

FACT SHEET

PROPOSED REISSUANCE OF THE EAGLE MINE GROUNDWATER DISCHARGE PERMIT

For the reissuance of the Groundwater Discharge Permit for the wastewater treatment facility for the Eagle Mine, a nickel/copper mine located in NW1/4 of the NE1/4 of Section 12, T50N, R29W of Michigamme Township, Marquette County

New Owner (as of July 17, 2013)
Eagle Mine LLC
A Subsidiary of Lundin Mining Corporation
4547 County Road 601
Champion, Michigan 49814

Previous Owner's Name:
Rio Tinto
(formerly Kennecott Eagle Minerals Company)
4547 County Road 601
Champion, Michigan 49814

Facility:
Eagle Mine Wastewater Treatment Facility
6510 Triple A Road
Michigamme, Michigan 49861

Wastewater Type:
Mine Contact Water consisting of mine dewatering water, contact storm water from the main operations area, water from the temporary development rock storage area, water from the coarse ore storage area, and from the truck wash. Crusher operations are no longer done at the site.

Proposed Flow (same as last permit):
504,000 gallons per day, 184,000,000 gallons per year

Effluent and Groundwater Limits:
Based on the application for a Groundwater Discharge Permit, the Department proposes to issue a Rule 2218 discharge permit, subject to effluent and groundwater limitations.

Wastewater must be treated to meet the groundwater quality standards contained in Rule 323.2222 of the Part 22 Rules, which includes Rule 323.2222(7). Rule 323.2222(7) requires standards that are protective of surface water when groundwater is known to vent to a surface water. The discharge permit is designed so that surface water quality standards will be met at the ground water surface water interface.

Mercury levels in the effluent and the groundwater are limited pursuant to Rule 1098, Antidegradation, of the Part 4 Rules of Part 31 of 1994 PA 451, as amended.

Mercury is the only Bioaccumulative Substance of International Concern in the discharge. The mercury limit was developed pursuant to the Part 4 water quality standards to be protective of surface water and meets the requirements of the best technology in process and treatment under Rule 1098.

Existing Treatment System:

The wastewater treatment system (WWTS) was designed to collect, treat, and discharge treated wastewater to the groundwater during construction, operation, and closure of the mine. Wastewater will be collected in two lined lagoons (contact water basins) designed to hold 13.8 million gallons of wastewater (11.1 million gallons with a 2-foot freeboard).

The WWTS consists of the following stages:

- Hydrocarbon filtration if needed.
- Degasification (removal of carbon dioxide).
- Multiflo Clarifier for metals precipitation/sedimentation, softening, and removal of metals, hardness, and some of the suspended solids.
- Multimedia Filtration system to remove more solids.
- Weak Acid Cation Exchange system to further reduce heavy metals and inorganic salt cations.
- Double-Pass Reverse Osmosis system to polish the effluent and remove sodium, chloride, and sulfate.
- Treated effluent is then stored in a tank for a short period of time.
 - Some of the effluent is routed back as part of the treatment system.
 - Most of the effluent is discharged to the groundwater via rapid infiltration through the treated water infiltration system (TWIS).
- Waste brine solids and sludge will be disposed of in accordance with applicable regulations.

Land Application Rate to the TWIS: 10 gallons/sqft/day

CONDITIONS IN THE DRAFT PERMIT:

As in the first permit, effluent and groundwater limits have been established that are protective of surface waters and the groundwater. Specific conductance and boron continue to act as indicator parameters that the WWTS is operating properly and providing adequate treatment.

CHANGES FROM THE FIRST PERMIT:

1. Under *Part 1, Section 1, Effluent Limitations:*

- a) The effluent limit for biochemical oxygen demand (BOD₅) was changed from 10 mg/l to report only. Sampling data in support of that shows BOD₅ levels at 2 mg/l on a consistent basis.

During November and December of 2011, BOD₅ exceeded the effluent limit – due to the use of citric acid (used to reduce the pH of the product water). When this was discovered, the mine changed products and now use a hydrochloric acid solution. Since the change they have not exceeded the limit for BOD₅.

- b) Uranium was added as a sampling parameter (no limit, report only) for effluent and groundwater due to the discovery of its presence in water from the Temporary Development Rock Storage Area leak detection sump. The source is thought to be a natural occurrence from rock that was used in construction and brought in from another site. Uranium is removed from the wastewater by the treatment system.

In addition, under *Section 8, Other Conditions*, a condition was added requiring Department notification within 24 hours if uranium levels reach or exceed 5 ug/l. A report on the source of the uranium and steps taken to reduce/eliminate the source is required within seven days. Additional action can be required by the Department.

The 5 ug/l is much lower than the Drinking Water MCL for uranium of 30 ug/l. This affords more protection in requiring action well before the MCL is ever reached.

- c) Condition 1.i) was added to allow the permittee to request a reduction in the monitoring frequency for all parameters except flow, pH, specific conductance and mercury.

2. Under Specific Conductance, Condition 1. a-c, the following revisions were made:

Condition a) was revised to including recording and reporting both the daily average and daily maximum level.

Condition b) was revised to require an adjustment of the Allowable Operational Range (the authorized range of specific conductance values) for specific conductance, six months after mining of the ore body begins.

Condition c) was revised to clarify the duration of increased sampling if specific conductance falls outside the Allowable Operational Range and now reads as follows:

If specific conductance levels fall outside the Allowable Operational Range, (AOR), **the permittee shall immediately cease the discharge.** The permittee must notify the Department within 24 hours of levels being outside the Allowable Operational Range. The permittee shall also submit a report within seven days, indicating the source of the results and steps taken to bring specific conductance back within the Allowable Operational Range. No discharge shall occur until specific conductance levels are returned within the AOR for a period of 24 hours. Within one day of commencing the discharge, the permittee must also collect effluent quality samples daily for a minimum of five days, to demonstrate compliance with all the limitations in Part I, Section 1 of this permit.

3. Under Part I, Section 3. Groundwater Monitoring and Limitations (Downgradient), the following groundwater limits were changed:

- a) The limit for Vanadium has been increased from 2.2 ug/l to 3.1 ug/l. This change is based on a calculation of site specific background levels and is allowed under Rule 323.2222(5)(a), which states that the concentration of the substance in the groundwater will not exceed a concentration half-way between the background groundwater quality and the concentration at which the site would be a facility as defined by Part 201. Background groundwater quality for this purpose was determined by upgradient and downgradient wells surrounding the TWIS. Samples were collected prior to the start of plant operations.
- b) MW-QAL051A's limit for vanadium has been set at 3.6 ug/l. The site specific background levels for this well are based upon a statistical analysis of data collected prior to the start of plant operations.
- c) The limit for pH has been increased from a maximum of 9.0 S.U. to 9.7 S.U. This change was also based on a calculation of site specific background levels, as described in Item 3.a.

4. Section 6, Facility Operation and Maintenance, was modified to specify actions required if the 2-foot minimum freeboard is exceeded and now reads:

During the period beginning on the effective date of this permit and lasting until the expiration date of this permit, the permittee shall comply with the inspection, operation and maintenance program requirements specified below. If the 2-foot minimum freeboard is exceeded, the permittee shall 1) notify the Upper Peninsula District Supervisor of the Water Resources Division within 24 hours of the determination; 2) take immediate measures to reduce flows where possible; and 3) if necessary, prepare to implement the Part 632 required contingency plan.

Condition 6 also revised the definition of "freeboard" as the distance between the highest level of the wastewater and the top of the lagoon.

5. Section 10, Compliance Requirements, Condition b) was changed to allow up to 48 hours (instead of 24 hours) to resample the groundwater if a limit is exceeded. This additional time is to allow for weather conditions, and should not affect the quality of the sample, as the velocity of the groundwater is relatively slow. The requirement to resample the effluent within 24 hours if a limit is exceeded remains.

6. Part II, under the definition of the Mine Contact Water, the reference to crusher operations was removed (as that no longer is done at the site) and replaced with the coarse ore storage area.

7. Attachment I, Expected Effluent Quality: the definition of the values was revised to indicate that they are the expected effluent quality that can be achieved by the WWTF. They are not the permit limits for the effluent (which are listed under Condition 1 of the permit). However, the under Section 8.d) of the permit, if any parameter in Attachment I exceeds the expected effluent quality by five times, the permittee must notify the Department. The Department will then evaluate the data and determine if additional sampling, corrective action or treatment are needed.

PUBLIC COMMENT:

Comments or objections to the draft permit received between December 3, 2013, and April 1, 2014, as well as those received at the Public Hearing, will be considered in the final decision on whether to issue this permit.

Copies of the public notice and proposed authorization may be obtained at the Upper Peninsula District Office, DEQ-Water Resources Division, 1504 West Washington Street, Marquette, Michigan 49855. Telephone: 906-228-4853. Fax: 906-228-4939.

ATTACHED DOCUMENTS:

1. Hydrogeologic Summary
2. Soil Review
3. Surface Water Review

HYDROGEOLOGIC SUMMARY FOR REISSUANCE PERMIT

Date: November 26, 2012

Designated Facility Name: Rio Tinto – Eagle Mine WWTP

Geologist: Jeff Warner

RULE AUTHORIZATION:

- 2218(3)(b) Reissuance, Significant Modifications
 2218(3)(c) Reissuance, No Modifications
 Other:

Recommendation: OK to issue

If the recommendation is Issue with Schedule/Modifications, what SOC items, or modifications, are you recommending?

CHECKLIST:

NARRATIVE DISCUSSION OF EFFLUENT AND GW COMPLIANCE YES NO

UPDATED SITE MAP YES NO

UPDATED GROUNDWATER CONTOUR MAP YES NO

MOST RECENT RAW DATA:

GROUNDWATER MONITOR WELL DATA YES NO

EFFLUENT QUALITY DATA YES NO

STATIC WATER LEVELS YES NO

IF 2218(3)(b) REISSUANCE WITH SIGNIFICANT MODIFICATIONS, HAVE ALL CHANGES BEEN EVALUATED, ie., UPDATED MOUNDING CALCULATIONS, AS THEY RELATE TO SITE HYDROGEOLOGY: YES NO

If any of the above items are missing, briefly explain why they are not necessary:

SITE HYDROGEOLOGY:

If any of the above items are missing, briefly explain why they are not necessary:

1. Is the groundwater monitoring system in compliance with:

Rule 2223(2), Design

Yes No

If No, what changes are required:

Rule 2224(1), Location <150 feet downgradient

Yes No

If no, what wells are being added:

2. Has the applicant requested an alternate point of compliance in groundwater per Rule 2224(2)

Yes No

If Yes, provide justification:

3. Has the facility been in compliance with the hydrogeologic related conditions of their permit? If not, provide a brief overview of the noncompliance and your interpretation of the severity of the noncompliance.

Since the start of operations in September 2011, all monitoring well sampling locations have been found to be generally in compliance with the requirements of the permit. A request has been made to establish site specific background groundwater quality for Vanadium and pH.

Using the groundwater sampling results collected from a representative number of wells, prior to the startup of the WWTP, the mean of the data is 1.40 ug/L of Vanadium. Using one standard deviation, the site specific background groundwater quality for Vanadium is 1.75 ug/L. The Part 201 Generic Cleanup Criteria that was used for this site to determine compliance is 4.5 ug/L for Vanadium. The concentration that is half way between these points is 3.2 ug/L, which will be the proposed limitation in the pending groundwater discharge permit.

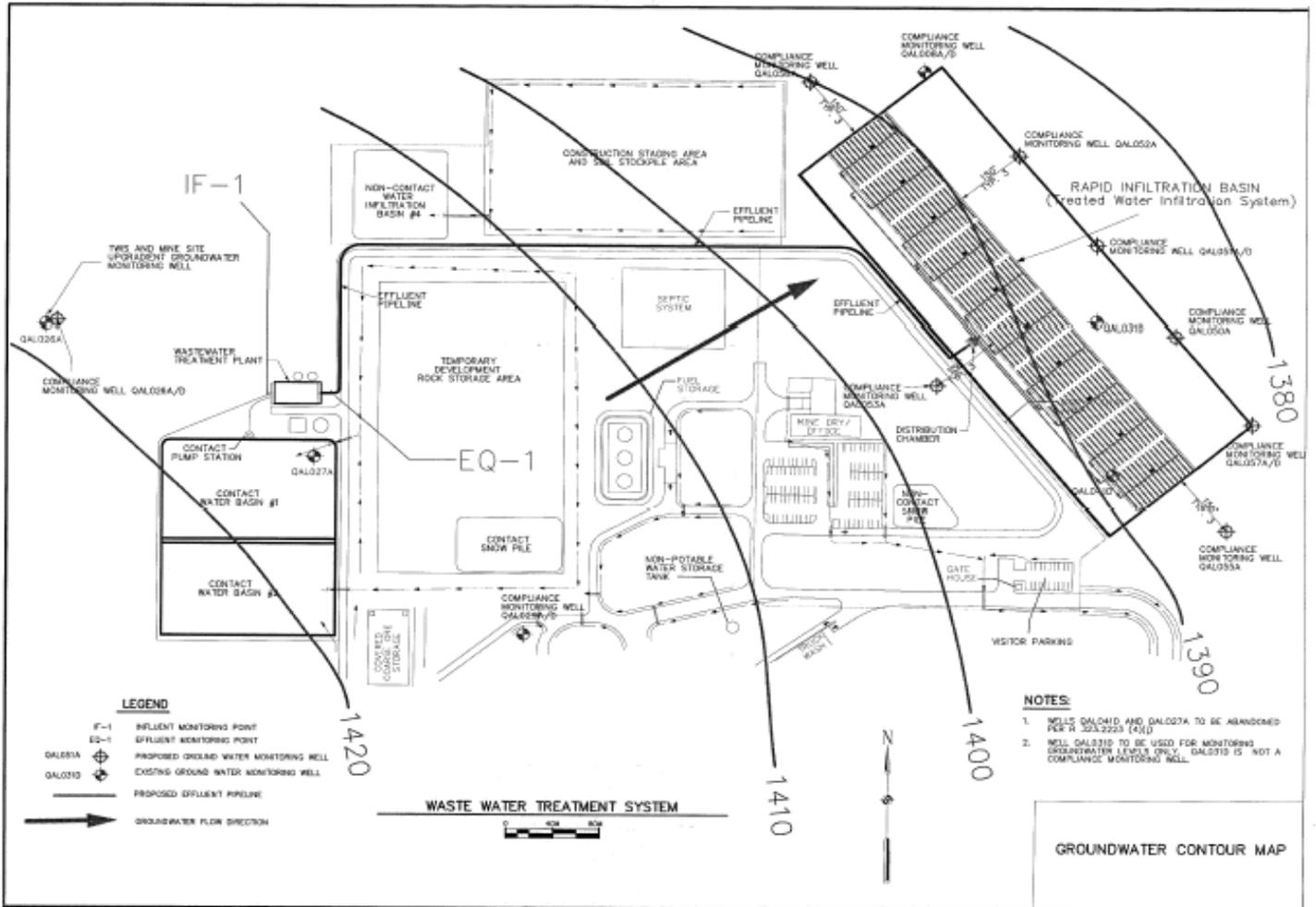
Background pH levels at the site range from 9.0 to 9.7 S.U. The Department may issue a permit that has a limit that is higher than the standards established if background groundwater quality exceeds that standard, and the discharge does not increase the concentration of the substance in the groundwater. Therefore, the proposed limitation in the pending groundwater discharge permit will be 9.7 S.U.

4. Attach the latest groundwater quality results from the nearest downgradient well, and identify the well number and date of sampling.

Samples collected May 2012 from QAL026A (up), QAL026D (up), QAL051A (dn), and QAL 051D (dn).

Parameter	Unit	QAL026A	QAL026D	QAL051A	QAL051D
		2nd Qtr 2012 5/1/2012	2nd Qtr 2012 5/1/2012	2nd Qtr 2012 5/1/2012	2nd Qtr 2012 5/1/2012
Field					
D.O.I	ppm	12	11	9.6	0.3
ORP	mV	134	96	129	-85
pH	SU	7.3	8.9	8.6	8.5
Specific Conductance	µmhos/cm	90	62	87	129
Temperature	°C	9.4	7.5	10	8.2
Turbidity	NTU	<1	<1	<1	<1
Water Elevation	R MSL	1416.17	1409.10	1363.76	1363.72
Metals					
Antimony	µg/L	<1.0	<1.0	<1.0	<1.0
Arsenic	µg/L	<1.0	<1.0	1.3	3.5
Barium	µg/L	5.4	<5.0	6.6	17
Beryllium	µg/L	<1.0	<1.0	<1.0	<1.0
Boron	µg/L	<20	<20	<20	22
Cadmium	µg/L	<0.20 e	<0.20 e	<0.20 e	<0.20 e
Chromium	µg/L	1.2	<1.0	1.1	<1.0
Cobalt	µg/L	<15	<15	<15	<15
Copper	µg/L	1.9	<1.0	1.2	1.0
Iron	µg/L	250	<20	100	<20
Lead	µg/L	<1.0	<1.0	<1.0	<1.0
Lithium	µg/L	<8.0	<8.0	<8.0	<8.0
Manganese	µg/L	<5.0	<5.0	<5.0	9.8
Mercury	µg/L	0.530	<0.500	<0.500	<0.500
Molybdenum	µg/L	<10	<10	<10	<10
Nickel	µg/L	<2.0	<2.0	<2.0	<2.0
Selenium	µg/L	<1.0	<1.0	<1.0	<1.0
Silver	µg/L	<0.20	<0.20	<0.20	<0.20
Strontium	µg/L	20 e	10 e	21 e	95 e
Thallium	µg/L	<1.0	<1.0	<1.0	<1.0
Vanadium	µg/L	<1.0	<1.0	3.3	1.0
Zinc	µg/L	15	<10	<10	<10
Major Anions					
Alkalinity, Bicarbonate	mg/L	50	27	41	62
Chloride	mg/L	<1.0	<1.0	<1.0	<1.0
Nitrogen, Ammonia	mg/L	<0.020 a	<0.020 a	0.038	0.023 a,s
Nitrogen, Nitrate	mg/L	0.49	0.098	0.17	<0.050
Nitrogen, Nitrite	mg/L	<0.050	<0.050	<0.050	<0.050
Phosphorus, Total	mg/L	0.0141 e	0.0230 e	0.0272 e	0.0169 e
Sulfate	mg/L	3.3	2.0	3.3	5.5
Major Cations					
Calcium	mg/L	8.5	8.2	11	15
Magnesium	mg/L	1.5	1.2	1.9	3.3
Potassium	mg/L	0.79	<0.50	0.77	1.0
Sodium	mg/L	1.1	0.57	1.1	2.9
General					
Hardness	mg/L	27	25	35	51

Site Map with Groundwater Flow Direction



MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

TO: Permit File
FROM: Bob Deatruck
Date: November 14, 2012
SUBJECT: Rio Tinto-Kennecott, Eagle Mine Project Wastewater Treatment Facility (Facility)

The permit application received on July 6, 2012, and available information regarding the discharge from the Facility, has been reviewed. The following summarizes the pertinent Rule 2233-2236 information related to the proposed discharge:

Discharge Mgmt. Plan (DMP) w/App:	No, Approved DMP on File
Daily Discharge Volume:	504,000 Gallons
Annual Discharge Volume:	184 Million Gallons
Discharge Method:	Rapid Infiltration
Acreage:	5 cells @ 30,000 Square Feet/cell
Effluent TIN:	< 5 mg/l
Effluent P:	<1 mg/l
Application Rate:	10 Gallons/Square Foot (sqft)/Day

Permit Recommendations:

Issuance:	Yes
Daily Discharge Volume:	504,000 Gallons
Annual Discharge Volume:	184 Million Gallons
Discharge Method:	Rapid Infiltration
Acreage:	5 cells @ 30,000 Square Feet/cell
Effluent TIN:	<5 mg/l
Effluent P:	<1 mg/l
Effluent Five-day Biochemical Oxygen Demand:	10 mg/l
Application Rate:	10 Gallons/sqft/Day

Due to the nature of operations at the Facility, the relatively high application rates of the wastewater to the infiltration cells, and the inability of the soil to provide any additional treatment to the applied wastewater, it is recommended the frequency of effluent sampling and testing established in the permit reflect the potential threat posed from the discharge of effluent which does not meet groundwater standards.

DISCUSSION:

The DMP for Rio Tinto-Kennecott, Eagle Mine Project Wastewater Treatment Facility (Facility) was re-evaluated as a result of the submittal of an application for reissuance of a Groundwater Discharge Authorization. The DMP was originally reviewed and approved in October of 2006. A copy of that review is on file. According to the Groundwater Discharge Permit Application, the Facility is requesting authorization to discharge 184,000,000 gallons of treated wastewater on an annual basis (504,000 gallons as a daily maximum). These volumes are identical to the current discharge authorization. The approved DMP establishes the protocol for management of the discharge to a rapid infiltration system comprised of five individual cells. Each cell is approximately 0.7 acres (30,600 sqft). According to the DMP, only four of the cells are in service at any given time. Each month one of the cells is rotated out of service for rest and, if necessary, maintenance related activities. The discharge to the cells is accomplished through a system of pressurized perforated pipes. Initially, the perforated pipes were to be buried; however, the Facility modified its design to have the pipes on the soil surface and covered with a layer of insulating spheres. The modification did not appear to alter the physiochemical nature of the soil to which the wastewater is to be discharged and as such, did not raise concerns regarding protection of the groundwater resource. The DMP indicates the typical application rate will be 6 inches [4.1 gallons per sqft (gal/sqft)] per day with a maximum application rate of 16 inches (10 gal/sqft) per day. The concentrations of all parameters of concern in the effluent are expected to be below the Part 22 Standards prior to discharge. As such, the discharge system is not expected to provide any additional treatment to the applied wastewater. The discharge is expected to occur on a year-round basis.

Conclusion

The DMP currently implemented by the Facility was previously reviewed and found to be adequate. As there are no changes to the discharge in terms of characterization or management, the existing DMP is therefore considered adequate. The document provides appropriate direction to the operator with regard to how the land treatment system is to be operated. According to available information, the soil within the discharge area appears to possess adequate permeability to absorb the maximum daily discharge at the permitted application rate. As stated in the previous review of this system, while the on-site soil appears to be capable of handling the discharge from a hydraulic perspective, there is concern with the potential threat to the groundwater resource resulting from the release of effluent, which does not meet groundwater standards, to the infiltration system. As such, it is recommended the frequency of effluent sampling and testing established in the permit reflect the potential threat posed from the discharge of effluent which does not meet groundwater standards.



MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

TO: Jeanette Bailey, Permits Section, Water Resources Division (WRD)

FROM: Glen Schmitt, Permits Section, WRD

DATE: January 31, 2013

SUBJECT: Rio Tinto Eagle Mine – Venting Groundwater Review
Groundwater Discharge Permit No. GW1810162

We have reviewed the draft Groundwater Discharge Permit for the Rio Tinto, Eagle Mine Waste Water Treatment Facility (WWTF) located in Michigamme, Michigan. The facility is located in the Salmon Trout River watershed in Marquette County. This review is to determine if final effluent limitations for metals in the draft permit are still consistent with the previous recommendations provided in October 26 and November 6, 2006 memos. The current permit authorizes to discharge a maximum of 0.504 million gallons per day (MGD) and 184 million gallons per year (MGY) of mine contact water to the groundwater through rapid infiltration basins.

Sources of information used for this review include the current Groundwater Discharge Permit, the Permits Section Toxics venting groundwater facility file, United States Environmental Protection Agency (USEPA) topographical maps, and the venting groundwater recommendations memos dated October 26 and November 6, 2006. Based on our review of this information, we have the following recommendations:

- 1) The acute and chronic limitations for cadmium, copper, selenium, and silver in the November 6, 2006 memo should remain.
- 2) Based on the “maximum outcome” or “composite effluent” concentrations used to develop recommendations in the October 26 and November 6, 2006 memos, there is a reasonable potential for total arsenic to be venting to surface waters at levels exceeding Michigan Water Quality Standards (WQS). We recommend a monthly average chronic limit of 10 micrograms per liter (ug/l) [0.04 lbs/day] with compliance monitoring consistent with the requirements for other metals with effluent limitations.
- 3) All other recommendations in the October 26 and November 6, 2006 memos should be retained in the draft permit.

If you have any questions regarding these recommendations, please contact me at (517) 241-0910.

cc: Rick Ruzs, Groundwater Permits Unit Chief, Permits Section, WRD
Tiffany Myers, Lakes Michigan and Superior Permits Unit Chief, Permits Section, WRD