

**Community Environmental Monitoring Program
Standards, Methodologies, and Baseline Data for Surface Water Quality Monitoring
along the Eagle Mine Transportation Route**

I. Program Implementation and Quality Assurance

A. Annual Work Plan

1. The Annual Work Plan summarizes the objectives for environmental monitoring along the transportation route between the Eagle Mine and the Humboldt Mill. The objective of surface water quality monitoring is to collect baseline data for evaluation of potential environmental impacts to surface waters from the transportation of ore during mining operations.

B. Quality Assurance

1. Data will be collected in accordance with established protocols by experienced Superior Watershed Partnership staff and/or contractor(s).
2. Equipment operation, calibration, and QA/QC are to be handled in accordance with specified operating procedures.

II. Elements of the Monitoring Program

A. Target Parameters and Equipment

1. Data will be collected in accordance with *Mine Permit Surface Water Monitoring* protocols and standards. Parameters, frequency of analysis, analytical methods and reporting limits are provided in Table 1.
2. Equipment to be used includes a multi-parameter water quality meter (YSI Model 556 MPS). The unit is able to capture field water quality parameters including, temperature, conductivity, percent saturation dissolved oxygen, pH, and oxidative-reduction potential (ORP).
3. Laboratory analyses of anions and metals will be conducted by CEMP/EPA approved laboratories: Underwriters Laboratories, Inc., 110 South Hill Street, South Bend, Indiana 46617; low-level mercury concentrations will be analyzed at: North Shore Analytical, Inc, 4511 West 1st Street, Ste. #1, Duluth, Minnesota 55807.

B. Monitoring Sites

1. There are 28 mapped road stream crossings along the Eagle Mine transportation route including 26 in the Dead-Kelsey Watershed (USGS Hydrologic Unit Code: 04020105, Lake Superior basin) and 2 in the Escanaba Watershed (USGS Hydrologic Unit Code: 04030110, Lake Michigan basin). Baseline surface water quality data will be collected from a downstream location at each site (Figure 1 and Table 2).

C. Monitoring Period

1. Begin monitoring program in the spring of 2014, prior to commencement of Eagle Mine ore production and processing (Fall 2014).
2. Conduct monitoring once per year for at least three years after Eagle Mine commences maximum production levels.

D. Data Analysis and Publication

1. Data gathered will be used to establish baseline surface water quality values and will be compared to the Michigan Surface Water Standards, Rule 57 reference values.
2. Data will be published in accordance with the CEMP Notification Plan (September 2013) including procedures for data processing, notification process, and schedule.

Table 1
Parameters, Frequency, Analytical Methods and Reporting Limits
for Surface Water Quality Monitoring along the Eagle Mine Transportation Route

Parameters	Frequency of Analysis	Analytical Methods	Laboratory Reporting Limit	Units
Field				
Temperature	Annual	Field	na	°C
Dissolved Oxygen	Annual	Field	na	mg/L
pH	Annual	Field	na	SU
Specific Conductance	Annual	Field	na	umhos/cm
Flow	Annual	Field	na	cfs
Anions				
Alkalinity, Bicarbonate	Annual	310.1/SM 2320 B	2.0	mg/L
Alkalinity Carbonate	Annual	310.1/SM 2320 B	2.0	mg/L
Chloride	Annual	EPA-325.2/4599-CL E	1.0	mg/L
Flouride	Annual	SM 4500 F-C	0.10	mg/L
Nitrate Nitrogen	Annual	EPA-353.2/4500 NO3F	0.050	mg/L
Sulfate	Annual	EPA-375.4/9038	1.0	mg/L
Cations				
Calcium	Annual	EPA-200.7/6010B	0.50	mg/L
Potassium	Annual	EPA-200.7/6010B	0.50	mg/L
Magnesium	Annual	EPA-200.7/6010B	0.50	mg/L
Sodium	Annual	EPA-200.7/6010B	0.50	mg/L
Total Dissolved Solids	Annual	EPA-160.1	50	mg/L
Metals				
Aluminum	Annual	EPA-200.7/6010B	50	ug/L
Lithium	Annual	EPA-200.7/6010B	10	ug/L
Antimony	Annual	EPA-200.8/6020	2.0	ug/L
Arsenic	Annual	EPA-200.8/6020	1.0	ug/L
Barium	Annual	EPA-200.8/6020	10	ug/L
Iron	Annual	EPA-200.7/6010B	20	ug/L
Beryllium	Annual	EPA-200.8/6020	1.0	ug/L
Boron	Annual	EPA-200.8/6020	50	ug/L
Cadium	Annual	EPA-200.8/6020	0.20	ug/L
Chromium	Annual	EPA-200.8/6020	1.0	ug/L
Copper	Annual	EPA-200.8/6020	1.0	ug/L
Cobalt	Annual	EPA-200.8/6020	10	ug/L
Lead	Annual	EPA-200.8/6020	1.0	ug/L
Manganese	Annual	EPA-200.8/6020	10	ug/L
Molybdenum	Annual	EPA-200.8/6020	10	ug/L
Nickel	Annual	EPA-200.8/6020	1.0	ug/L
Selenium	Annual	EPA-200.8/6020	2.0	ug/L
Silver	Annual	EPA-200.8/6020	0.20	ug/L
Zinc	Annual	EPA-200.8/6020	10	ug/L
Mercury ¹	Annual	EPA-1631E	0.00025	ug/L

¹ Acceptable by MDEQ to use 0.005 ug/L as reporting limit for mercury.

Figure 1
Community Environmental Monitoring Program
Surface Water Quality Monitoring Sites along the Eagle Mine Transportation Route

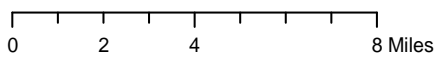
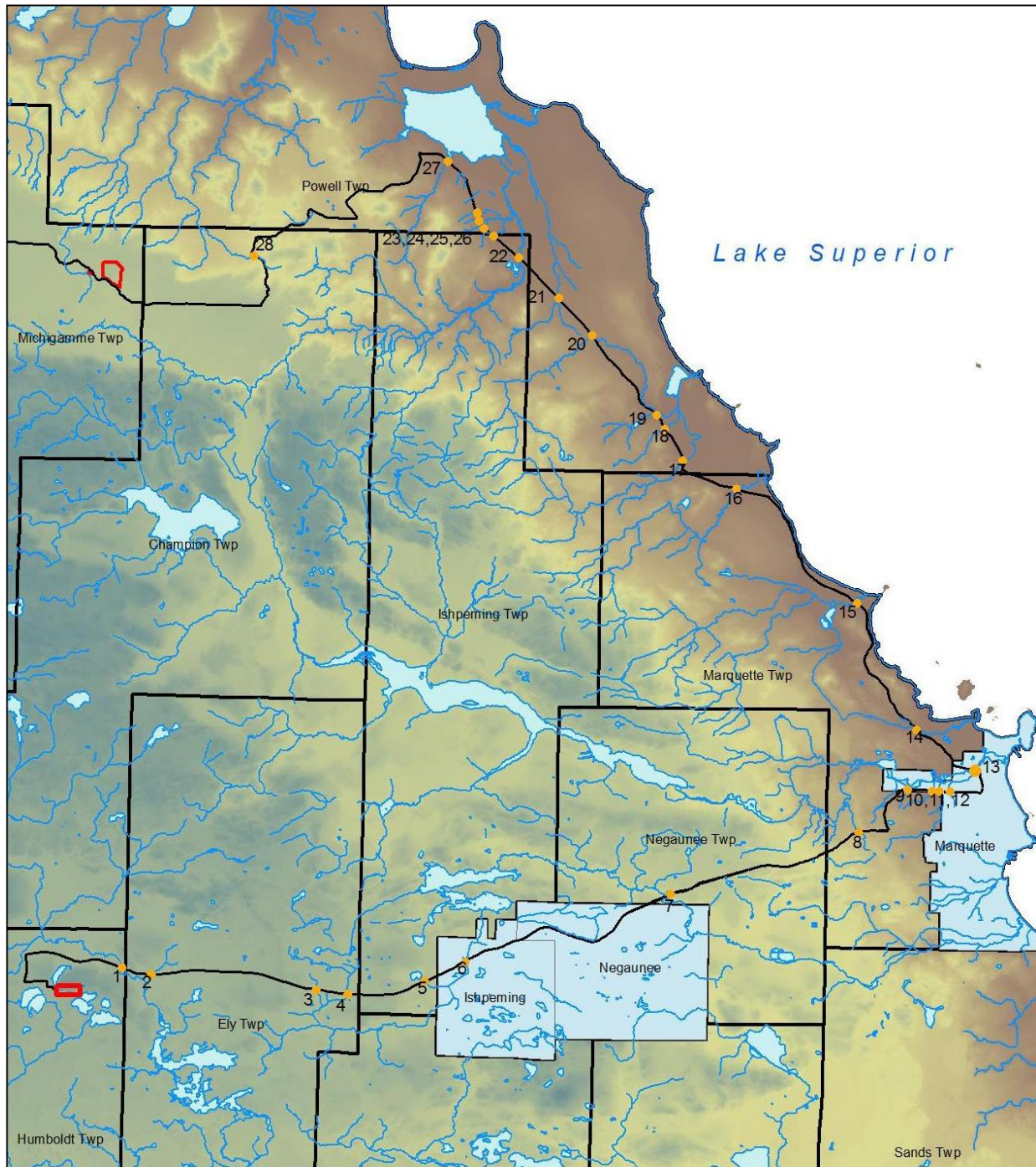


Table 2
Surface Water Quality Monitoring Sites along the Eagle Mine Transportation Route

Map Reference Number	Stream Name	Watershed Description	Location Description	Monitoring Description
1	Middle Branch Escanaba River	USGS HUC: 04030110, Escanaba Watershed, Lake Michigan basin	US41 W, Humboldt Township	Table 2 Field and Laboratory Parameters
2	Tributary to Middle Branch Escanaba River	USGS HUC: 04030110, Escanaba Watershed, Lake Michigan basin	US41 W, Ely Township	Table 2 Field Parameters
3	Unknown	Dead-Kelsey Watershed USGS HUC: 04020105, Lake Superior basin	US41 W, Ely Township	Table 2 Field Parameters
4	Carp Creek	Dead-Kelsey Watershed USGS HUC: 04020105, Lake Superior basin	US41 W, Ely Township	Table 2 Field Parameters
5	Unknown	Dead-Kelsey Watershed USGS HUC: 04020105, Lake Superior basin	US41 W, Ishpeming Township	Table 2 Field Parameters
6	Carp Creek	Dead-Kelsey Watershed USGS HUC: 04020105, Lake Superior basin	US41 W, City of Ishpeming	Table 2 Field and Laboratory Parameters
7	Carp River	Dead-Kelsey Watershed USGS HUC: 04020105, Lake Superior basin	US41 W, Negaunee Township	Table 2 Field and Laboratory Parameters
8	Brickyard Creek	Dead-Kelsey Watershed USGS HUC: 04020105, Lake Superior basin	US41W/Brickyard Road, Marquette Township	Table 2 Field Parameters
9	Unnamed Tributary to Dead River	Dead-Kelsey Watershed USGS HUC: 04020105, Lake Superior basin	Wright Street, Marquette Township	Table 2 Field Parameters
10	Backyard Creek	Dead-Kelsey Watershed USGS HUC: 04020105, Lake Superior basin	Wright Street, City of Marquette	Table 2 Field Parameters
11	Badger Creek	Dead-Kelsey Watershed USGS HUC: 04020105, Lake Superior basin	Wright Street, City of Marquette	Table 2 Field Parameters
12	Raney Creek	Dead-Kelsey Watershed USGS HUC: 04020105, Lake Superior basin	Wright Street, City of Marquette	Table 2 Field Parameters
13	Dead River	Dead-Kelsey Watershed USGS HUC: 04020105, Lake Superior basin	County Road 550, City of Marquette	Table 2 Field and Laboratory Parameters
14	Compeau Creek	Dead-Kelsey Watershed USGS HUC: 04020105, Lake Superior basin	County Road 550 Marquette Township	Table 2 Field and Laboratory Parameters

Map Reference Number	Stream Name	Watershed Description	Location Description	Monitoring Description
15	Harlow Creek	Dead-Kelsey Watershed USGS HUC: 04020105, Lake Superior basin	County Road 550 Marquette Township	Table 2 Field Parameters
16	Little Garlic	Dead-Kelsey Watershed USGS HUC: 04020105, Lake Superior basin	County Road 550 Marquette Township	Table 2 Field Parameters
17	Big Garlic	Dead-Kelsey Watershed USGS HUC: 04020105, Lake Superior basin	County Road 550, Powell Township	Table 2 Field Parameters
18	Birch Creek	Dead-Kelsey Watershed USGS HUC: 04020105, Lake Superior basin	County Road 550, Powell Township	Table 2 Field Parameters
19	Sawmill Creek	Dead-Kelsey Watershed USGS HUC: 04020105, Lake Superior basin	County Road 550, Powell Township	Table 2 Field Parameters
20	Wilson Creek	Dead-Kelsey Watershed USGS HUC: 04020105, Lake Superior basin	County Road 550, Powell Township	Table 2 Field Parameters
21	Johnson Creek	Dead-Kelsey Watershed USGS HUC: 04020105, Lake Superior basin	County Road 550, Powell Township	Table 2 Field Parameters
22	Yellow Dog River	Dead-Kelsey Watershed USGS HUC: 04020105, Lake Superior basin	County Road 550, Ishpeming Township	Table 2 Field and Laboratory Parameters
23	Unknown	Dead-Kelsey Watershed USGS HUC: 04020105, Lake Superior basin	County Road 550, Ishpeming Township	Table 2 Field Parameters
24	Unknown	Dead-Kelsey Watershed USGS HUC: 04020105, Lake Superior basin	County Road 550, Powell Township	Table 2 Field Parameters
25	Unknown	Dead-Kelsey Watershed USGS HUC: 04020105, Lake Superior basin	County Road 550, Powell Township	Table 2 Field Parameters
26	Unknown	Dead-Kelsey Watershed USGS HUC: 04020105, Lake Superior basin	County Road 550, Powell Township	Table 2 Field Parameters
27	Alder Creek	Dead-Kelsey Watershed USGS HUC: 04020105, Lake Superior basin	County Road 550, Powell Township	Table 2 Field Parameters
28	East Branch Salmon Trout River	Dead-Kelsey Watershed USGS HUC: 04020105, Lake Superior basin	Triple A Road, Champion Township	Table 2 Field and Laboratory Parameters