general lack of connectivity between the shallow water table in the wetlands and the deeper bedrock aquifer. The depth of soil and till overlying the bedrock ranges up to 33 ft, with bedrock outcrops present that alter local groundwater flow paths. A pumping and isotope test conducted in 2006 indicated that the majority of the groundwater pumped during a 30-day pump test from a 610-ft-deep well drilled into the Virginia Formation was derived from aquifer recharge rather than surface water seepage from surface water features such as the Northshore Pit or wetlands. The variability of the bedrock and soil surface, along with the location of the surface water divide, creates localized, short, surficial groundwater flow paths within the watersheds on the Mine Site." Also see information provided in GLIFWC 77 that was added to beginning of section.	There is not enough information for us to remove our comment.
GLIFWC 82	GLIFWC	4.2.3.1.2 Hydrology Wetland Vegetation And Community Types	The discussion in these bullets represent observations of current conditions in wetlands that are not under hydrologic stress from mine induced drawdown.Once dewatering of the aquifer occurs, the situation is likely different. The text should be clarified.	This is existing conditions being discussed and not the potential effects of the project. No text edits.	ok
GLIFWC 83	GLIFWC	4.2.3.1.2 Hydrology Wetland Vegetation And Community Types	It should be noted in the text that according to scientific literature, ombotrophic wetlands can be affected by groundwater drawdown. See GLIFWC wetlands attachment.	Following sentence was added: Wetlands can be either groundwater or precipitation fed.	ok
4.2.6 Aquatic Species					
GLIFWC 84	GLIFWC	4.2.6.4 Mercury Concentrations In Fish	The discussion of 303d listing is not correct because the Embarrass River is on the 2012 303d list. See GLIFWC map of 303d waters in the wild rice attachment (fugure 3). Sulfate has a link to mercury methylation which is directly related to mercury contamination in fish. This should be noted here.	Text revised to clarify the current status of 303(d) listings. The Embarrass River is on the 303d list as impaired for Fishes Bioassessment, a category not related to mercury.	ok. However it should be noted that the Embarrass river is expected to be impaired for sulfate in the next draft list. Language regarding changes to 303d lists should be added.
4.2.8 Noise and Vibration					

Chapter 4.2

Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 85	GLIFWC	4.2.8.2 Mine Site	As with the 2009 DEIS, this document relies on assessing noise impacts on a few receptors instread of discussing the overall area that would be affected. A discussion of noise impacts to all publicly accessible areas is the Superior National Forest is needed. See GLIFWC noise attachment.	A discussion of noise impacts to all publicly accessible areas in the Superior National Forest has been included. As indicated above, the USFS has provided shapefiles for all recreational sites within the project vicinity (family camp grounds, camp sites, boating, fishing, swimming, and family picnic areas). In addition to the residential areas, BWCAW, and wildlife corridors already discussed in the SDEIS, we have also included recreational sites, trails, and closest State wildlife waters (used by tribal members for harvesting purposes) in all the noise and vibration contour maps. A discussion of noise impacts to all publicly accessible areas in the SNF has been included in the text in Section 4.2.8.2. Though not depicted on the noise and vibration figures due to sensitivity regarding cultural resources and locations, a discussion of the nearest archaeological sites (e.g., Spring Lake Sugarbush and Mesabe Widjiu [Laurentian Divide]) within the Project vicinity has been included in the text.	GLIFWC has concerns about the analysis. Provide a link to the cumulative effect section in the appendix.
4.2.9 Cultural Resources					
GLIFWC 86	GLIFWC	4.2.9.2.3 Area Of Potential Effects	Text asserts that compliance with standards suggests there would be no impacts to vegetation or soils. This assumption is incorrect. Significant effects and changes fron unimpacted conditions can occur without violation of a standard.	No change. The assumption is based on meeting ambient air quality standards.	GLIFWC stands by the comment.
GLIFWC 87	GLIFWC	4.2.9.2.3 Area Of Potential Effects	The discussion on water quality standards is not complete. The project may not exceed any evaluation criteria but that assumes successful implementation of perpetual water treatment and perpetual maintenance of the features that are left behind (hydromet and flotation tailings basins, cat 1 stockpile). This information should be included anytime the SDEIS makes the claim that all evaluation criteria are met. In addition, evaluation criteria are different from water quality standards. The PSDEIS indicates that water quality standards will not be met for several constituents.	Refer to chapter 5.2 for the environmental analysis of effects of the NorthMet Project Proposed Action.	GLIFWC disagrees with the co-lead disposition. Provide a link to the perpetual maintenance section in the appendix.
GLIFWC 88	GLIFWC	4.2.9.2.3 Area Of Potential Effects	We disagree with the conclusion that there would be no impacts due to groundwater drawdowns. See GLIFWC wetland attachment.	Refer to chapter 5.2 for the environmental analysis of effects of the NorthMet Project Proposed Action.	GLIFWC disagrees with the co-lead disposition. Provide a link to the hydrology section in the appendix.
GLIFWC 89	GLIFWC	4.2.9.2.3 Area Of Potential Effects	The visual area of potential effect should be the viewshed of the existing tailings basin. See GLIFWC map.	Text has been revised for clarity.	There is not enough information for us to remove our comment.

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Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
4.2.10 Socioeconomics					
GLIFWC 107	GLIFWC	4.2.10 Socioeconomics - "The study area for socioeconomics extends beyond the area of direct potential project effects to include all of Cook, Lake, and St. Louis counties (see Figure 4.2.10-1)."	IMPLAN modeling played a key role in the SDEIS's socio-economic accessment. IMPLAN modeling and the employment figures derived from the model (i.e. direct, indirect and induced) were for St. Louis County (i.e. NorthMet Economic Impact 2011 Update: Economic Impact of PolyMet's NorthMet Project on St. Louis County, Minnesota Revised April 2012 for PolMet Mining Inc.). The socio-economic study area (i.e. 3 counties) is not consistent with IMPLAN modeling (one county). See GLIFWC socioeconomics attachment for additional information.	Section 5.2.10.1.3 explains why the IMPLAN model focuses on St. Louis County, and how this is consistent with the remainder of the Socioeconomic section. No text edit.	We disagree. The comment stands.
GLIFWC 108	GLIFWC	4.2.10 Socioeconomics - Jobs Held by residents section, Table 4.2.10-9 Employment Status of Study Area Communities, 2009	This table illustrates unemployment rates in 2009 during the worste of the recession. Tables should be updated with unemployment figures for the Counties in 2010, 2011,and 2012 to ascertain impacts of business cycles on regional employment. See GLIFWC socioeconomics attachment for additional information.	No change. Will revisit updating all data (including IMPLAN) for the Final SEIS.	We disagree. The comment stands.
GLIFWC 109	GLIFWC	4.2.10 Socioeconomics - Education Section	A table is needed to provide number of graduates from Mesabi Range Community and Technical College (Virginia and Eveleth); Vermilion Community College (Ely); Hibbing Community College; Fond du Lac Tribal and Community College (Cloquet); and Lake Superior College (Duluth) for the following job categories: 1)Management, 2) Mine Operations - Contract supervision, operators, maintenance, 3) Mine Technical - Geology, grade control, planning, 4) Railroad Operations, 5) Plant Operations, 6) Sample Preparation and analytical laboratory, and 7) Finance, purhchasing, marketing, environmental, HR. See GLIFWC socioeconomics attachment for additional information.	Sufficient assumptions have been made about availability of the workforce. No change.	We disagree. The comment stands.

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Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 110	GLIFWC	4.2.10.1.6 Subsistence	Subsistence section failed to acknowledge the large number of species that could be harvested off-reservation by tribes. RESOURCES USED - As of 1837 and 1842, the Chippewa exploited virtually every resource in the ceded territory. Among the mammals the Chippewa hunted at treaty time were white-tailed deer, black bear, muskrat, beaver, marten, mink, fisher, snowshoe hare, cottontail rabbit, badger, porcupine, moose, woodchuck, squirrel, raccoon, otter, lynx, fox, wolf, elk, and bison. Among the birds the Chippewa hunted were ducks, geese, songbirds, various types of grouse, turkeys, hawks, eagles, owls, and partridges. Among the fish the Chippewa harvested were, in Lake Superior, whitefish, herring, chubs, lake trout and turbot; and, in-shore, suckers, walleye, pike, sturgeon, muskie, and perch. LAC COURTE OREILLES CHIPPEWA IND. v. STATE OF WIS. NO. 74-C-313. 653 F.Supp. 1420 (1987). See GLIFWC socioeconomics attachment for additional information.	Species list added to Cultural Resources section (4.2.9), and referenced in Section 4.2.10.1.6. Reference to Section 4.2.9 added.	ok

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Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 111	GLIFWC	4.2.10.1.6 Subsistence	Subsistence section failed to acknowledge the large number of species that could be harvested off-reservation by tribes. RESOURCES USED - The Chippewa also harvested a large number of plants and plant materials, including: box elder, sugar maple, arum-leaved arrow-head, smooth sumac, stag-horn sumac, wild ginger, common milkweed, yellow birch, hazelnut, beaked hazelnut, nannyberry, climbing bitter-sweet, large-leaved aster, Philadelphia fleabane, dandelion, panicled dogwood, large toothwort, cucumber, Ojibwe squash, large pie pumpkin, gourds, field horsetail, bog rosemary, leather leaf, wintergreen, Labrador tea, cranberry, blueberry, beech, white oak, bur oak, red oak, black oak, corn, wild rice, Virginia waterleaf, shell bark hickory, butternut, wild mint, catnip, hog peanut, creamy vetchling, navy bean, lima bean, cranberry pole bean, lichens, wild onion, wild leek, false spikenard, sweet white water lily, yellow lotus, red ash, white pine, hemlock, brake, marsh marigold, smooth juneberry, red haw apple, wild strawberry, wild plum, pin cherry, sand cherry, wild cherry, choke cherry, highbush blackberry, red raspberry, large-toothed aspen, prickly gooseberry. LAC COURTE OREILLES CHIPPEWA IND. v. STATE OF WIS. NO. 74-C-313. 653 F.Supp. 1420 (1987). See GLIFWC socioeconomics attachment for additional information.	Species list added to Cultural Resources section (4.2.9), and referenced in Section 4.2.10.1.6. Reference to Section 4.2.9 added.	ok

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Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 112	GLIFWC	4.2.10.1.6 Subsistence	Subsistence section failed to acknowledge the large number of species that could be harvested off-reservation by tribes. RESOURCES USED -wild black currant, wild red currant, smooth gooseberry, Ojibwe potato, hop, Virginia creeper, river-bank grape, red maple, mountain maple, spreading dog-bane, paper birch, low birch, downy arrowwood, woolly yarrow, white sage, alternate-leaved dogwood, wool grass, great bulrush, scouring rush, sweet grass, Dudley's rush, marsh vetchling, sweet fern, black ash, balsam fir, tamarack, black spruce, jack pine, Norway pine, arbor vitae (white cedar), hawthorn, shining willow, sphagnum moss, basswood, cat-tail, wood nettle, slippery elm, and Lyall's nettle, poison ivy, winterberry, mountain holly, sweet flag, Indian turnip, wild sarsaparilla, ginseng, spotted touch-me-not, blue cohosh, speckled elder, hound's tongue, marsh bellflower, harebell, bush honeysuckle, red elderberry, snowberry, highbush cranberry, white campion, yarrow, pearly everlasting. LAC COURTE OREILLES CHIPPEWA IND. v. STATE OF WIS. NO. 74-C-313. 653 F.Supp. 1420 (1987)	Species list added to Cultural Resources section (4.2.9), and referenced in Section 4.2.10.1.6. Reference to Section 4.2.9 added.	ok
GLIFWC 113	GLIFWC	4.2.10.1.6 Subsistence	Subsistence section failed to acknowledge the large number of species that could be harvested off-reservation by tribes. RESOURCES USED -lesser cat's foot, common burdock, ox-eye daisy, Canada thistle, common thistle, daisy fleabane, Joe-Pye weed, tall blue lettuce, white lettuce, black-eyed Susan, golden ragwort, entire-leaved groundsel, Indian cup plant, fragrant golden-rod, tansy, cocklebur, bunch berry, tower mustard, marsh cress, tansy-mustard, squash, wild balsam-apple, hare's tail, wood horsetail, prince's pine, flowering spurge, golden corydalis, giant puffball, wild geranium, rattlesnake grass, blue flag, wild bergamot, heal-all, marsh skullcap, white sweet clover, reindeer moss, northern clintonia, Canada mayflower. LAC COURTE OREILLES CHIPPEWA IND. v. STATE OF WIS. NO. 74-C-313. 653 F.Supp. 1420 (1987) See GLIFWC socioeconomics attachment for additional information.	Species list added to Cultural Resources section (4.2.9), and referenced in Section 4.2.10.1.6. Reference to Section 4.2.9 added.	ok

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Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 114	GLIFWC	4.2.10.1.6 Subsistence	Subsistence section failed to acknowledge the large number of species that could be harvested off-reservation by tribes. RESOURCES USED -small Solomon's seal, star-flowered Solomon's seal, carrion flower, twisted stalk, large flowered bellwort, ground pine, Canada moonseed, heart-leaved umbrella-wort, yellow water lily, great willow-herb, evening primrose, Virginia grape fern, yellow ladies' slipper, rein orchis, adder's mouth, bloodroot, white spruce, common plantain, Carey's persicaria, swamp persicaria, curled dock, shield fern, female fern, sensitive fern, red baneberry, Canada anemone. LAC COURTE OREILLES CHIPPEWA IND. v. STATE OF WIS. NO. 74-C-313. 653 F.Supp. 1420 (1987). See GLIFWC socioeconomics attachment for additional information.	Species list added to Cultural Resources section (4.2.9), and referenced in Section 4.2.10.1.6	ok
GLIFWC 115	GLIFWC	4.2.10.1.6 Subsistence	Subsistence section failed to acknowledge the large number of species that could be harvested off-reservation by tribes. RESOURCES USED - thimble-weed, wild columbine, gold thread, bristly crowfoot, cursed crowfoot, purple meadow rue, agrimony, large-leaved aven, rough cinquefoil, marsh five-finger, smooth rose, high bush blackberry, meadow-sweet, steeple bush, goose grass, small cleaver, small bedstraw, prickly ash, balsam poplar, large toothed aspen, quaking aspen, crack willow, bog willow, pitcher-plant, butter and eggs, cow wheat, wood betony, mullein, moosewood, musquash root, cow parsnip, sweet cicely, wild parsnip, black snakeroot, Canada violet, American dog violet, speckled alder, sweet gale, goldthread, bluewood aster, horseweed, Canada hawkweed, fragrant goldenrod, shin leaf, sessile-leaved bellwort, slender ladies' tresses, and starflower. The Chippewa harvested other miscellaneous resources, such as turtles and turtle eggs.COURTE OREILLES CHIPPEWA IND. v. STATE OF WIS. NO. 74-C-313. 653 F.Supp. 1420 (1987). See GLIFWC socioeconomics attachment for additional information.	Species list added to Cultural Resources section (4.2.9), and referenced in Section 4.2.10.1.6. Reference to Section 4.2.9 added.	ok

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Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
5.2.2 Water Resources					
GLIFWC 195	GLIFWC	5.2.2.3.4 Mercury	There is a general lack of understanding of mercury dynamics in the St. Louis River Watershed. See the supplemental document "Great Lakes Indian Fish and Wildlife Commission (GLIFWC) Comments Related to Mercury" [Comment 1] for details.	The Co-leads agree that the mercury dynamics are complex; however, the analysis as presented indicated that there was minimal potential for a downstream increase in mercury loading.	GLIFWC disagrees with the co-lead disposition. Provide a link to the mercury section in the appendix.
GLIFWC 197	GLIFWC	5.2.2.3.4 Mercury - Throughout the section	The conclusion that mercury will not increase in the environment or exceed applicable environmental evaluation criteria is based on several assumptions. One such assumption is that mercury methylation will not increase because the amount of sulfate being released to the environment will actually be reduced by the project. This assumption is not justified. See the supplemental document "Great Lakes Indian Fish and Wildlife Commission (GLIFWC) Comments Related to Mercury" [Comment 3] for details.	Text will be edited to remove this statement. Similar sentences will also be removed.	ok
GLIFWC 198	GLIFWC	5.2.2.3.4 Mercury	The conclusion that mercury will not increase in the environment or exceed applicable environmental evaluation criteria is based on several assumptions. One such assumption is that the Nothmet project would have minor effects on flows in the Partrige and Embarrass Rivers or their tributaries and is thus not expected to result in increases in flow fluctuations that promote mercury methylation. This assumption is not justified. See the supplemental document "Great Lakes Indian Fish and Wildlife Commission (GLIFWC) Comments Related to Mercury" [Comment 4] for details.	The modeling does not suggest that flow fluctuations should be any greater than existing conditions.	GLIFWC disagrees with the co-lead disposition. Provide a link to the hydrology section in the appendix.
GLIFWC 200	GLIFWC	5.2.2.3.4 Mercury - Throughout the section	There is a potential for the overflow from the West Pit (after year 40) to exceed the Great Lakes Initiative (GLI) standard for mercury of 1.3 ng/L. This has not been considered when concluding the Proposed Action would not exceed applicable environmental evaluation criteria. See the supplemental document "Great Lakes Indian Fish and Wildlife Commission (GLIFWC) Comments Related to Mercury" [Comment 6] for details.	Both an analog approach and a mass balance were conducted for evaluating the potential for the West Pit lake water quality to exceed the GLI standard for mercury of 1.3 ng/L. Both analyses concluded the potential for an exceedance was unlikely. Further, West Pit overflow water is first treated at the WWTF before discharge, which would further reduce mercury concentrations in the effluent.	Comment stands. Provide a link to the mercury section in the appendix.

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Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
	GLIFWC	5.2.2	The GOLDSIM model is not able to reproduce the existing water quality conditions that are observed at the site. This indicates that the model is poorly calibrated to existing conditions. Therefore, it is doubtful that GOLDSIM will be able to accurately predict future water quality which is a much more difficult task. Provide a link to the hydrology section.		Provide a link to the hydrology section in the appendix
GLIFWC 173	GLIFWC	5.2.2.3.5 Proposed And Recommended Mitigation Measures	The section on proposed action design changes and fixed engineering controls are no longer mitigation measures as they are now part of the proposed project. These chages have already been described in other sections of the PSDEIS. It appears that the list of mitigations is being padded. These sections should be removed.	This section acknowledges measures taken to avoid, minimize, or mitigate impacts to water resources. Just because a measure is included as part of the proposed project does not mean it does not serve to mitigate impacts.	ok
GLIFWC 174	GLIFWC	5.2.2.3.5 Proposed And Recommended Mitigation Measures	The notion of fine material being segregated in the center of the rail cars is not credible. See GLIFWC rail car attachment.	Discussion of fine material being segregated in the center of rail cars has been removed.	While that language has been removed, the overall conclusion regarding rail cars remains. Provide a link to the rail car information in the appendix.
GLIFWC 175	GLIFWC	5.2.2.3.5 Proposed And Recommended Mitigation Measures	Because the hydrology of surface and groundwater for the Partridge River is poorly understood, this section should give information on the maximum capacity for the WWTF. GLIFWC staff believe that this facility will have to treat significantly greater ammounts of water than the applicant proposes based on field baseflow data.	As stated on page 5.2.2-109, "The WWTF equalization basins are designed for the spring snowmelt when the Mine Sit would be at its maximum area. In the event of an extreme event (e.g., 100-year storm), excess water would remain in the mine pits, which essentially have unlimited storage capacity, with mine operations in the pits temporarily shut down (see Mine Site Water Management Plan)." The WWTF is being designed such that additional capacity may be added if required as per the adaptive water management plan	ok

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Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 176	GLIFWC	5.2.2.3.5 Proposed And Recommended Mitigation Measures	Says that the Category 1 stockpile cover design could be updated but it does not say how. The rest of the text is simply a restatement of the proposed project.	Text added. Design options, which would need to be approved by the MPCA and MDNR, include: increased or decreased thickness of the geomembrane material to modify the potential for defects to be created during installation and to modify the life of the geomembrane; increased or decreased soil cover thickness above the geomembrane material to modify water storage capacity; increased or decreased soil hydraulic conductivity of the granular drainage layer above the geomembrane to modify lateral drainage capacity; increased or decreased uninterrupted slope length to modify lateral drainage capacity; modified soil type and/or thickness below the geomembrane to modify leakage rate through potential geomembrane defects; and/or including a geosynthetic clay liner below the geomembrane to modify leakage rate through potential geomembrane defects. After installation of the cover system, post-installation adjustments, such as modifying vegetation density and erosion of the cover system, could be made if approved by the MPCA and MDNR (PolyMet 2013g).	ok
GLIFWC 177	GLIFWC	5.2.2.3.5 Proposed And Recommended Mitigation Measures	This is a restatement of the bentonite cover that is part of the proposed project. This is not a mitigation measure. How exactly can the cover system be modified? What part of the cover design is adaptive?	Text added to clarify. Prior to installation, the design of the pond bottom cover system could be adjusted to modify performance. Design options include: increasing or decreasing the thickness of the bentonite amendment, and/or increasing the percent of bentonite, and/or a combination of increasing/decreasing the thickness and increasing/decreasing the percent bentonite. After installation, the design of the installed pond bottom cover system could also be adjusted to modify performance by these same methods. In addition, the bentonite amended layer could be excavated from portions of the pond bottom. Any design modifications would need to be approved by the MPCA and MDNR (PolyMet 2013g).	ok
GLIFWC 178	GLIFWC	5.2.2.3.5 Proposed And Recommended Mitigation Measures	Describe the long term maintenance needs for PRB's including replacement frequency (expected effective timeperiod)	The Proposed Action relies on mechanical treatment to achieve water quality objectives. Non-mechanical treatment (including PRBs) is described as a goal, but is not specifically part of the Proposed Action. It is beyond the scope of the SEIS to describe non-mechanical systems in detail. For interested readers, information on non-mechanical systems is referenced in the SDEIS (PolyMet, 2013g).	GLIFWC staff disagree with the co-lead disposition. Provide a link to the perpetual maintenance section in the appendix.

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Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 179	GLIFWC	5.2.2.3.5 Proposed And Recommended Mitigation Measures	As previously commented, other sections of the PSDEIS state that the applicant is not seeking a seasonal application of the wild rice standard. Yet, the west pit overflow non mechanical treatment system relies on a seasonal discharge to comply with the standard. This non-mechanical treatment option should be eliminated from the project as it does not meet the stated goals of compliance with water quality standards.	The Proposed Action relies on mechanical treatment to achieve water quality objectives. Non-mechanical treatment (including PRBs) is described as a goal, but is not specifically part of the Proposed Action. It is beyond the scope of the SEIS to describe non-mechanical systems in detail. For interested readers, information on non-mechanical systems is referenced in the SDEIS (PolyMet, 2013g).	GLIFWC staff disagree with the co-lead disposition. Provide a link to the perpetual maintenance section in the appendix.
GLIFWC 202	GLIFWC	5.2.2.3.6 Monitoring - Throughout the section	It is not apparent whether mercury monitoring is included within the water quality monitoring of the Mine Site or Plant Site. If it is, this should be specified. If it is not, it should be added to the monitoring activities.	Water quality monitoring would be finalized during permitting, but in general, mercury monitoring would be included within the water quality monitoring.	ok
GLIFWC 180	GLIFWC	5.2.2.4 Northmet Project No Action Alternative	This section describes the flaw in the PSDEIS of assuming that the no action alternative is equivalent to existing conditions. We agree that they are not the same thing. A true no action alternative should be modeled as required by NEPA. See GLIFWC hydrology attachment for more information.	Description of the No Action Alternative will be clarified.	There is not enough information for us to remove the comment. Provide a link to the hydrology section of the appendix.
GLIFWC 117	GLIFWC	5.2.2 Water Resources	As previously commented, the mine site is not located within the historic iron/taconite mining district. It is in a separate geology alltogether in an mostly undisturbed area knows an the 100 mile swamp. Correct the text.	Text edited.	ok
GLIFWC 118	GLIFWC	5.2.2 Water Resources	The negative effects of sulfate on wild rice are well understood and scientifically documented. Edit the text as outlined in the GLIFWC wild rice attachment.	All information provided was considered when the MPCA made its recommendation. The text already states that 'Some research has indicated that natural wild rice thrives better in low sulfate waters.'. No text edit.	GLIFWC staff disagree with the co-lead disposition. Provide a link to the wild rice section in the appendix.
GLIFWC 119	GLIFWC	5.2.2 Water Resources	There is a discussion comparing the NorthMet project to other sulfide mines. The goal appears to be the minimization of impact discussion prior to any information presented on the impact analysis itself. If this type of information is to be presented, additional discussion about the water quality contamination that these other mines have caused, their location and ore grade is necessary.	No change to SDEIS text.	Comment stands.
GLIFWC 120	GLIFWC	5.2.2 Water Resources	why is the term wild rice bed in quotes? Remove the quotes.	Quotes removed.	ok

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Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 121	GLIFWC	5.2.2 Water Resources	The discussion on water treatment should state that both active and passive treatment systems would need to operate successfully in perpetuity.	Text edited to reflect that the Closure objective is to provide mechanical and non-mechanical treatment for as long as necessary to meet regulatory standards at evaluation locations in groundwater and surface water. Both mechanical and non-mechanical treatment will require periodic maintenance and monitoring activities. Modeling predicts that treatment activities will be a minimum 200 years at the Mine Site and a minimum of 500 years at the Plant Site. While long-term, these time frames for water treatment are not necessarily perpetual. The owning company would be held accountable to maintenance and monitoring required under permit and would not be released until all conditions have been met.	GLIFWC does not agree with the language in the co-lead disposition. Provide a link to the Perpetual care language in the appendix.
GLIFWC 122	GLIFWC	5.2.2 Water Resources	The discussion of model results and compliance with evaluation criteria assumes perpetual water treatment and perpetual maintenance of the facilities. This should be clearly stated. Also, evaluation criteria are different from standards. The PSDEIS does say that standards would be exceeded for several constituents.	Text edited. As described in the SDEIS, the evaluation criteria do use the standards, but interpret the standards from a probabilistic perspective. The P90 approach is a reasonable method for applying the results of probabilistic modeling for EIS impact assessment. In this context, it is not appropriate to say that "a constituent will exceed a water quality standard". It is more accurate to say that "there is at least a 90 percent probability that a constituent will not exceed a standard (or up to a 10 percent probability that it will)". These quoted statements are very different.	GLIFWC does not agree with the language in the co-lead disposition. Provide a link to the Perpetual care language in the appendix.
GLIFWC 196	GLIFWC	5.2.2 Water Resources	The conclusion that mercury will not increase in the environment or exceed applicable environmental evaluation criteria is based on several assumptions. One such assumption is that the tailings basin will function as a mercury sink. This assumption is not justified. See the supplemental document "Great Lakes Indian Fish and Wildlife Commission (GLIFWC) Comments Related to Mercury" [Comment 2] for details.	Co-leads disagree. Tailings Basins in general are a sink for mercury.	GLIFWC does not agree with the language in the co-lead disposition. Provide a link to the mercury section in the appendix.
GLIFWC 221	GLIFWC	5.2.2 Water Resources	The No-Action, P50 model (continuation of current conditions) for As shows annual maximum values (~0.5 ug/L), substantially less than those shown as mean existing water quality in Table 4.2.2-18 (mean As is 0.78 to 1.4 ug/L depending on the data set).	Baseline data is presented in Table 4.2.2-18 which is different to what was modeled for the Continuation of Existing Conditions Scenario.	“Continuation of Existing Conditions” is supposed to represent a model of existing conditions. If baseline for Colby Lake in Table 4.2.2-18 is not existing conditions then what is it?

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Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 222	GLIFWC	5.2.2 Water Resources	the travel times to the Partridge River depend on the basic hydrology of the mine site. As we comment elsewhere, the baseflow assumed for the Partridge is not supported by data from the Dunka Rd. gage. Incorporating the higher baseflow indicated by the gage data into modeling assumptions and calibration would result in a more conductive site and therefore, faster transport times.	Groundwater travel times are related to river baseflow estimates. We believe the baseflow estimates are reasonable. Higher baseflows would likely result in a more conductive site and faster transport times, but this would not necessarily result in higher solute concentrations in either groundwater or surface water; in fact we believe higher baseflows would result likely result in lower concentrations. The GoldSim model duration was 200 years, which was sufficient to capture the peak concentration of all solutes along all surficial groundwater flow paths; therefore, the GoldSim model does not need faster transport times to capture peak solute concentrations.	A more conductive site would, as you agree, result in faster transport times but would also result in great loss of groundwater to pit dewatering. The interaction between site conductivity and contaminate transport is not a simple relationship that can fully captures by a “belief” on your part.
GLIFWC 223	GLIFWC	5.2.2 Water Resources	The evaluation point at the toe of the basins is omitted from the table. Without that information it is impossible to evaluate the need for and the effectiveness of the seep capture system. Given that the seep capture system can not be operated indefinitely, it is important to report the character of the water that will be exiting the basins. A figure showing the water character at the toe of the basins should be added. Figures from Water Modeling Data Package Vol 2-Plant Site v9 MAR2013.pdf such as Figure F-01-04.1 or Figure F-01-18.1 or Figure F-01-24.1 would be suitable.	Although we agree that the evaluation locations at the toe of the tailings basin are valuable in terms of ongoing monitoring and early warning of potential water quality issues, we do not see any real benefit to including these additional evaluation locations in the SDEIS as the GoldSim model was run for sufficient durations that the peak of seepage from all contamination sources reaches the evaluation locations currently included in the SDEIS.	Given dilution of contamination between the basin and the reported evaluation points, the modeled peak is not the same as the concentration at the toe of the basin. Toe of basin concentrations should be reported.
GLIFWC 123	GLIFWC	5.2.2.1.1 Groundwater	The conclusion that there are no significant hydrologic affects of the project cannot be supported. It is based on fatally flawed modelling in XP-SWMM using antiquated data from far downstream. See GLIFWC hydrology attachment.	We believe the XP-SWMM modeling is acceptable for use in the SDEIS. The 20 year old data is acceptable as there haven't been any significant changes within the watershed. We believe the assumptions used were reasonably conservative. Additional detail is provided in the water sections of the SDEIS, and further rationale is provided in the Water Data Packages.	GLIFWC does not agree with the co-lead disposition. Provide a link to the hydrology section in the appendix.

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Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 124	GLIFWC	5.2.2.1.1 Groundwater	The discussion of groundwater evaluation criteria is incomplete. The evaluation point at the Dunka road needs to be discussed and all results displayed in a table. This is because there are 2 alternatives for the land exchange and a preferred alternative is not yet chosen. This section, and all other sections of chapter 5 must not assume a property boundary in the text. Finally, figure 5.2.2-4 apprears to depict the Dunka Rd. evaluation point. the text should also.	Although we agree that the evaluation locations along Dunka Road are valuable in terms of ongoing monitoring and early warning of potential water quality issues, we do not see any real benefit to including these additional evaluation locations in the SDEIS as the GoldSim model was run for sufficient durations that it captures the peak solute concentrations along all flow paths at the evaluation locations currently included in the SDEIS.	The Dunka road should be included because Alternative B of the land exchange would use that evaluation point as the point of compliance should that alternative be chosen.
GLIFWC 125	GLIFWC	5.2.2.1.1 Groundwater- figure 5.2.2-4	The location of the groundwater evaluation point for the ore surge pile flowpath should be moved to the section of the property boundary closest to the pile itself. Does the modeling use this incorrect evaluation point?	The evaluation point for the OSP is the Partridge River because the river is located slightly further upgradient (northwest) than the mine property boundary. The distance from the OSP to the evaluation point is about 1100 meters which is consistent with Figure 5.2.2-4.	We suggest you look at the figure again. The river is not closer than the property boundary to the OSP source. NOTE - Map corrected in later version.
GLIFWC 126	GLIFWC	5.2.2.1.2 Surface Waters - Hydrologic Alterations	The evaluation criteria values for the project are taken from XP_SWMM modeling That model is fatally flawed and produces results that conflict with measured data. The results cannot be used. See GLIFWC hydrology attachment	We believe the XP-SWMM modeling is acceptable for use in the SDEIS. The 20 year old data is acceptable as there haven't been any significant changes within the watershed. We believe the assumptions used were reasonably conservative. Additional detail is provided in the water sections of the SDEIS, and further rationale is provided in the Water Data Packages.	GLIFWC does not agree with the co-lead disposition. Provide a link to the hydrology section in the appendix.
GLIFWC 127	GLIFWC	5.2.2.1.2 Surface Waters	GLIFWC disagrees with MPCA interpretation of areas of wild rice production. See GLIFWC wild rice attachment.	The SDEIS uses MPCA's draft determination regarding the locations of water used for the production of wild rice.	GLIFWC does not agree with the MPCA determination of points of compliance. Provide a link to the wild rice section in the appendix.
GLIFWC 128	GLIFWC	5.2.2.1.2 Surface Waters	GLIFWC disagrees with MPCA seasonal application of the wild rice standard. See GLIFWC wild rice attachment.	The SDEIS uses MPCA's draft determination regarding the seasonal application of the wild rice standard.	GLIFWC does not agree with the MPCA seasonal application of the wild rice sulfate standard. Provide a link to the wild rice section in the appendix.
GLIFWC 129	GLIFWC	5.2.2.1.2 Surface Waters	Section states that PolyMet is not seeking application of a seasonal wild rice standard. This is in conflict with other sections of the PSDEIS. See GLIFWC wild rice attachment.	All information provided was considered when the MPCA made their recommendation. Should the application of the standard change, it will be addressed at that time.	GLIFWC does not agree with the MPCA determination of points of compliance. Provide a link to the wild rice section in the appendix.
GLIFWC 194	GLIFWC	5.2.2.1.2 Surface Waters	There is a general lack of understanding of mercury dynamics in the St. Louis River Watershed. See the supplemental document "Great Lakes Indian Fish and Wildlife Commission (GLIFWC) Comments Related to Mercury" [Comment 1] for details.	The Co-leads agree that the mercury dynamics are complex; however, the analysis as presented indicated that there was minimal potential for a downstream increase in mercury loading.	GLIFWC does not agree with the co-lead disposition. Provide a link to the mercury section in the appendix.

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Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 130	GLIFWC	5.2.2.2.3 Water Quality Modeling (goldsim)	There is a comparison of sulfur content with other mines. Fundamentally, it does not matter if S levels are lower or higher compared to other mines. NorthMet would be located in a wet environment with complex hydrology where other mines are located in arid or arctic environments with little hydrologic connectivity. All mines are different and this language makes the attempt to minimize the risks of this particular mine. Remove the language.	Caveat added to discussion.	There is not enough information for us to remove the comment.
GLIFWC 131	GLIFWC	5.2.2.2.3 Water Quality Modeling (goldsim)	XP-SWMM model is fatally flawed and should not be used in impact assessment. See GLIFWC hydrology attachment	The difference in the baseflows are very small (indistinguishable from a stage standpoint). We believe the XP-SWMM modeling is acceptable for use in the SDEIS. The 20 year old data is acceptable as there haven't been any significant changes within the watershed. We believe the assumptions used were reasonably conservative. Additional detail is provided in the water sections of the SDEIS, and further rationale is provided in the Water Data Packages.	GLIFWC does not agree with the co-lead disposition. Provide a link to the hydrology section in the appendix.
GLIFWC 132	GLIFWC	5.2.2.2.3 Water Quality Modeling (goldsim)	There is a statement that the no action alternative is a continuation of existing conditions. GLIFWC staff fundamentally disagree with this approach. This flawed assumtion leads to errors in water quality model outputs. NEPA requires an analysis of the no action alternative so that the effects of the proposed action can be understood in a larger context. See GLIFWC hydrology attachment.	We believe the assumptions used were reasonably conservative. The description of the No Action Alternative and Continuation of Existing Conditions will be further clarified in the SDEIS.	GLIFWC does not agree with the co-lead disposition. Provide a link to the hydrology section in the appendix.
GLIFWC 133	GLIFWC	5.2.2.3.1 Northmet Project Proposed Action Water Budget Overview - figure 5.2.2-15	This map, or a new map are needed with the location of the west pit level control structure, the outfall location, and the potential location of facilities described in the AWMP.	Figure 5.2.2-15 will be edited to include the west pit level control structure & the outfall location.	ok
GLIFWC 134	GLIFWC	5.2.2.3.1 Northmet Project Proposed Action Water Budget Overview	Section states that figure 5.2.2-15 has the location of a wetland and outlet control structure OS-5. It does not. Figure should also include the tributary channel that would connect the outfall to the Partridge River.	Figure 5.2.2-15 will be edited to include the west pit level control structure & the outfall location.	ok

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Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 135	GLIFWC	5.2.2.3.1 Northmet Project Proposed Action Water Budget Overview	Discussion on the hydromet tailings facility should clearly state that the periodic pumping and water collection activities would be perpetual.	The Closure objective is to provide water management activities at the hydrometallurgical facility for as long as necessary to meet regulatory standards at evaluation locations in groundwater and surface water. While described as long-term, the time frame for these activities is not necessarily "perpetual". Chapter 3 describes closure of the Hydrometallurgical Residue Facility. Once the facility is drained and reclaimed (covered), no further pumping would be required. As such, there would not be periodic or perpetual pumping of water from the Hydrometallurgical Residue Facility post closure.	GLIFWC does not agree with the language in the co-lead disposition. Provide a link to the Perpetual care language in the appendix.
GLIFWC 136	GLIFWC	5.2.2.3.1 Northmet Project Proposed Action Water Budget Overview - Mine Site section	The section should clearly state for how long water collection and treatment of Category 1 stockpile seepage would be needed. It should also state that the length of time the WWTP would operate in order to comply with water quality standards is perpetual	Text edited to reflect that the Closure objective is to provide mechanical and non-mechanical treatment for as long as necessary to meet regulatory standards at evaluation locations in groundwater and surface water. Both mechanical and non-mechanical treatment will require periodic maintenance and monitoring activities. Modeling predicts that treatment activities will be a minimum 200 years at the Mine Site and a minimum of 500 years at the Plant Site. While long-term, these time frames for water treatment are not necessarily perpetual. The owning company would be held accountable to maintenance and monitoring required under permit and would not be released until all conditions have been met.	GLIFWC does not agree with the language in the co-lead disposition. Provide a link to the Perpetual care language in the appendix.
GLIFWC 137	GLIFWC	5.2.2.3.1 Northmet Project Proposed Action Water Budget Overview	States that the goal is to transition to non mechanical water treatment. The fact that all water treatment (mechanical and/or non mechanical) would need to occur in perpetuity. It should also clearly state that a transition to non mechanical treatment may not be possible.	Text edited (see GLIFWC 136: maintenance and monitoring long term required)	GLIFWC does not agree with the language in the co-lead disposition. Provide a link to the Perpetual care language in the appendix.
GLIFWC 138	GLIFWC	5.2.2.3.1 Northmet Project Proposed Action Water Budget Overview	First paragraph should state that treatment and capture of water needs are perpetual.	Text edited (see GLIFWC 136: maintenance and monitoring long term required)	GLIFWC does not agree with the language in the co-lead disposition. Provide a link to the Perpetual care language in the appendix.

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Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 139	GLIFWC	5.2.2.3.1 Northmet Project Proposed Action Water Budget Overview	States that long term closure activities will continue until the various facility features are deemed environmentally acceptable, in a self sustaining and stable condition. This is a misleading statement because the maintenance and water treatment needs are perpetual. A stable and self sustaining site will never occur.	Text edited to reflect that the Closure objective is to provide mechanical and non-mechanical treatment for as long as necessary to meet regulatory standards at evaluation locations in groundwater and surface water. Both mechanical and non-mechanical treatment will require periodic maintenance and monitoring activities. Modeling predicts that treatment activities will be a minimum 200 years at the Mine Site and a minimum of 500 years at the Plant Site. While long-term, these time frames for water treatment are not necessarily perpetual. The owning company would be held accountable to maintenance and monitoring required under permit and would not be released until all conditions have been met.	GLIFWC does not agree with the language in the co-lead disposition. Provide a link to the Perpetual care language in the appendix.
GLIFWC 140	GLIFWC	5.2.2.3.1 Northmet Project Proposed Action Water Budget Overview	Non mechanical treatment options would still require maintenance and monitoring in perpetuity to ensure effectiveness.	Text edited to reflect that the Closure objective is to provide mechanical and non-mechanical treatment for as long as necessary to meet regulatory standards at evaluation locations in groundwater and surface water. Both mechanical and non-mechanical treatment will require periodic maintenance and monitoring activities. Modeling predicts that treatment activities will be a minimum 200 years at the Mine Site and a minimum of 500 years at the Plant Site. While long-term, these time frames for water treatment are not necessarily perpetual. The owning company would be held accountable to maintenance and monitoring required under permit and would not be released until all conditions have been met.	GLIFWC does not agree with the language in the co-lead disposition. Provide a link to the Perpetual care language in the appendix.
GLIFWC 199	GLIFWC	5.2.2.3.1 Northmet Project Proposed Action Water Budget Overview	There is no discussion of the impacts on mercury from the construction of wetlands over the East Pit and at the permiter of the tailings basin during reclamation. See the supplemental document "Great Lakes Indian Fish and Wildlife Commission (GLIFWC) Comments Related to Mercury" [Comment 5] for details.	These wetlands are not expected to be sources of mercury nor have elevated mercury concentrations. The water used to augment flows north of the tailings storage facility would have significantly lower sulfate concentrations than current conditions. Therefore we do not expect these wetlands to function as any more of a source of methyl mercury than the current wetlands found in these locations.	The answer addresses only one part of the comment. There are other factors besides sulfate that generate methylmercury in a wetland. Wetlands in general, wether they are high in sulfate or not have the potential to generate methylmercury. Please add a link to the mercury section of the appendix.
GLIFWC 141	GLIFWC	5.2.2.3.2 Partridge River Watershed	The entire section is fatally flawed because it relies on the Canisteo Pit analog method. GLIFWC staff have objected to the use of this method since it was proposed (See GLIFWC wetland attachment).This analog approach is not scientifically defensible.	The analog approach is considered a reasonable method for evaluating the extent of pit drawdown considering the heterogeneous nature of glacial till and the underlying low-permeability bedrock. Even when the pit water level is well below the top of bedrock, the low-permeability bedrock limits the amount of surficial groundwater that can drain downward into the pit and there is sufficient recharge to the surficial unit to generally maintain water levels.	GLIFWC does not agree with the co-lead disposition. Provide a link to the wetland section in the appendix.

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Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 142	GLIFWC	5.2.2.3.2 Partridge River Watershed - table 5.2.2-18	Chemical mechanisms column for the west pit should include water level fluctuations in the pit with wetting and drying of pit walls. This fluctuation is likely if a non-mechanical treatment option is used in order to meet the MPCA seasonal wild rice standard.	This factor will be addressed in future analysis of the passive system.	If the passive systems are not to be analized at all, they should be removed from the SDEIS.
GLIFWC 143	GLIFWC	5.2.2.3.2 Partridge River Watershed	Placing peat and unsaturated overburden in an unlined area would create a significant pulse of mercury. This mercury release does not seem to be accounted for in the mercury sections. The mercury, once released would travel the groundwater flow path and constitute an untreated discharge into the Partridge River. This is a particular concern because of the applicants failure to model mercury.	Surface runoff from the Overburden Storage and Laydown Area is considered “Process Water,” and would be captured in an unlined pond (Pond PW-OSLA) and monitored for quality, including mercury. If the Overburden Storage and Laydown Area water was of sufficient quality, it would be pumped to the CPS and discharged to the East Pit or the Tailings Basin. If water in Pond PW-OSLA required treatment, it would be pumped to the WWTF for treatment prior to delivery to the CPS. The potential release of mercury from the decomposition of overburden materials is included in the mercury mass balance (Section 5.2.2.3.4).	ok
GLIFWC 144	GLIFWC	5.2.2.3.2 Partridge River Watershed	The no action alternative is not the same as existing conditions. An accurate no action alternative needs to be modeled in order to compare impacts under NEPA.	The SDEIS text regarding the No Action Alternative and "Continuation of Existing Conditions" will be clarified.	GLIFWC does not agree with the co-lead disposition. Provide a link to the hydrology section in the appendix.
GLIFWC 145	GLIFWC	5.2.2.3.2 Partridge River Watershed	All statements indicating that evaluation criteria would be met must include the caveat that perpetual water capture and treatment must be done to make that happen. We disagree that all water quality standards would be met. Water quality will be exceeded for several constituents.	Text edited. As described in the SDEIS, the evaluation criteria do use the standards, but interpret the standards from a probabilistic perspective. The P90 approach is a reasonable method for applying the results of probabilistic modeling for EIS impact assessment. In this context, it is not appropriate to say that "a constituent will exceed a water quality standard". It is more accurate to say that "there is at least a 90 percent probability that a constituent will not exceed a standard (or up to a 10 percent probability that it will)". These quoted statements are very different.	GLIFWC does not agree with the language in the co-lead disposition. Provide a link to the Perpetual care language in the appendix.
GLIFWC 146	GLIFWC	5.2.2.3.2 Partridge River Watershed	Title is not correct because there is no property boundary yet. In addition, the table should provide the 90th percentile concentration values for both land exchange alternatives.	Table title will be revised. In this section. the SDEIS is evaluating the Proposed Action. See Section 5.3.2 for a discussion of the land exchange alternative.	ok

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Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 147	GLIFWC	5.2.2.3.2 Partridge River Watershed	The first paragraph is not correct. The Copper Nickel study from 1979 states "Highly saline groundwater has been encountered in some bedrock areas in the study area…The source and spatial distribution of this water in the Study Area is unknown. The Superior National Forest technical memorandum No. 4 Brackish Groundwater within the SNF states that In 1976, brackish waters were encountered at the AMAX site which is in the same geology as the NorthMet project. In 2012 elevated chloride levels were found at mineral exploration drill locations near the South Kawishiwi River. The text should be corrected in light of available data from the SNF.	We disagree - applicable data is discussed.	Comment stands.
GLIFWC 148	GLIFWC	5.2.2.3.2 Partridge River Watershed	XP-SWMM model is fatally flawed and should not be used in imoact assessment. See GLIFWC hydrology attachment.	We believe the XP-SWMM modeling is acceptable for use in the SDEIS. The 20 year old data is acceptable as there haven't been any significant changes within the watershed. We believe the assumptions used were reasonably conservative. Additional detail is provided in the water sections of the SDEIS, and further rationale is provided in the Water Data Packages.	GLIFWC does not agree with the co-lead disposition. Provide a link to the hydrology section in the appendix.
GLIFWC 149	GLIFWC	5.2.2.3.2 Partridge River Watershed	Pit seepage is a long term untreated discharge. The section should clearly state this.	The following edit has been made to the text: These untreated pit discharges to groundwater in the West Pit Surficial Flow Path and the East Pit Category 2/3 Surficial Flowpath would occur in perpetuity. Groundwater in these flowpaths would flow down gradient and eventually discharge to the Partridge River.	ok
GLIFWC 150	GLIFWC	5.2.2.3.2 Partridge River Watershed	The discussion in the fourth bullet states that sulfate exceedances would be "exclusively limited to the low flow winter months" This explanation is only relevant if the applicant is seeking a seasonal application of the sulfate standard. Other sections of the PSDEIS have stated that they are not. This conflict should be resolved.	PolyMet Is not seeking seasonal application for the Proposed Project. Any future request for a seasonal application would require MPCA approval.	GLIFWC does not agree with the co-lead disposition. Provide a link to the wild rice section in the appendix.
GLIFWC 151	GLIFWC	5.2.2.3.2 Partridge River Watershed	The entire discussion of sulfate being exceeded during low flows is colored by the fact that there is very little undferstanding of hydrology in the upper Partridge River. The XP-SWMM model used to interpolate flow data is fatally flawed and does not produce reliable data. The net effect is that the PSDEIS cannot reliably state wether the sulfate standard will be met or not.	We believe the XP-SWMM modeling is acceptable for use in the SDEIS. The 20 year old data is acceptable as there haven't been any significant changes within the watershed. We believe the assumptions used were reasonably conservative. Additional detail is provided in the water sections of the SDEIS, and further rationale is provided in the Water Data Packages.	GLIFWC does not agree with the co-lead disposition. Provide a link to the hydrology section in the appendix.

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Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 152	GLIFWC	5.2.2.3.2 Partridge River Watershed	The last bullet states that the no action alternative is assumed to be the same as existing conditions. This is not correct as it ignores the intermittent dewatering of the Northshore pits. A realistic no action alternative needs to be modeled.	The description of the No Action Alternative and Continuation of Existing Conditions will be further clarified in the SDEIS.	GLIFWC does not agree with the co-lead disposition. Provide a link to the hydrology section in the appendix.
GLIFWC 153	GLIFWC	5.2.2.3.2 Partridge River Watershed	The conclusion that sulfate concentrations at 200 years would be less than 10 mg/l may not be supportable by modeling. It assumes that the no action alternative is the same as existing conditions and that is not the case.	The GoldSim model results do suggest that sulfate concentrations in the Partridge River at SW-005 would be less than 10 mg/L.	GLIFWC does not agree with the co-lead disposition. Provide a link to the hydrology section in the appendix.
GLIFWC 154	GLIFWC	5.2.2.3.2 Partridge River Watershed	The discussion relies on dilution to meet the sulfate standard. Because hydrology at the mine site is not understood, there is no basis to make this claim.	We believe the XP-SWMM modeling is acceptable for use in the SDEIS. The 20 year old data is acceptable as there haven't been any significant changes within the watershed. We believe the assumptions used were reasonably conservative. Additional detail is provided in the water sections of the SDEIS, and further rationale is provided in the Water Data Packages.	GLIFWC does not agree with the co-lead disposition. Provide a link to the hydrology section in the appendix.
GLIFWC 155	GLIFWC	5.2.2.3.2 Partridge River Watershed	The first paragraph describes a situation where the wild rice sulfate standard "would be exceeded anyway". This is an acknowledgement that the standard is, at least at some times, bein exceeded through cumulative impacts of other operations. If this is the case, the Clean Water Act does not allow Polymet to contribute any load to that exceedance regadless of dilution.	The Co-leads recognize this is a major difference of opinion.	Provide a link to the hydrology section in the appendix.
GLIFWC 156	GLIFWC	5.2.2.3.2 Partridge River Watershed	GLIFWC staff disagree that effective mitigation for sulfate exceedences are identified. There is conjecture about the dilutive effects of treated waste water but no modeling or analysis to demonstrate that effect.	The text has been edited to include possible contingency measures that could be implemented. Given that the identified contingency measures are based on engineered facilities that can be pilot tested, there is reasonable likelihood that contingency measures could be implemented (if needed) to prevent exceedance of the 10 mg/L sulfate standard in Partridge River surface water.	GLIFWC does not agree with the co-lead disposition. The purpose of the analysis was to demonstrate that the project would not exceed standards. The disposition is an assumption and not a demonstration.
GLIFWC 157	GLIFWC	5.2.2.3.2 Partridge River Watershed	GLIFWC staff disagree with the characterization of dust from the rail corridor as minor. See GLIWC rail car attachment.	This section acknowledges the dust issue and refers the reader to section 5.2.3.2.2. There is no other discussion or characterization of dust in this section. Discussion of fine material being segregated in the center of rail cars has been removed.	GLIFWC does not agree with the co-lead disposition. Provide a link to the rail car section in the appendix.

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Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 158	GLIFWC	5.2.2.3.2 Partridge River Watershed	As previously stated, XP_SWMM is fatally flawed and therefore flow information cannot be used to show that standards are met through dilution. Therefore, the conclusions on arsenic in Colby lake cannot be supported.	We believe the XP-SWMM modeling is acceptable for use in the SDEIS. The 20 year old data is acceptable as there haven't been any significant changes within the watershed. We believe the assumptions used were reasonably conservative. Additional detail is provided in the water sections of the SDEIS, and further rationale is provided in the Water Data Packages.	GLIFWC does not agree with the co-lead disposition. Provide a link to the hydrology section in the appendix.
GLIFWC 159	GLIFWC	5.2.2.3.2 Partridge River Watershed	perpetual water treatment would be needed in to avoid violating standards in Colby Lake.	No change to SDEIS text.	GLIFWC does not agree with the co-lead disposition. Provide a link to the perpetual maintanance section in the appendix.
GLIFWC 160	GLIFWC	5.2.2.3.2 Partridge River Watershed	The last paragraph correctly discusses perpetual treatment needs. The improvements in water quality in the west pit are speculative and do not change the fact that perpetual treatment is necessary. Therefore the paragraph should indicate that while non-mechanical treatment options may be possible at some point in time, that non-mechanical treatment would also have to be perpetual for standards to be met.	Water quality changes in the pits are not speculative, but are predicted based on flow/chemical modeling with reasonable assumptions. Text clarified.	ok
GLIFWC 161	GLIFWC	5.2.2.3.2 Partridge River Watershed - Figures 5.2.2-37 through 5.2.2-39	Need to indicate the appropriate water quality standard	The West Pit is not considered an evaluation location so a water quality standard does not apply. Water quality standards would apply to the WWTF (which treats the West Pit overflow) discharge.	ok. We understand that there will be a polluted pit lake and water quality standards will not apply until water leaves the lake.
GLIFWC 162	GLIFWC	5.2.2.3.2 Partridge River Watershed	States that water quality in the permanent mine features left behind is expected to improve over time. This is misleading because the model was not run long enough to predict when that would be. It is clear that, using sulfate as an example, the west pit would be a perpetual source with the potential of contaminating downstream beds in perpetuity.	The flow/chemical modeling does predict that water quality will improve over the modeled time frame of 200 years. Text has been modified.	ok
GLIFWC 163	GLIFWC	5.2.2.3.2 Partridge River Watershed	Why was water quality modeling terminated after 200 years?	Before 200 years, the maximum chemical loading in affected groundwater is predicted to reach the Partridge River.	But the plume in bedrock is not.

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Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 201	GLIFWC	5.2.2.3.2 Partridge River Watershed	There is no consideration of the likely mercury pulse to the Partridge River resulting from placement of the stripped peat and unsaturated overburden into the unlined Overburden Storage and Laydown Area. See the supplemental document "Great Lakes Indian Fish and Wildlife Commission (GLIFWC) Comments Related to Mercury" [Comment 7] for details.	Surface runoff from the Overburden Storage and Laydown Area is considered “Process Water,” and would be captured in an unlined pond (Pond PW-OSLA) and monitored for quality. If the Overburden Storage and Laydown Area water was of sufficient quality, it would be pumped to the CPS and discharged to the East Pit or the Tailings Basin. If water in Pond PW-OSLA required treatment, it would be pumped to the WWTF for treatment prior to delivery to the CPS.	ok
GLIFWC 164	GLIFWC	5.2.2.3.3 Embarrass River Watershed	States that the seepage capture system is not expected to have an effect on groundwater downgradient of wetlands because ponded water at the surface is expected to infiltrate and replace groundwater. This is a circular argument. The ponded water downgradient of the tailings basin is mostly tailings basin water that has been seeping over decades saturating the aquifer and flooding wetlands. The seepage capture system would reduce that water source and that capture system is likely perpetual. It is not reasonable to assume that the ponded water will be able to replace groundwater captured by the containment system in perpetuity because the tailings basin is the water source for both the ponds and the groundwater. What are the impacts to groundwater levels and wetlands outside the containment system once the pond water at the surface runs out?	The text has been changed to reflect the decrease in groundwater seepage would not be expected to have a significant effect on groundwater down gradient of the groundwater containment system because there would be sufficient natural recharge to maintain saturation in the surficial (unconsolidated) unit.	ok
GLIFWC 165	GLIFWC	5.2.2.3.3 Embarrass River Watershed	How long would the groundwater capture system need to operate? How long would the WWTP need to operate?	Modeling predicts that groundwater capture and mechanical (WWTP) or non-mechanical water treatment would need to occur for a minimum of 500 years. Capture and treatment would continue after that time until water quality monitoring at groundwater and surface water evaluation locations indicate that these measures are no longer needed.	GLIFWC does not agree with the co-lead disposition. Provide a link to the perpetual maintanance section in the appendix.
GLIFWC 166	GLIFWC	5.2.2.3.3 Embarrass River Watershed - Figure 5.2.2-40	Figure is misleading. Edit the figure to indicate that the long term does not end at year 45 but rather extends into perpetuity.	The figure will be edited.	There is not enough information for us to remove our comment.

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Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 167	GLIFWC	5.2.2.3.3 Embarrass River Watershed	The no action alternative is not the same as existing conditions. This assumption ignores ongoing VIC work and the Cliffs Erie consent decree that would improve water quality over time. It also ignores the fact that rain will fall on the tailings basin, percolate through the tailings and flush constituents. Over time this effect will reduce the source term of the facility. An accurate no naction alternative needs to be modeled in order to compare impacts under NEPA. See GLIFWC attachment.	Description of the No Action Alternative will be clarified.	There is not enough information for us to remove our comment. Please add a link to the hydrology section in the appendix
GLIFWC 168	GLIFWC	5.2.2.3.3 Embarrass River Watershed	The discussion on TDS is not correct. The no action alternative is not the same as existing conditions. It does not matter that the exceedances from the tailings basin were caused by historic operations. PolyMet assumes responsibility for those exceedances if the project goes forward.	Description of the No Action Alternative will be clarified.	There is not enough information for us to remove our comment. Please add a link to the hydrology section in the appendix
GLIFWC 169	GLIFWC	5.2.2.3.3 Embarrass River Watershed	With respect to the TDS exceedances. How long before the model shows that groundwater criteria are met? And how does that differ from information in the consent decree?	The NorthMet Proposed Project water quality model indicates that the 90th percentile value for TDS in the Plant Site groundwater would drop below the 500-mg/l groundwater evaluation criteria at ~55 years after start of mining, as illustrated in Figure 5.2.2-44. Because the No Action condition for the LTVSMC Tailings Basin is represented in the GoldSim model without implementation of any mitigation measures, model predictions do not show a reduction in Plant Site groundwater TDS under the No Action conditions, also illustrated in Figure 5.2.2-44.	GLIFWC does not agree with the co-lead disposition. Provide a link to the hydrology section in the appendix.
GLIFWC 170	GLIFWC	5.2.2.3.3 Embarrass River Watershed	Flow in the tributary streams will change as effluent from the tailings basin changes over time under a no action scenario. The assumption that existing conditions is the same as the no action scenario is not supported. A no action alternative should be modeled.	The description of the No Action Alternative and Continuation of Existing Conditions will be further clarified in the SDEIS.	There is not enough information for us to remove our comment. Please add a link to the hydrology section in the appendix

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Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 171	GLIFWC	5.2.2.3.3 Embarrass River Watershed	The section should indicate that the assumption of meeting evaluation criteria depends on perpetual water capture, water treatment, and tailings facility maintenance. We disagree that water quality standards would be met. The PSDEIS states that standards would be exceeded for several constituents.	Text edited. As described in the SDEIS, the evaluation criteria do use the standards, but interpret the standards from a probabilistic perspective. The P90 approach is a reasonable method for applying the results of probabilistic modeling for EIS impact assessment. In this context, it is not appropriate to say that "a constituent will exceed a water quality standard". It is more accurate to say that "there is at least a 90 percent probability that a constituent will not exceed a standard (or up to a 10 percent probability that it will)". These quoted statements are very different.	GLIFWC does not agree with the co-lead disposition. Provide a link to the perpetual maintenance section in the appendix.
GLIFWC 172	GLIFWC	5.2.2.3.3 Embarrass River Watershed	As previously commented, the no action alternative is not the same as existing conditions.	The description of the No Action Alternative and Continuation of Existing Conditions will be further clarified in the SDEIS.	There is not enough information for us to remove our comment. Please add a link to the hydrology section in the appendix
5.2.3 Wetlands					
GLIFWC 182	GLIFWC	5.2.3.1.2 Potential Indirect Wetland Effects Methodology And Evaluation Criteria	The indirect impact analysis is fatally flawed. The analog approach is not scientifically defensible and further, it uses cherry picked data to reach conclusions. See GLIFWC wetland analysis attachment.	Per the Final Wetlands IAP Summary Memo, the Co-lead Agency position was that the assessment of potential indirect wetland impacts at the mine site should be conducted based upon an interpretation of the general analog guidelines regarding groundwater drawdown analog information provided by the Water Resources IAP Workgroup in accordance with the guidance provided in the attachment to this summary memo. The Co-lead Agencies believe that even with additional groundwater data collection and additional groundwater modeling, there would still be a high level of uncertainty regarding groundwater model outputs. Therefore, the Co-lead Agencies believe that the analog guideline method of estimating glacial aquifer groundwater drawdown near the proposed mine is reasonable and appropriate for this site and do not recommend that additional field data collection and groundwater modeling be conducted for the purpose of estimating glacial aquifer groundwater drawdown.	GLIFWC does not agree with the co-lead disposition. Provide a link to the wetland section in the appendix.

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Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
				Some Wetland IAP Workgroup members disagree with the Co-lead Agency position. They believe that additional field data collection and additional groundwater modeling are necessary to provide groundwater drawdown cone of depression information near the open pit mine. That position was an earlier recommendation of the Wetland IAP Workgroup and was supported by Workgroup members from the Fond du Lac Band, Grand Portage Band, Great Lakes Indian Fish and Wildlife Service, U.S. Fish and Wildlife Service, 1854 Treaty Authority, Minnesota Pollution Control Agency and the U.S. Environmental Protection Agency. However; it was not supported by Workgroup members from the Co-lead Agencies, Environmental Resources Management, or Barr Engineering. In addition, some Workgroup members believe that the Co-lead Agency position is contrary to standard analysis that mining companies have to conduct as part of sulfide mine EIS processes across the country. In addition, the Grand Portage Band believes that the geology of the analog sites appear to be non-analogous with the geology of the proposed mine site.	We continue to believe that use of the all existing data is most appropriate.
GLIFWC 185	GLIFWC	5.2.3.1.2 Potential Indirect Wetland Effects Methodology And Evaluation Criteria	As commented previously, the modeling done to assess changes in Partridge River flow is fatally flawed and does not yield usable results.	The Co-lead Agencies have concluded that the use of lateral effect equations for ditches is not suitable for use in determining glacial aquifer drawdown near open pit mines, and that method should not be used to estimate groundwater drawdown near the NorthMet project open pits. There was no disagreement among any of the Workgroup members.	We agree with the statement regarding the lateral effects model. In fact we were convinced that it would not work when the Corps suggested using the model in the NorthMet SDEIS. However, The comment refers to the XP-SWMM modeling so the lead agency disposition is appropos of nothing. Add a link to the hydrology section in the appendix.
GLIFWC 188	GLIFWC	5.2.3.2.2 Mine Site And Transportation And Utility Corridor Indirect Wetland Effects	The section on changes in hydrology due to drawdown is scientifically indefensible and fatally flawed. See GLIFWC wetland attachment.	See GLIFWC 182	GLIFWC does not agree with the co-lead disposition. Provide a link to the wetland section in the appendix.
GLIFWC 189	GLIFWC	5.2.3.2.2 Mine Site And Transportation And Utility Corridor Indirect Wetland Effects	The XP-SWMM model used for assessing impacts t Partridge River flow is fatally flawed and should not be used in the PSDEIS. See GLIFWC hydrology attachment	We believe the XP-SWMM modeling is acceptable for use in the SDEIS. The 20 year old data is acceptable as there haven't been any significant changes within the watershed. We believe the assumptions used were reasonably conservative. Additional detail is provided in the water sections of the SDEIS, and further rationale is provided in the Water Data Packages.	GLIFWC does not agree with the co-lead disposition. Provide a link to the hydrology section in the appendix.

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Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 190	GLIFWC	5.2.3.2.2 Mine Site And Transportation And Utility Corridor Indirect Wetland Effects	Presents an incorrect characterization of the impacts of dust emissions along the rail line. The section states that the air IAP did not identify any air quality effects. This issue was raised in the water quality IAP and the lead agencies moved it to air quality. We maintain that this is a water quality issue. The lead agencies have refused to fully address the issue and have chosed to simply monitor the waters near the rail line in order to detect impacts after they have already occured.	The Co-leads position on the potential for contamination along the rail line is discussed in 5.2.2 and 5.2.3.	GLIFWC does not agree with the co-lead disposition. Provide a link to the rail car section in the appendix.
GLIFWC 191	GLIFWC	5.2.3.2.2 Mine Site And Transportation And Utility Corridor Indirect Wetland Effects	Same comment a page 5.2.3-51. In addition the statement that deposition along the rail line would be minimal because of the coarse nature of the ore. This is incorrect. Relatively small ammounts of fine ore dust can create large water quality impacts as evidenced by the clean water act violations at the Flambeau mine in Wisconsin.	The Co-leads position on the potential for contamination along the rail line is discussed in 5.2.2 and 5.2.3.	GLIFWC does not agree with the co-lead disposition. Provide a link to the rail car section in the appendix.
GLIFWC 181	GLIFWC	5.2.3 Wetlands	Some wetlands in the indirect impact category are severely affected by drawdown, fragmentation, watershed destruction and dust deposition. These effects are well understood and so the Corps should require up front mitigation for these wetland impacts. See GLIFWC wetland attachment for additional analysis and information.	A wetland monitoring plan would be developed and implemented if the NorthMet project is permitted. The plan would require wetland hydrology monitoring, vegetation monitoring, and wetland water quality monitoring to identify if indirect wetland impacts occur during implementation of the project. If indirect wetland impacts resulting from the project are determined by the monitoring program, compensatory wetland mitigation would be required for those indirect wetland impacts. Text revised throughout the mitigation/monitoring discussions to address comment.	GLIFWC does not agree with the co-lead disposition. Provide a link to the wetland section in the appendix.
GLIFWC 193	GLIFWC	5.2.3.3.4 Monitoring	The section on monitoring for indirect effects, specifically the 4 goals, are exactly the type of analysis that is required for a federal EIS. This information should have been an integral part of the effects analysis for this project and GLIFWC staff have been advocating for this approach for years. This information, collected after the fact, cannot be used in impact assessment and thus cannot help mitigate the effects of the proposed project.	A wetland monitoring plan would be developed and implemented if the NorthMet project is permitted. The plan would require wetland hydrology monitoring, vegetation monitoring, and wetland water quality monitoring to identify if indirect wetland impacts occur during implementation of the project. If indirect wetland impacts resulting from the project are determined by the monitoring program, compensatory wetland mitigation would be required for those indirect wetland impacts.	GLIFWC does not agree with the co-lead disposition. Provide a link to the wetland section in the appendix.

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Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 216	GLIFWC	5.2.3.3.2 Wetland Mitigation and Contingency Mitigation	In discussing Financial Assurances there is no mention of the perpetual pump and treatment costs or liabilities for the mine. In reviewing various sections discussing Financial Assurances in no portion of the PSDEIS did authors identify: 1) annual projected operating costs for pollution control once the mine is closed including operation of the reverse osmosis system; 2) capital replacement costs and life cycle for pollution control infrastructure including piping, pumps, etc (i.e. What would have to be replaced every 10, 25, 50, 75 years and what would be the costs?); 3) and Net Present Value of the Financial Assurances (i.e. comparing the value of a dollar today to the value of that same dollar in the future). See GLIFWC socioeconomics attachment for additional information.	This comment appears to be addressing financial assurance in general and not just wetlands. Section 3 has a discussion on the project financial assurance. The level of detail provided in the SDEIS has been agreed upon by Co-Leads and with EPA. The details of the assurance will be developed during permitting. Section 3.2.2.4 provides a discussion of the financial assurance for the NorthMet Project Proposed Action.	ok
GLIFWC 184	GLIFWC	5.2.3.1.2 Potential Indirect Wetland Effects Methodology And Evaluation Criteria	The wetland sensitivity tables developed for the Crandon project in Wisconsin relied on a detailed understanding of the relationship between the surficial aquifer and the bottom of the wetland. That basic hydrologic information was never collected for this project therefore the significance criteria table is not necessarily applicable to NorthMet wetlands and its use in this context is not appropriate. See GLIFWC wetland attachment for additional information.	The wetland sensitivity tables in the Crandon mine project were used, though the Crandon project has different soils and hydrology than NorthMet, since it was decided and agreed upon in the IAP workgroup meetings. There is a general understanding on the NorthMet Project Mine Site of the general lack of connectivity of the surficial and bedrock aquifers, the soils present, the hydraulic conductivities, and the bedrock types (Barr 2006c; Barr 2008h; Barr 2010d). No text edit.	GLIFWC does not agree with the co-lead disposition. Provide a link to the wetland section in the appendix.
GLIFWC 187	GLIFWC	5.2.3.2.2 Mine Site And Transportation And Utility Corridor Indirect Wetland Effects	Based on information in the wetlands data package, we disagree with the assumptions used in defining if a wetland is fragmented or not. The method used in the PSDEIS would allow wetlands that have over 50% of their area filled to be classified as unimpacted by assuming that all of their hydrology depends on rainfall. This is not acceptable because filling a large percentage of a wetland disrupts the internal hydrologic regime and fragments the vegetation community in the wetland.	Fragmented wetlands are classified as indirect impact; however, fragmented wetlands are included in upfront mitigation. Total upfront mitigation is for the 912.5 acres of direct effects and 26.4 acres of fragmented wetlands (indirect effect). Tables have been revised to reflect this.	GLIFWC does not agree with the co-lead disposition. Provide a link to the wetland section in the appendix.
GLIFWC 183	GLIFWC	5.2.3.1.2 Potential Indirect Wetland Effects Methodology And Evaluation Criteria	The heading "Potential Indirect Wetland Effects Resulting from Changes in Hydrology" appears in both pages. Edit the title to specify how the sections are different.	Edited as suggested.	ok

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Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 186	GLIFWC	5.2.3.2.1 Mine Site And Transportation And Utility Corridor Direct Wetland Effects	Backfill of category 3 and 4 waste rock does not minimize or avoid wetland fill. That waste rock will be on the site for over 10 years and the wetlands in the footprint of the stockpile would be destroyed. What backfill does accomplish is provide an opportunity to create new wetlands in those locations. However, the high quality character of the existing wetlands will likely not be replaced.	Sentence revised. PolyMet proposes to mitigate wetland effects by placing waste rock back into the East Pit and Central Pit after year 11, thereby reducing the need for additional surface stockpile areas that would otherwise affect wetlands.	ok
GLIFWC 204	GLIFWC	5.2.3.3.4 Monitoring	It appears that wetland monitoring following restoration is only vegetative and hydrologic in nature. Total and methyl mercury should be monitored pre-project through post-reclamation to collect information on mercury levels and methylation rates and identify any necessary remedial actions.	Wetland monitoring following restoration would be vegetative and hydrologic in nature. Reference to water monitoring discussed in Section 5.2.2.3.6 was added. Water quality will be monitored downstream and piezometers will be located in the wetlands.	ok
5.2.5 Wildlife					
GLIFWC 205	GLIFWC	5.2.5 Wildlife - Throughout the section	The Wildlife Section (5.2.5) does not discuss mercury contamination. Similarly the Aquatic Species Section (5.2.6) does not discuss direct health impacts to aquatic species due to mercury. These impacts must be considered. See the	The Open Water discussion in Section 5.2.5.2.3 has been expanded to include discussion of the potential for wildlife exposure to mercury.	There is not enough information for us to remove our comment. Please add a link to the mercury section in the appendix
GLIFWC 207	GLIFWC	5.2.5.2.3 Species Of Greatest Conservation Need	The PSDEIS dismisses the possibility of waterfowl and waterbirds utilizing the tailings basin despite the fact that common waterfowl and waterbirds have been observed at the LTVSMC tailings basin during migration. The wetlands to be constructed over the East Pit and at the perimeter of the tailings basin are also not considered as potential waterbird/fowl habitat. We believe that there is a significant potential pathway of mercury exposure to these species from utilizing these sites. See the supplemental document "Great Lakes Indian Fish and Wildlife Commission (GLIFWC) Comments Related to Mercury" [Comment 12] for further discussion.	The Open Water discussion in Section 5.2.5.2.3 has been expanded to more accurately describe the potential wildlife use of the Tailings basin, as well as the potential for exposure to mercury.	There is not enough information for us to remove our comment. Please add a link to the mercury section in the appendix
5.2.6 Aquatic Species					

Chapter 5.2

Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 206	GLIFWC	5.2.6 Aquatic Species - Throughout the section	The Wildlife Section (5.2.5) does not discuss mercury contamination. Similarly the Aquatic Species Section (5.2.6) does not discuss direct health impacts to aquatic species due to mercury. These impacts must be considered. See the supplemental document "Great Lakes Indian Fish and Wildlife Commission (GLIFWC) Comments Related to Mercury" [Comment 11] for further discussion.	Mercury effects are being considered by the Co-leads and the SDEIS will be revised.	There is not enough information for us to remove our comment. Please add a link to the mercury section in the appendix
GLIFWC 208	GLIFWC	5.2.6 Aquatic Species	PSDEIS states there will be effects on flow in the Partridge R. and Embarrass R. tributaries, but that they are not expected to influence habitat. We feel that the water level fluctuations may be sufficient to impact habitat which could lead to changes in species composition or relative abundance which could in turn impact mercury foodweb dynamics. See the supplemental document "Great Lakes Indian Fish and Wildlife Commission (GLIFWC) Comments Related to Mercury" [Comment 13] for further discussion.	The text of Paragraph 2 on page 5.2.6-1 has been revised to clarify why the proposed projects flow reductions are not expected to lead to community alterations citing a 2013 USGS document that indicates that streamflow modifications below 25% are used as a baseline study and that affects on algae, fisheries, and macroinvertebrates would not be measurable at this flow reduction rate.	There is not enough information for us to remove our comment. Please add a link to the mercury section in the appendix
GLIFWC 209	GLIFWC	5.2.6.2.2 Embarrass River Watershed	Many lakes and rivers in the area are classified as “impaired waters” by the MPCA due to elevated fish mercury. All additional increases in mercury contributions to the environment therefore constitute a risk to human and ecosystem health. There are numerous aspects of the proposed action cited in the PSDEIS that will lead to increased mercury releases to the environment, increasing human and ecosystem risk. Further, the PSDEIS documents and increased risk (i.e., risk quotient) to human fish conmumers as a direct result of the project. See the supplemental document "Great Lakes Indian Fish and Wildlife Commission (GLIFWC) Comments Related to Mercury" [Comment 14] for further discussion.	Mercury effects are being considered by the Co-leads and the SDEIS will be revised.	There is not enough information for us to remove our comment. Please add a link to the mercury section in the appendix
5.2.7 Air Quality					

Chapter 5.2

Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 203	GLIFWC	5.2.7.2.5 Mercury Deposition Impact Analysis	The estimate of air emissions of mercury as a result of the project (4.6 lbs/yr) does not take into account emissions from electricity gereration for the site or from the burning of fuel by mining vehicles or other equipment. This should be quantified and included in the analysis.	Mercury emissions were calculated for mining vehicles and included in the emission inventory. In addition, emissions from electric generation have been incorporated within the TMDL development, by reference. Thus, these emissions have been taken into account for MPCA's evaluation and determination that the Project mercury emissions will not impede the reduction goals.	There is not enough information for us to remove our comment. Please add a link to the mercury section in the appendix
GLIFWC 210	GLIFWC	5.2.7.2.5 Mercury Deposition Impact Analysis	According the PSDEIS, "the MPCA has conducted a review of the NorthMet Project Proposed Action mercury emissions and has determined that it will not impede the reduction goals." The mercury TMDL for the St. Louis River has not yet been established due to insufficient understanding of mercury dynamics in the watershed. It is known that the statewide TMDL is insufficient for reducing mercury to acceptable levels in fish of the SLR. Since there is no SLR mercury TMDL available, the impact of the project's mercury emissions on reduction goals in the area cannot be adequately assessed.	It is agreed that there is no specific TMDL for the St. Louis River system, however, until a specific TMDL is developed for this body of water, the Statewide TMDL is the driving regulation for all other water bodies within the state, including the St. Louis River.	Comment stands.
5.2.8 Noise and Vibration					

Chapter 5.2

Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 214	GLIFWC	5.2.8 Noise And Vibration	There is no cumulative analysis for noise vibration and airblast in the PSDEIS. Activities at existing facilities (Mesabi Nugget, Northshore) should be looked at in conjunction with the proposed NorthMet project. See GLIFWC noise and vibration attachment for more information.	In the absence of measured ambient sound data for receptors in the immediate vicinity of the Mine Site and Plant Site (except BWCAW), literature values from the USEPA Levels guideline document (USEPA 1974) were used to represent baseline levels in the areas (measured data have been provided for the BWCAW). Since the Northshore Mine is an existing facility, the ambient Leq assumed for receptors outside the Mine Site area (Figure 4.2.8-1 and Table 4.2.8-3) account for existing noise from the Northshore Mine located approximately 2 miles north of the Mine Site (see Section 4.2.8-2). The vibration associated with blasting at the Northshore mine is also already accounted for under baseline conditions. Similarly, the baseline noise and vibration conditions of all identified receptors near the Plant Site already capture or account for noise and vibration from the Mesabi Phase I Plant, which is an existing facility. Noise and vibration diminish with distance i.e., the impacts are reduced as the receptor distance to the source increase. The Mesabi Nugget Plant is approximately 1 mile and 8 miles away from the Plant Site and Mine Site respectively. Similarly, the Northshore Mine is approximately 2 miles and 11 miles away from the Mine Site and Plant Site, respectively. Project related noise plus baseline levels (which accounts for noise from other nearby existing sources/facilities) are provided in Table 5.2.8-7.	GLIFWC does not agree with the co-lead disposition.Lack of site specific data has not stopped the lead agencies from developing and using analog information for other resource areas (e.g. wetlands) While the appropriateness of analog data can be debated, the excuse of doing nothing because of a lack of data is not credible. Provide a link to the cumulative impact section in the appendix.
GLIFWC 212	GLIFWC	5.2.8.1.1 Noise	The methods used in the PSDEIS limit the analysis to selected locations defined as sensitive to noise. While thise locations may in fact be sensitive, concentrating on those few places for the analysis inappropriately eliminates an impact assessment of other areas. See GLIFWC noise attachment for more information.	A discussion of noise impacts to all publicly accessible areas in the Superior National Forest has been included. The USFS has provided shapefiles for all recreational sites within the project vicinity (family camp grounds, camp sites, boating, fishing, swimming, and family picnic areas). In addition to the residential areas, BWCAW, and wildlife corridors already discussed in the SDEIS, we have also included recreational sites, trails, and closest State wildlife waters (used by tribal members for harvesting purposes) in all the noise and vibration contour maps. A discussion of noise impacts to all publicly accessible areas in the SNF (i.e., recreational sites) has been included in the text in Section 4.2.8.2. Though not depicted on the noise and vibration figures due to sensitivity regarding cultural resources and locations, a discussion of the nearest archaeological sites (e.g., Spring Lake Sugarbush and Mesabe Widjiu [Laurentian Divide]) within the Project vicinity has been included in the text.	ok

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Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 213	GLIFWC	5.2.8.2 Northmet Project Proposed Action	A discussion of applicable standards is appropriate. However, significant impacts from a project can occur without violating standards if the change from baseline condition is large enough. A discussion of this type of impact is needed.	A discussion of impacts based on change from baseline condition is discussed in Section 5.2.8.2.3, Total Noise Effects from NorthMet Project Proposed Action Operations. See sub sections titled "Daytime Operations (7 p.m. to 10 p.m.)" and "Nighttime Operations (10 p.m. to 7 a.m.). Text regarding noise change from baseline conditions in Section 5.2.8.2.3 have been revised to accommodate the new noise modeling results that accounts for reduced baseline noise levels at BWCAW and audibility limits for the BWCAW.	ok
5.2.9 Cultural Resources					
GLIFWC 211	GLIFWC	5.2.9 Cultural Resources - Throughout the section	Increased mercury, especially in fish, could negatively impact cultural resources, especially for local Native American tribes who rely on fish as a major source of subsistence food and who view fishing and fish consumption as vitally important cultural and spiritual activities. This is not acknowledge in the PSDEIS. Further, fish harvest is a treaty reserved right of these tribes. The presence of mercury in fish at levels that restrict consumption threaten the ability of the tribes to exercise this treaty right.	The Co-lead Agencies recognize that mercury accumulation in fish is an important issue to the Bands. The effects of mercury in fish are acknowledged in the SDEIS; please refer to the discussions in Sections 4.2.6, 4.2.10, 5.2.6, and 5.2.10. Additional text has been added to section 5.2.9.	There is not enough information available to remove the comment.
GLIFWC 220	GLIFWC	5.2.9.2.2 Treaty Resources - "There is little specific information concerning the use of natural resources by the Bands in the NorthMet Project area. This likely reflects limited subsistence gathering in the NorthMet Project area due to general inaccessibility. T"is lack of data also...	The authors make assumptions that because there is no written record of tribal use that no use takes place. To access potential socioeconomic impacts, all treaty resources [i.e. animals, fish and plants identified in LAC COURTE OREILLES CHIPPEWA IND. v. STATE OF WIS. NO. 74-C-313. 653 F.Supp. 1420 (1987)] need to be assessed on lands being transferred to the Forest Service and Forest Service lands being sold including: 1) presence and absence, 2) distribution, and 3) population density. See GLIFWC socioeconomics attachment for additional information.	The Co-lead Agencies disagree with the assertion that there was a focus only on the written record. Oral interviews, field surveys, consultation, and other sources were used when determining contemporary tribal use of the proposed NorthMet Project area.	Comment stands.
5.2.10 Socioeconomics					

Chapter 5.2

Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 215	GLIFWC	5.2 - Entire section	**It is essential that throughout the SDEIS authors need to repeatly state that Indirect and Induced Effect employment numbers are calculated by IMPLAN and may be temporary, part-time, full-time, long-term or short term jobs. It is also crititical to acknowledge estimates for full-time employment were provided by NorthMet. See GLIFWC socioeconomics attachment for additional information.	Section 5.2.10.1.3 contains this statement about type of jobs. Added a statement regarding the source of direct employment.	ok
GLIFWC 217	GLIFWC	5.2 Northmet Project Proposed Action	The Draft Environmental Impact Statement (DEIS) prepared in 2009 stated, "Due to the estimated 20-year operating life of the facility, it is estimated that approximately 55% of labor for the operations would be non-local and would relocated to the east range; 20% would commute daily or weekly from centeres such as Duluth; and the remaining labor would be local" DEIS (page 4.10-15). These two statements related to the same project give readers entirely different perspecitives on this project. This confusion is caused by including 3 counties in the "study area". Since the most recent IMPLAN modeling done in April 2012 was restricted to a single county (Lake), this section should be re-written to reflect the estimated labor that would relocated to the east range and the estimated labor that would commute from Duluth as done in the earlier DEIS for the estimated 360 direct operations-phase positions. Again authors need to state that Indirect and Induced Effect employment numbers are calculated by IMPLAN may be temporary, part-time, full-time, long-term or short term jobs. See GLIFWC socioeconomics attachment for additional information.	The DEIS definition of "local" appears to be limited to the East Range, essentially the nearby towns and cities in St. Louis County alone. By comparison, the PSDEIS clearly states that "local" workers--those who would commute daily or weekly--would come from a very wide commute shed, given the willingness of workers in this region to commute relatively long distances. The definitions of "local" are very different; therefore, no change is needed.	ok

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Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 218	GLIFWC	5.2.10.2.1 Population And Population Trends - "For purposes of this analysis, the SDEIS assumes that approximately 75 percent of direct and indirect operations phase employees would be local residents who would not need to relocate as a result of employment."	IMPLAN Modeling estimated that 112 of the 330 indirect jobs (i.e. temporary, part-time, full-time, long-term or short-term) would be in custom computer programming services (i.e. page 13, April 2012 IMPLAN report). Is it realistic to project 75 percent of the direct and indirect operations phase employees would be local residents given 33.9% of indirect jobs are in custom computer programming services? The basis for these estimates need to be explained and references used to base these estimates cited. See GLIFWC socioeconomics attachment for additional information.	Recall that "local" in this case is the commute-shed for the Project, which covers a wide area and several cities (Duluth, Hibbing, Virginia, etc.). As a high-level estimate, this is not unreasonable. No text edit.	ok
GLIFWC 219	GLIFWC	5.2.10.2.1 Population And Population Trends - Operations	The PSDEIS fails to provide a table entitled Anticipated Steady State Operation Employment Levels as provided in the 2009 Draft Environmental Impact Statement (DEIS)) - see pages 4.10-17 and 4.10-18 Table 4.10-13. This table was provided for the 448 direct jobs originally projected and categorized employment by: 1)Management, 2) Mine Operations - Contract supervision, operators, maintenance, 3) Mine Technical - Geology, grade control, planning, 4) Railroad Operations, 5) Plant Operations, 6) Sample Preparation and analytical laboratory, and 7) Finance, purhchasing, marketing, environmental, HR. A similar table is needed that would detail PolyMet's projected 360 full time direct jobs in the categories above. Without this data, it is impossible to evaluate the accuracy of the PSDEIS projections on employment and local hiring. See GLIFWC socioeconomics attachment for additional information.	The referenced table was produced by BBER as part of the IMPLAN model exercise. While useful to help explain the assumptions of the IMPLAN model, the table detailing the distribution of jobs by type is not a key finding of the SDEIS itself. Indeed, inclusion of the referenced table in the body of the SDEIS is not appropriate because it would distract the reader from the document's key findings about overall employment and other socioeconomic impacts of the NorthMet Proposed Project. This information is included in the IMPLAN report. Reference to IMPLAN report included.	ok

Chapter 6

Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 224	GLIFWC	6.2.1 Cumulative Effects Analysis Approach	The post-closure period is not correctly described. Closure in other sections of the document occurs from year 20 to year 40. Post closure is an open ended period after year 40. Because water treatment and facility maintenance needs at this project are perpetual, post-closure should be clearly defined here as year 40 to perpetuity.	For all resources, future temporal boundaries are the expected service life of the mining activities, including closure (years 20 to 40) and post-closure restoration (year 40 and beyond.)	ok
GLIFWC 225	GLIFWC	6.2.2.1.18 United Taconite	United Taconite facility is undergoing additional permit review due to their plans to fill over 1000 acres of wetland to expand the tailings basin. This would also contribute high sulfate water to the St. Louis river. The Corps and MPCA are currently involved in this work. Therefore, all appropriate information on this facility should be included in the cumulative effect analysis.	The Co-lead agencies believe that the cumulative wetland impact assessment area as defined in the wetlands work plan is sufficient to meet the requirements of NEPA and is appropriate for the NorthMet project EIS because it includes the watersheds in which the proposed direct and indirect wetland impacts would occur. For the NorthMet project, that would be the Embarrass River watershed and the Partridge River watershed. In addition, the Co-lead agencies included direction in the Final Wetland Resources IAP Summary Memo on how to identify the amount of wetland acreage below the OHWM within this part of the St. Louis River and to evaluate the potential for cumulative indirect wetland impacts in those wetlands from changes in flow in the St. Louis River based on the qualitative water flow evaluation to be conducted. No other direct or indirect NorthMet project impacts would occur in the St. Louis River watershed, and the Co-Lead Agencies do not believe that a cumulative wetland impact assessment needs to be conducted for the entire St. Louis River watershed for the environmental review of the Proposed PolyMet NorthMet project. The Co-lead agencies believe that a qualitative evaluation of cumulative wetland impacts on water quality in the Partridge River watershed and the Embarrass River watershed, including impaired waterbodies, should be included in the cumulative water quality impacts section of the SDEIS.	GLIFWC disagrees with the co-lead disposition. Provide a link to the cumulative impact section of the appendix.
GLIFWC 226	GLIFWC	6.2.2.1.21 Speculative Actions	Provide a map of the speculative projects and indicate in the text the potentially affected watershed for each project.	The speculative projects are provided for disclosure purposes only, and the locations of several of these projects are not known. No text edit.	GLIFWC disagrees with the co-lead disposition. Provide a link to the cumulative impact section of the appendix.
GLIFWC 227	GLIFWC	6.2.3.3 Water Resources	Impacts to dewatered wetlands should be mentioned in this section.	Section 6.2.3.3.3 discusses cumulative effects on hydrology. Section 6.2.3.4 discussed cumulative effects on wetlands.	GLIFWC disagrees with the co-lead disposition. Provide a link to the cumulative impact section of the appendix.

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Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 228	GLIFWC	6.2.3.3.1 Cumulative Effects Assessment Areas	The section should state that water quality standards are met only with perpetual water treatment and maintenance.	The following paragraph has been added to Section 5.2.2 - Summary: The Closure objective is to provide mechanical and non-mechanical treatment for as long as necessary to meet regulatory standards at evaluation locations in groundwater and surface water. Both mechanical and non-mechanical treatment will require periodic maintenance and monitoring activities. Modeling predicts that treatment activities will be a minimum 200 years at the Mine Site and a minimum of 500 years at the Plant Site. While long-term, these time frames for water treatment are not necessarily perpetual.	GLIFWC disagrees with the co-lead disposition. Provide a link to the perpetual maintenance section of the appendix.
GLIFWC 229	GLIFWC	6.2.3.3.1 Cumulative Effects Assessment Areas	The limited water quantity and quality data has been as issue for 7 years since the beginning of the project. The lead agencies and the applicant have been resistant to fill these data gaps. See GLIFWC hydrology attachment for further detail.	The 20 year old flow data is acceptable as there haven't been any significant changes within the watershed. Additional water quality sampling has been conducted and the results included in this PSDEIS (Section 4.2.2). No text edit.	GLIFWC disagrees with the co-lead disposition. Provide a link to the hydrology section of the appendix.
GLIFWC 230	GLIFWC	6.2.3.3.2 Cumulative Actions	Add United Taconite to the list.	Disagree. The analysis in Section 6.2.3.3 includes existing and potential future actions that have the potential, in combination with the NorthMet Project Proposed Action, to cumulatively affect surface water hydrology and quality within the Partridge River and Embarrass River watersheds. The United Taconite mine is outside the analysis area as the six permitted mine pit dewatering discharges all discharge to the St. Louis River Basin. No text edit.	GLIFWC disagrees with the co-lead disposition. Provide a link to the cumulative impact section of the appendix.
GLIFWC 231	GLIFWC	6.2.3.3.3 Cumulative Effects On Hydrology - Embarrass River	Should not assume that the passive treatment will prove effective. Change language to "...if passive treatment proves effective...	No text change needed. The NorthMet Project Proposed Action would rely upon mechanical treatment to achieve water resource objectives as long as needed; however, the goal would be to transition to non-mechanical treatment to ensure attainment of water resources objectives, including compliance with applicable groundwater and surface water standards, during the closure phase.	GLIFWC disagrees with the co-lead disposition. Provide a link to the perpetual maintenance section of the appendix.
GLIFWC 232	GLIFWC	6.2.3.3.4 Cumulative Effects On Surface Water Quality - Partridge River Section	The section states that all water quality evaluation criteria would be met. The section should clearly state that that assumption is based on the successful operation of water capture and water treatment systems in perpetuity. In addition, evaluation criteria are not the same as water quality standards. Water quality standards would be exceeded for several constituents. The same comment applies to the assumptions in the sulfate and mercury sections.	The SDEIS is comparing water quality predictions against water quality evaluation criteria. We acknowledge that the evaluation criteria could differ from water quality standards.	ok
GLIFWC 233	GLIFWC	6.2.3.3.4 Cumulative Effects On Surface Water Quality - Embarrass River	The river is on the draft 2012 303d list for sulfate. Correct the text.	Text revised to clarify the current status of 303(d) listings.	ok

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Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 234	GLIFWC	6.2.3.3.4 Cumulative Effects On Surface Water Quality	Reduction in sulfate loads depend on perpetual capture and treatment of water. Include this caveat.	The following paragraph has been added to Section 5.2.2 - Summary: The Closure objective is to provide mechanical and non-mechanical treatment for as long as necessary to meet regulatory standards at evaluation locations in groundwater and surface water. Both mechanical and non-mechanical treatment will require periodic maintenance and monitoring activities. Modeling predicts that treatment activities will be a minimum 200 years at the Mine Site and a minimum of 500 years at the Plant Site. While long-term, these time frames for water treatment are not necessarily perpetual.	GLIFWC disagrees with the co-lead disposition. Provide a link to the perpetual maintenance section of the appendix.
GLIFWC 235	GLIFWC	6.2.3.4.4 Cumulative Effects Assessment - Partridge River watershed section	The section states that lake acreage has increased by 19% compared to pre settlement times. Are these lakes natural, impoundments/flowages, or flooded mine pits? Should specify in the text. If these new waters are mine pits, we disagree with their characterization as "resources" because of their contaminated nature. In addition, many of the impacted wetlands are part of the 100 mile swamp system A detailed discussion of the ecological significance of this wetland complex is needed as well as the overall effect of fragmenting the complex.	Pre-settlement conditions were identified using NWI and GLO survey maps, while existing conditions were determined using delineations, NWI maps, NHD shapefiles, and MDNR Mining features (2009 shapefile). The 19% increase in lakes between pre-settlement and existing conditions stems from the increase in size of White Water Reservoir (increase of 314 acres) and areas classified as lake in the NHD shapefile. When calculating pre-settlement, existing, and future lakes, no deepwater habitats/mine pits were included; these would fall under the deepwater category. The potential effects to the wetlands within the 100 mile swamp are discussed in Chapter 5.	ok
GLIFWC 236	GLIFWC	6.2.3.3.4 Cumulative Effects On Surface Water Quality - Embarrass river watershed section	Same comments an above for the Partridge River section. In addition, this section should provide a description of the wetlands impacted by seepage from the LTV tailings basin.	Section 6.2.3.3.3 discusses cumulative effects on hydrology. Section 6.2.3.4 discussed cumulative effects on wetlands.	The co-lead disposition does not answer the comment.
GLIFWC 237	GLIFWC	6.2.3.4.3 Cumulative Actions	The XP-SWMM model uses antiquated data collected from far downstream of the site. The model is fatally flawed and yields unreliable results. The conclusion that no effects would occur on riparian wetlands is not supportable. See GLIFWC hydrology attachment for more detail.	We believe the XP-SWMM modeling is acceptable for use in the SDEIS. The 20 year old data is acceptable as there haven't been any significant changes within the watershed. We believe the assumptions used were reasonably conservative. Additional detail is provided in the water sections of the SDEIS, and further rationale is provided in the Water Data Packages.	GLIFWC disagrees with the co-lead disposition. Provide a link to the hydrology section of the appendix.

Chapter 6

Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 238	GLIFWC	6.2.3.6.4 Cumulative Effects Assessment - Wildlife travel corridors	The corridor southeast of the plant site is characterized as poor. Therefore the discussion in the section is misleading because this is not in fact a viable wildlife corridor. It should then be removed from the corridor list and removed from the map. In addition, cumulative effects from noise and vibration are not analyzed and would have a significant impact on wildlife corridors (See GLIFWC noise attachment for more detail) Finally, the conclusions should be revisited in light of fewer corridors along the range than originally identified.	The Emmons and Oliver report characterizes this corridor as small but important. The Barr Report on wildlife corridors states that the current LTVSMC Tailings Basin is located within the moderate quality habitat corridor. Neither of these studies classifies the corridor as poor quality, though Section 6.2.3.6.4 describes the Tailings Basin, which is within(but not occupying the entire width of the corridor, as being of poor quality for wildlife travel. The text will be edited for additional clarity.	ok
GLIFWC 239	GLIFWC	6.2.3.7.4 Cumulative Effects Assessment - Cumulative water quality effects	The conclusion of no cumulative effect depends on perpetual water capture and treatment as well as perpetual maintenance of the facilities that would remain after the end of mining. We believe that this is not a realistic assumption and that it short-circuits the evaluation of cumulative effects. In addition, evaluation criteria are not the same as water quality standards. Water quality standards would be exceeded for several constituents.	The Closure objective is to provide mechanical and non-mechanical treatment for as long as necessary to meet regulatory standards at evaluation locations in groundwater and surface water. Both mechanical and non-mechanical treatment will require periodic maintenance and monitoring activities. Modeling predicts that treatment activities will be a minimum 200 years at the Mine Site and a minimum of 500 years at the Plant Site. While long-term, these time frames for water treatment are not necessarily perpetual. Co-leads agree that evaluation criteria are not the same as water quality standards (for some constituents). The SDEIS is comparing water quality predictions against water quality evaluation criteria. We acknowledge that the evaluation criteria could differ from water quality standards.	GLIFWC disagrees with the co-lead disposition. Provide a link to the perpetual maintenance section of the appendix.
GLIFWC 240	GLIFWC	6.2.3.7.4 Cumulative Effects Assessment - Physical habitat effects	As previously stated, the conclusion of no changes to flows in the Partridge River is based on fatally flawed XP-SWMM modeling. This conclusion is not supported.	We believe the XP-SWMM modeling is acceptable for use in the SDEIS. The 20 year old data is acceptable as there haven't been any significant changes within the watershed. We believe the assumptions used were reasonably conservative. Additional detail is provided in the water sections of the SDEIS, and further rationale is provided in the Water Data Packages.	GLIFWC disagrees with the co-lead disposition. Provide a link to the hydrology section of the appendix.
GLIFWC 241	GLIFWC	6.2.3.8.10 Climate Change	A discussion of the effects of wetland destruction is needed in this section. The discussion should include the release of carbon to the atmosphere from wetland and peat excavation as well as the loss of carbon sequestration capacity of the existing high quality wetlands.	Agreed. The direct GHG estimated emissions will be revised in the text and in Table 6.2-20 as discussed in Comment # FDL 77.	ok

Chapter 6

Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 242	GLIFWC	6.2.3.8.11 Noise And Vibration	This section does not provide a cumulative assessment of noise impacts. For example the section should identify areas of national forest and forest service roads that would be subjected to noise plus airblast effects. Another example, what acreage of publicly accesible lands would be withing the noise and vibration / airblast zone. Reliance on an few receptors is not a proper way to conduct an analysis of noise impacts. See GLIFWC noise attachment for more detail.	The only reasonably foreseeable actions that could interact in such a way as to have a cumulative effect on the receptors identified in Sections 4.2.8 and 5.2.8 is the Mesabi Nugget Phase II Mine Project located approximately 2 miles west of the Plant Site and 10 miles west of the Mine Site. Other reasonable foreseeable projects in the region are 25 to 55 miles away from the NorthMet Project and as such, would have no cumulative effect on nearest receptors (see Figure 6.2.2-1 and Table 6.2-1). Noise from existing industries (logging, mining, etc.) have been accounted for in the baseline noise levels discussed in Section 4.2.8 and 5.2.8. Section 6.2.3.8.11 has been revised to assess the cumulative impact of the Mesabi Phase II Mine Project. The maximum impact area for noise (11,456 acres), ground vibration (11,469 acres), and airblast (11,334 acres) are discussed in Section 5.2.8.	GLIFWC disagrees with the co-lead disposition. Provide a link to the cumulative impact section of the appendix.
GLIFWC 243	GLIFWC	6.2.3.11.4 Cumulative Effects Assessment - Visual Resources	A calculation of the viewshed for the water vapor plumes and night visibility of tower lights should be developed and included. Are these features visible from public access points?	This comment belongs in Section 5.2.11, not here, since it is a primary impact of the operations themselves, and not cumulative with other resources. Please see response in Recreation/Visual spreadsheet. Response in this section to be developed based on language to be added to Section 5.2.11.	ok
GLIFWC 244	GLIFWC	6.2.3.3.4 Cumulative Effects On Surface Water Quality	There is a general lack of understanding of mercury dynamics in the St. Louis River Watershed. See the supplemental document "Great Lakes Indian Fish and Wildlife Commission (GLIFWC) Comments Related to Mercury" [Comment 1] for details.	The Co-leads agree that the mercury dynamics are complex; however, the analysis as presented indicated that there was minimal potential for a downstream increase in mercury loading	GLIFWC disagrees with the co-lead disposition. Provide a link to the mercury section of the appendix.

Chapter 7

Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 245	GLIFWC	7.2.4 Comparison Of Effects	As previously commented, the PSDEIS does not provide an adequate comparison of effects for water quality and water quantity. The assumption that the no action alternative is equivalent to a continuation of existing conditions leads to errors in water quality modeling. In addition, a lack of usable water quantity and flow data lead to conclusions that cannot be supported.	Refer to the water section and response to comments with respect to the suitability of the water quantity and flow data, and a discussion on the purpose and intent of the water modeling scenarios. Further clarity on these modeling scenarios is provided in Chapter 5.2.2	GLIFWC disagrees with the co-lead disposition. Provide a link to the hydrology section of the appendix.
GLIFWC 246	GLIFWC	7.2.4 Comparison Of Effects - water resources section	99.9% capture is not realistic and is not supported by text in other sections of the SDEIS.	Greater than 90% of water would be captured and treated to meet effluent limits set to meet water quality standards	ok
GLIFWC 247	GLIFWC	7.2.4 Comparison Of Effects - water resources section	GLIFWC staff disagree with second and third bullets of combined proposed action. Standard is exceeded for sulfate and there is not enough information in the document to reach a conclusion on mercury.	The GoldSim results do not indicate an exceedance of the waters supporting the production of wild rice sulfate standard pursuant to the MPCA staff recommendation. Mercury is addressed in the air and water sections (Section 5.2.2 and 5.2.7) as well as in aquatic resources (5.2.6)	Data collected at SW005 indicates that the standard is exceeded for some measurements. GOLDSIM is not properly calibrated and therefore is not able to reproduce existing conditions. Provide a link to the hydrology section in the appendix.
GLIFWC 248	GLIFWC	7.2.4 Comparison Of Effects - aquatic species section	The claim of a decrease in mercury loading is not suportable. See GLIFWC mercury attachment	The aquatic species summary points in the SDEIS table have been revised and does no longer include the mercury loading conclusion commented on.	ok
GLIFWC 249	GLIFWC	7.2.4 Comparison Of Effects - air quality and climate change	Combined proposed action would create a pulse of carbon through the exposure of peat. There would also be a loss of carbon sequestration potential due to the destruction of wetlands.	Acknowledge partial loss of carbon sink and release of stored carbon from wetlands destruction. The text has been updated to address carbon release in the wetland summary section of the table	ok pending review of the new language.
GLIFWC 250	GLIFWC	7.2.4 Comparison Of Effects - noise	Use of receptors to limit analysis is not appropriate. In addition no cumulative assessment is available. See GLIFWC noise attachment for more information.	A discussion of noise impacts to all publicly accessible areas in the Superior National Forest has been included in the noise section of Chapter 5 (Section 5.2.8).	ok
GLIFWC 251	GLIFWC	7.2.4 Comparison Of Effects - socioeconomics	biased information. There is no discussion of expected adverse effects.	See discussion in Section 5.2.10.14.	Information presented in the Freudenberg paper should be described here. The comment stands.

Chapter 7

Comment_No.	Agency	Section	Comment	Co-Lead Disposition	GLIFWC Response
GLIFWC 252	GLIFWC	7.3.1 Irreversible Or Irretrievable Commitment Of Resources	GLIFWC disagrees with the statement indicating no exceedance of water quality standards. The document indicates that standards would be exceeded.	As described in the SDEIS, the evaluation criteria do use the standards, but interpret the standards from a probabilistic perspective. The P90 approach for assessing compliance is a reasonable method for applying the results of probabilistic modeling to regulatory decision making. In this context, it is not appropriate to say that "a constituent will exceed a water quality standard". It is more accurate to say that "there is at least a 90 percent probability that a constituent will not exceed a standard (or up to a 10 percent probability that it will)". These quoted statements are very different.	GLIFWC disagrees with the co-lead disposition. Provide a link to the perpetual maintenance section of the appendix.
GLIFWC 253	GLIFWC	7.3.1 Irreversible Or Irretrievable Commitment Of Resources	Section should state that the NorthMet project would require maintenance and water treatment in perpetuity which constitutes and irreversible and irretrievable commitment of resources.	The Closure objective is to provide mechanical and non-mechanical treatment for as long as necessary to meet regulatory standards at evaluation locations in groundwater and surface water. Both mechanical and non-mechanical treatment will require periodic maintenance and monitoring activities. Modeling predicts that treatment activities will be a minimum 200 years at the Mine Site and a minimum of 500 years at the Plant Site. While long-term, these time frames for water treatment are not necessarily perpetual.	GLIFWC disagrees with the co-lead disposition. Provide a link to the perpetual maintenance section of the appendix.
GLIFWC 254	GLIFWC	7.3.2 Short-term Uses Versus Long-term Productivity Of The Environment	section does not appear to have been updated from information presented in the 2009 DEIS. It still talks about categore 3 and 4 permanent stockpiles. Correct the text.	The section has been updated and does not talk about permanent category 3 and 4 stockpiles. Extra detail has been added to the section to help make it clear that the Category 2/3 and 4 Stockpiles will be removed and backfilled into the East Pit/	ok
GLIFWC 255	GLIFWC	7.3.2 Short-term Uses Versus Long-term Productivity Of The Environment	wetland impacts would not be short term. Restoration of wetlands is not likely to replace the high quality wetlands found at the site. In addition water quality impacts are long term because treatment would be needed in perpetuity.	The sentence commented on has been clarified. The Co-leads consider that the potential wetland impacts as described in the section would be short-term because impacts would be mitigated and monitored. Additional information on impacts, mitigation and monitoring of wetlands is provided in chapter 5.2.3.	GLIFWC disagrees with the disposition of the comment. It is not likely that mitigaion will be able to replace the functions of the high quality wetlands that would be destroyed at the mine site.
GLIFWC 256	GLIFWC	7.3.3 Unavoidable Adverse Effects	GLIFWC staff disagree with the claim that new exceedances of relevant standards would not occur. Water quality standards will be exceeded. Perpetual water treatment and perpetual maintenance needs are residual practical effects of the proposed project.	As described in the SDEIS, the evaluation criteria do use the standards, but interpret the standards from a probabilistic perspective. The P90 approach for assessing compliance is a reasonable method for applying the results of probabilistic modeling to regulatory decision making. In this context, it is not appropriate to say that "a constituent will exceed a water quality standard". It is more accurate to say that "there is at least a 90 percent probability that a constituent will not exceed a standard (or up to a 10 percent probability that it will)". These quoted statements are very different.	The response does not address the fact that if standards are met, it will require perpetual treatment. Provide a link to the perpetual maintenance section in the appendix.