Application

Kennecott
Eagle Minerals

Humboldt Mill

Mining Permit Application
Volume IIF

Environmental Impact Assessment
Appendix B-2 through H

Project I.D.: 06W003

Kennecott Eagle Minerals Company
Ishpeming, Michigan

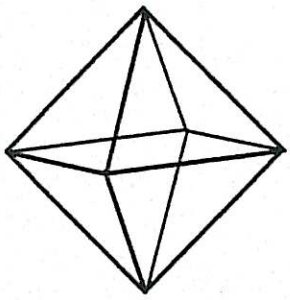
December 2008

Foth

B-2

Humboldt Mill Facility Investigation Report

Report



Kennecott
Eagle Minerals

Humboldt Mill
Facility Investigation Report

Scope I.D.: 06W003

Kennecott Eagle Minerals Company
Marquette, Michigan

December 2007

Foth

Humboldt Mill
Facility Investigation Report

Project ID: 06W003

Prepared for
Kennecott Eagle Minerals Company
ISO 14001:2004 Registered System

Prepared by
Foth Infrastructure & Environment, LLC

December 2007

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Humboldt Mill
Facility Investigation

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List of Abbreviations, Acronyms, and Symbols

COC	Chain-of-Custody
DCC	Direct Contract Criteria
DWPC	Drinking Water Protection Criteria
Foth	Foth Infrastructure & Environment, LLC
KEMC	Kennecott Eagle Minerals Company
MDEQ	Michigan Department of Environmental Quality
RCRA	Resource Conservation Recovery Act
SPLP	synthetic precipitation leaching procedure
TCLP	toxic characteristic leaching procedure

1 Introduction

Kennecott Eagle Minerals Company (KEMC) requested that Foth Infrastructure & Environment, LLC (Foth) perform an investigation of stockpiled and buried materials at the Humboldt Mill property located at 4547 County Road 601, Marquette County, Michigan. The site is located in Humboldt Township, Marquette County, Michigan about 24 miles west of the City of Marquette (Figure 1-1). Major highways leading to the Subject Site include State Highway 95, located approximately one mile to the west and US 41/State Highway 28, located approximately one mile to the north. Access to the mill site is from County Road 601, which intersects State Highway 95.

1.1 Purpose of the Investigation

The purpose of the mill investigation is to determine the presence or absence of hazardous substances. This report will document the activities that have been conducted to evaluate investigated materials. This evaluation encompasses field and laboratory analysis of soils, stockpiled materials, residues and other media on the Humboldt Mill.

2 Investigation of Mill Buildings and Stockpiles

The mill buildings were investigated to assess the characteristics of stockpiled materials, the potential occurrence of PCBs and other potential environmental hazards.

2.1 Stockpile Sampling

The intent of the stockpile sampling program was to obtain information about characteristics of stockpiled materials remaining from past operations at the site. Sample areas included stockpiles in the Mill Building and stockpiles located in the old crusher buildings west of the office and mill buildings. In addition, samples were collected from two aboveground storage pile areas located outdoors. Sampling included 20 discrete sample areas. The Mill Building samples were analyzed for the parameters listed in Table 2-1. A site map showing sample locations is provided on Figure 2-1.

2.1.1 Methodology

Prior to collecting the stockpile samples, a reconnaissance of the buildings was performed to identify stockpiles for sampling. Stockpiles were identified and marked on a site map. A description of the stockpile samples is provided in Table 2-2. Horizontal and vertical dimensions of each stockpile were measured using a tape measure. Stockpile dimensions were recorded in a field book. The dimensions were used to calculate the approximate volume of each stockpile. Volume calculations were then recorded in the field book.

Stockpiles were sampled by collecting composite samples at each sample location. Smaller stockpiles required collection of only one composite sample. However, larger stockpiles sometimes required more than one composite. The number of composite samples required was based on the approximate volume of material in each stockpile following the guidelines in the table below.

Stockpile Sample Requirements

Volume of Soil in Stockpile (cubic yards)	Minimum Number of Composite Samples
< 200	1
200 – 500	2
500 – 1000	3
1000 – 2000	4
Each additional 2000 cubic yards	1

Once the volume of the stockpile was estimated, the area was divided into sections of approximately equal volume, with one section for each composite sample. Samples were collected by the field crew using a pre-cleaned hand auger or other appropriate tool. The field crew obtained four to six hand auger borings for each composite sample and collected one to three sub-samples from each boring. A variety of depths and locations of the stockpile were sampled. Sub-samples were collected from a depth of greater than one foot below the pile surface and were of approximate equal volume. Samples were analyzed for total and toxic

characteristic leaching procedure (TCLP) metals. Cyanide was also identified as an analyte in that it may have been present in certain materials processed in the former gold circuit.

Each composite sample was created using the following procedure:

- Combine all sub-samples in a large clean stainless steel mixing bowl;
- Decant or drain away any liquids;
- Remove large stones, sticks and vegetation;
- Thoroughly mix the sub-samples together with a clean stainless steel or disposable spoon;
- Transfer an adequate volume of the composite sample to the sample container provided by the laboratory;
- Wipe the threads, then cover, label and seal the container.

For quality control purposes, duplicate samples were collected and submitted with the set of samples. One duplicate for every ten or less samples was submitted to the laboratory. Samples to be split for duplicate analyses were first homogenized in a pre-cleaned stainless steel bowl. The duplicate sample was submitted to the laboratory as a "blind" sample.

Re-usable sampling equipment that came into contact with the sample, including stainless steel bowls, hand augers, etc. was decontaminated between each sample. All sub-samples collected for a single composite sample were considered to be one sample, unless the sub-samples were used for both discrete and composite samples. Sampling equipment was cleaned using the following procedure:

- Using a non-phosphate soap and clean potable water solution, the equipment was washed to remove all visible soil particles.

- The equipment was then rinsed with potable water to remove all soap.

- The equipment was then rinsed with acetone or methanol. Wiping the equipment with an acetone or methanol saturated towel was also used followed by disposal of the towel.

- The equipment was then triple rinsed with deionized water. If deionized water was not available, distilled water was used.

- The equipment was then allowed to air dry.

Sampling team members wore a new pair of disposable gloves during each sample collection activity. Gloves were disposed between each composite sample.

A record was kept of the distance from each sample location (including individual sub-sample locations within each composite sampling area) to two permanent immobile objects such that sampling areas could easily be relocated. A sketch was also made of the area, with sampled areas clearly identified. In addition, photographs were obtained, annotated with the date, photographer, sample number and orientation of the sample area.

Sample containers used were provided by the laboratory and were dependent on the sample matrix and analyses desired. All sample containers were filled completely, so that minimal air

space remained in the sample containers, unless a specific collection method required a pre-measured quantity and/or field preservation technique. Once opened, the containers were used immediately. If the container was used for any reason in the field, (e.g., screening) and not sent to the laboratory for analysis, it was discarded.

Immediately after collection, the sample label was affixed to all sample containers. Labels included the following information:

- Project title and location;
- Sample location;
- Sample identification number;
- Date and time of sample collection;
- Type of sample (grab or composite);
- Initials of sampler;
- Preservative used;
- Sample analysis requested.

This information was written in indelible ink. Samples were placed on ice in a laboratory supplied cooler to maintain sample temperature at 4 °C.

Chain-of-Custody (COC) procedures allowed for tracking of possession and handling of individual samples from the time of field collection through laboratory analysis. Sample COC documentation was prepared by completing a COC form. The COC was prepared by the sampler(s) at the time of sampling.

After sample collection, the samples were securely stored and packaged as required by analytical protocol until they were delivered to Pace Analytical Laboratory in Green Bay, WI. COC records were placed in a plastic bag and transported with the samples.

Additional samples of the buried pyrite were collected via hand augers. These samples are labeled on Figure 2-1 as HA-1BP, HA-2BP and HA-3BP. These samples were analyzed for total metals and TCLP and synthetic precipitation leaching procedure (SPLP) metals.

2.2 PCB Sampling

During the site investigation, oil staining was noted on the floor adjacent to one of two motor control centers inside the building. Although historical reports for the site indicate that all PCB transformers were removed from the buildings, there is no discussion regarding the possibility of PCB equipment still remaining inside electrical control cabinets.

In addition to oil staining on the floor, it was also noted during the site investigation that a brown oily material had leaked down the side of the concrete block office structure located inside the Mill Building. Some of the material had coagulated into discrete layers of material. Both of these areas were sampled. The location of these samples is shown on Figure 2-1.

2.2.1 Methodology

To assess oil staining on the floor, a standard PCB wipe test was performed in two areas within the stain area and adjacent the electrical equipment in accordance with the definition in 40 CFR

761.123. Samples were obtained by using a standard-size template (10 centimeters by 10 centimeters, or 100 cm^2) to delineate the area to be sampled. The wiping medium was a gauze pad that was saturated with hexane. The gauze pad was prepared in the laboratory and the wiping medium was stored in sealed glass vials until it was used for the test. The actual wipe test was performed very quickly after the hexane was exposed to the air. The sample was obtained by wiping the grid with parallel strokes across each axis until complete coverage was obtained (the entire surface was wiped twice). The gauze pad was then returned to the glass vial container. A set of disposable gloves was used by the sampler during collection of each sample. These samples are referred to as M-2 East and M-2 West on Figure 2-1.

To assess the brown oily material, several equal portions of the material were sampled in several places using a clean spatula to produce a composite sample (M-6). Sample material was placed into a clean glass container and closed immediately after sample collection.

Subsequent to sampling, all containers were placed into a cooler and kept at 4 °C. COC forms were used to identify the samples that were being shipped to the laboratory for analysis. All samples were analyzed for seven Aroclors as well as for total PCBs.

2.3 Other Materials Sampling

In addition to sampling "stockpile" materials that were described above, other materials inside the buildings were further investigated. These were primarily former process materials that either had been released from storage tanks inside the building or were being stored in large quantities in open containers. These included the following materials and locations:

- Sludge that had collected in a large sump area in the basement of the Mill Building near the area where filter presses are located on the first floor. This sample location is identified on Figure 2-1 as M-1.

- Material that had leaked out from the bottom of an old thickener tank located in the southeast corner of the Mill Building. It is possible that process materials may be from former gold processing in the building. This sample location is identified on Figure 2-1 as M-4.

- A tank of dried material is located in the eastern end of the Mill Building. While the tank is currently not leaking, a certain quantity of white powder had been noted at the end of a pipe at the bottom of the tank. This sample location is identified on Figure 2-1 as M-5.

- A large open tank is located inside the Mill Building at the eastern end. This tank is about three-quarters full of water, but was also noted during the site evaluation to possibly contain a layer of oil. This sample location is identified on Figure 2-1 as M-3.

2.3.1 Methodology

To assess whether contaminants in these materials exceed Michigan Department of Environmental Quality (MDEQ) cleanup levels, solid materials identified in the first three bullets above (M-1, M-4 and M-5) were analyzed for total and TCLP metals. In addition, the second and third samples (M-4 and M-5) were also analyzed for total cyanide, in that it is believed these materials may have been associated with gold processing at the site. Due to the visual presence

of an oil sheen, the sample identified as M-3 was analyzed for VOCs. All samples were grab samples using sample collection jars provided by the analytical laboratory. A clean spatula was used to collect solid samples of material. The liquid sample was obtained by dipping the container across the surface of the tank of water. Subsequent to sampling, samples were labeled and placed into a cooler at 4 °C. All sampling took place on October 31, 2006.

3 Mill Analytical Results

3.1 Stockpile Sampling Results

Stockpile samples were collected by Foth during site visits on March 28 to 30, 2006; June 6, 2006; and October 31, 2006 following procedures outlined in Section 2. During the site visit, numerous stockpiles were noted throughout the buildings. While some of these materials were totally contained within bins, supersacks or drums, others were stored openly on the ground or the condition of the container had caused the material to spill on the ground. In selecting materials for sampling, the primary focus was on materials that were being stored on the ground or presented some degree of risk due the condition of the storage container.

In four instances, composite samples of loose material were collected from the floor. This was done in areas where there appeared to be no concrete floor and/or where substantial material had been spilled over the floor due to past operations. These areas are noted below and on Figure 2-1:

- Crushing Building Floor - (Map ID No. 10)
- Concrete Mill Floor - (Map ID No. 16)
- Mill Basement Floor - (Map ID No. 11)
- Mill RR Floor - (Map ID No. 19)

Table 2-2 provides a list of materials that were included in the sampling and a short description of the nature of the material. Appendix A-1 also includes field logs for stockpile samples that were collected. Appendix A-2 is a presentation of the analytical results in a tabular format for each type of material. Appendix A-3 includes a copy of the laboratory analytical report, including COC forms. The results are compared against R 299.5744 and R 299.5746 clean-up criteria for Residential and Commercial I categories. Although industrial cleanup criteria also exist, these cleanup criteria were selected for use in this analysis because these are the appropriate baseline cleanup levels to consider when assessing baseline conditions. Given most of these materials are located inside buildings and/or in containers, it is assumed the most applicable screening level would be generic soil cleanup criteria for direct contact (DCC).

If the material has potential to affect groundwater, other generic soil cleanup criteria may be applicable, such as those for Drinking Water Protection (DWPC). This would particularly be the case for samples collected from materials identified as “South Storage Pile A” and “Leachate Residue Pile” (Map ID No’s 1 and 2 on Figure 2-1). Both of these materials are located outside.

In addition to total metals, all metals that are regulated under the Resource Conservation and Recovery Act (RCRA) were analyzed for TCLP metals. Results are compared against the EPA TCLP criteria and are also provided in the table in Appendix A-2.

In general, all materials exhibit some degree of elevated metals. This is not surprising given most of these materials remain from previous facility operations. Some materials, such as the material identified as “Filter Press Floor” (Map ID No. 15), exhibited concentrations that exceeded several DCC, including total cyanide, lead, iron and arsenic. This material was found on the floor in the vicinity of one of the filter presses. Given these levels, it is possible this material remains from former gold processing operations. Stockpile samples in the crusher building exceed the DCC for aluminum (EECB-2) and arsenic (EECB-1 and EECB-3).

Multiple composite samples collected of indoor floor materials, except the concrete mill floor sample, exceeded DCC for arsenic. In addition, one of the samples (Mill Basement Floor, Map ID No. 11) also exceeded the DCC for total cyanide and lead. Given these concentrations and other analyses for the material, it is possible this latter material may be similar to the "Filter Press Floor" sample described above in that it appears to have concentrations of metals in the same general ranges. It should also be noted that one of the indoor floor materials exceeded the acceptable TCLP concentration for lead (Concrete Basement Floor, Map ID No. 16). This was in the general area of the west portion of the mill, where numerous incoming materials appear to have been stored.

The acceptable TCLP concentration for lead was also exceeded for two additional materials. These were the materials described as "Lunch Room Slag" (Map ID No. 20) and "Gold Contact" (Map ID No. 12). The first material was a sample from two deteriorated fiber drums of fire assay waste located in the former lunch room in the mill. The second material was from a small pile of white material located in the mill basement.

The two outdoor sample locations included the "South Storage Pile A" (Map ID No. 1) and the "Leachate Residue Pile" (Map ID No. 2). The first sample was a composite of material obtained from a small storage pile located just to the south of the Mill Buildings. The second sample was a boring collected in the vicinity of the former leachate residue storage area to the immediate south of the Mill Buildings. Samples collected from these two outdoor sample locations show exceedances of several soil DWPC, including those for aluminum, antimony, arsenic, cobalt, iron, manganese and silver. The generic soil cleanup criterion for nickel was also exceeded for the South Storage Pile in this category. DCC for arsenic were also exceeded for both samples.

In addition to the stockpile samples that were identified and sampled during this site visit, there are numerous other materials stored in these areas that are fully contained in drums, supersacks or bins. One material of note not sampled was located in the old crusher building in the general vicinity of Map ID No. 9. Ten steel drums were noted with a label identifying the material as "Grit Blast Waste". The label indicated the material was considered to be a hazardous waste due to it failing TCLP for characteristics of lead and cadmium. The material was not sampled due to the fact it was sealed in a drum.

Samples M-1, M-3, M-4 and M-5 on Figure 2-1 are located inside buildings. In assessing these samples, it is assumed that the most applicable screening level is the DCC. The exception was M-3 where the DWPC is appropriate.

In addition to total metals (and cyanide for two materials), all solid samples were analyzed for TCLP metals. Laboratory results for the solids are shown in Appendix A-2. In general, all materials showed some degree of elevated metals. Similar to the materials described above, these materials are all derived from process materials, so this is not a surprising finding. Only three metals were found to exceed the DCC in three solid samples (M-1, M-4 and M-5): antimony, arsenic and iron.

The laboratory results for VOC analysis of Sample M-3 (water) indicate that all constituents were below detection limits (Appendix A-2).

3.2 PCB Sampling Results

Sample results for the oil-stained area (M-2 east and M-2 west) indicates that all PCB concentrations were below cleanup levels set forth in the federal PCB Cleanup Policy described at 40 CFR 761. Total PCB concentrations for both samples were slightly elevated at 7.1 and 8.6 µg/100 cm^2; however both concentrations were below Federal cleanup levels for PCBs at 10 µg/100 cm^2.

Sample results for a composite of the black oily material, at M-6, indicate total PCBs may exceed the required cleanup level. For example, Aroclor-1260 was at 270 µg/kg, Arochlor-1254 was at 490 µg/kg and Aroclor-1242 was at 560 µg/kg. Total PCBs were 1,300 µg/kg. Federal cleanup levels for a high-occupancy location without a fence or cap would be 1,000 µg/kg. However, it should be noted that these cleanup levels were targeted for sources of PCBs of 50,000 µg/kg (50 ppm) or greater. The policy also applies to spills of materials that occurred after May 4, 1987. Spills prior to that date are addressed on a case-by-case basis. In that it is not known what the source of this spill is or when it occurred, the more conservative cleanup standard 1,000 µg/kg is being applied. MDEQ regulations also defer to the federal standard for PCB cleanup. Therefore, it appears the federal and state cleanup criteria for this material may have been exceeded. The full set of results are summarized in Appendix A-2.

3.3 Buried Pyrite Area Sampling Results

Samples from the buried pyrite area were obtained by Foth during a site visit on June 6, 2006 at the request of KEMC. The buried pyrite area is located west of the Mill Building (Figure 2-1). A historical figure shows the pyrite area consisting of two distinct portions (Maxim, 2000). The far western portion is labeled as "concentrated pyrite material" while the section in the middle and to the east is described as “unsorted pyrite material”. The figure suggests the concentrated pyrite area is much smaller than the unsorted area. Although there is not much discussion of this in the accompanying text, it is assumed this means the western portion contains material that could have higher concentrations of metals.

These samples were identified in the field as HA-1, HA-2 and HA-3 and are labeled on Figure 2-1 and in Appendix A-2 as HA-1BP, HA-2BP and HA-3BP. HA-1BP was collected in the western portion, where higher metal concentrations may be expected to occur. HA-2BP and HA-3BP were obtained in the middle and eastern portion, which is the unsorted pyrite. After scraping off a couple inches of surface material, the auger was driven into the material about 12 to 18 inches at each location. At each location, the auger was met with considerable resistance due to the presence of rocks below the surface. This was particularly the case for HA-2BP and HA-3BP. More silt and granular material was noted in HA-1BP. At each location, brown and yellow colored material was encountered immediately, which suggests the pyrite material lies just below the surface and is not covered with a top confining layer of material. Round iron pellets were also noted as samples were being obtained.

Samples were analyzed for a suite of metals. Analyses included total metals, TCLP and SPLP. RCRA metals included arsenic, barium, cadmium, chromium, lead, mercury, selenium and silver. Although copper and nickel do not have specified RCRA TCLP levels, TCLP and SPLP analyses were also performed on these metals, due to their importance to the overall project. Percent solids were also analyzed. In general, the total metals concentrations were significantly higher in HA-1BP when compared to results from HA-2BP and HA-3BP. This was particularly

the case for arsenic, cadmium, chromium, copper, lead, nickel and silver. Total metals were also elevated above state-wide background levels for most of the samples. Arsenic and chromium appear to exceed state DCC for generic soil cleanup levels for all three samples and nickel and silver exceed DWPC in HA-1BP. All samples passed TCLP and SPLP analyses by significant margins. A comparison of these data against state cleanup criteria is presented in Appendix A-2. A copy of the laboratory report and COC form is provided in Appendix A-3.

Although this set of samples appears to pass all leach tests that were performed, it should be noted that this sampling technique only allowed collection of samples near the top of the pyrite storage area. The total volume of the buried pyrite area is deeper and it is possible there could be higher concentrations of metals further down in the material. This could include material that could have higher leaching potential.

The results of this sampling effort can be compared to past samples that have been collected at the site. Maxim Technologies (2000) provided the results of buried pyrite samples collected in July 1998 (Maxim Technologies, 2000, see Tables 3a and 3b). These all appear to be obtained from test pits at intervals ranging from 2 to 5 ft. below the surface. A total of 10 sample locations were identified. Results from this time period indicate that while metals were elevated in many of the samples, all samples passed SPLP and TCLP tests.

It should also be noted that visual observations of this area indicate sparse vegetation across the top of the pyrite area when compared to other parts of the site. Brownish-orange stains were observed on the access road directly below the pyrite area, which suggest runoff from this area is ongoing. Exposed soil on the other side of the road from the pyrite area also has sparse vegetation, suggesting some impact from runoff at the buried pyrite area.

4 References

Maxim Technologies, Inc., 2000. *Remedial Action Plan for Closure of the Humboldt Millsite Michigan under Part 201*.

Tables

Table 2-1
Mill Building Analytical Parameters

Metal	Type of Analysis
Aluminum	Total
Antimony	Total
Arsenic	Total, TCLP
Barium	Total, TCLP
Beryllium	Total
Cadmium	Total, TCLP
Chromium	Total, TCLP
Cobalt	Total
Copper	Total
Cyanide	Total
Iron	Total
Lead	Total, TCLP
Magnesium	Total
Manganese	Total
Mercury	Total, TCLP
Nickel	Total
Selenium	Total, TCLP
Silver	Total, TCLP
Thallium	Total
Vanadium	Total
Zinc	Total

TCLP = Toxicity characteristic leaching procedure

Prepared by: JSK
Checked by: JSL

Table 2-2
Description of Stockpile Samples

Map ID	Sample ID	Field Description
1	South Storage Pile A	Small aboveground pile of material located outdoors immediately to the south of the Mill Buildings.
2	Leachate Residue Pile	Storage area located outdoors to the southeast of the Mill Buildings; sample was collected using a hand auger. Sample appearance was sand with steel pellets mixed within.
3	Shop Supersack	This material was representative of supersacks of gray material stored in the maintenance shop. One portion was coarse hard material, with the other being soft and fine.
4	Shop Bin 2	This sample was obtained from a metal bin in the maintenance shop. The sample consisted of very fine material with flour consistency.
5	Shop Bin 1	Very hard fine sandy and gravel material; very dusty. A composite was obtained by advancing two borings into the material
6	Crusher – East End #2 (EECB 2)	This material was located in the east end of the crusher building. This was a pile of material on the bare ground that was best described as coarse sandy material with a gray color.
7	Crusher – East End #1 (EECB 1)	This material was located directly on the floor in the east end of the crusher building. The material was finely ground material with a gray color that was similar in consistency to sand. Although located in the same vicinity, this material is visibly different from that described for EECB 2.
8	Crusher – East End #4 (EECB 4)	This material was located in the east end of the crusher building. It consisted of light gray gravel sized chunks. The consistency was very dusty.
9	Crusher – East End #3 (EECB 3)	This is a large pile of material located in the central to east end of the crusher building. The majority of the material is dark gray to yellow, with iron pellets mixed within.
10	Crusher – Floor	This is a composite of floor material from eight different locations near the center to east end of the crusher building. The sample appearance was coarse black sand and gravel with pyrite-looking fragments.
11	Mill Basement Floor	This is a composite of floor material in the lower level of the Mill Building. It is described as being gray to black mixed with floury-like material seen in other bags throughout the mill.
12	Gold Contact	This material is located in the mill basement approximately in the south center of the building. It is a small pile on the floor. It is best described as a fine white powder.
13	Mill Basement Bin	This material is located in a bin in the lower level of the Mill Building. It is best described as medium grain brown sandy-type material with a hard crust.
14	Active Mill Product	This material is located in the east portion of the main mill on the first floor. This was a sample of black fine powder from one of

Map ID	Sample ID	Field Description
		eight open 55-gallon drums.
15	Filter Press Floor	This material was collected from the floor in the vicinity of the filter presses. The presses were generally located on the first floor of the mill near the south side. The material can be best described as coarse hard brown sand-sized particles.
16	Concrete Mill Floor	This sample was obtained on the west side of the main building. This is a composite of light gray material and black rocky material mixed together that has been spilled on the ground throughout this particular area.
17	Mill Hopper	This sample was collected from a hopper on the main floor of the Mill Building. The sample can be described as gray powder mixed with some sand-type material.
18	Mill Supersacks	This sample was a composite obtained from supersacks stored in the west portion of the Mill Building on the main floor. It is representative of up to 22 supersacks being stored in this area. Some of the bags are split and material has spilled on the ground.
19	Mill RR Floor	This is a composite of floor material that has collected in the northwest portion of the main Mill Building. It is located generally in the area of railroad tracks that once served this area. The sample can best be described as being medium brown sand with gravel.
20	Lunch Room Slag	This sample was obtained from deteriorated fiber drums located in the former lunch room area near the offices. It appears to be fire assay waste from former on-site laboratory operations. Rainwater has come into contact with the drums and caused yellow staining on the floor.

Prepared by: CED1
Checked by: JSL

Figures

Baraga
Michigamme Twp
Champion Twp
Powell Twp
Ishpeming Twp
Marquette Twp
Negaunee Twp
Ely Twp
Marquette
Village of Champion
Champion Mine Site
Ropes Mine Site
~24 Miles
US 41
Marquette
Lake Superior
Ishpeming
Negaunee
Humboldt Mill
Project Location
US 95
CR 601
Republic Twp
Sands Twp
Chocolay Twp
Tilden Mine Site
Empire Mine Site
Tilden Twp
Richmond Twp
Humboldt Twp
West Branch Twp
Skandia Twp

NOTES

1. Horizontal datum based on NAD 83/94. Horizontal coordinates based on UTM Zone 16.
2. All base information downloaded from Michigan Center of Geographic Information (http://www.michigan.gov/cgi).
3. Site Location - Project Site within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.

LEGEND

- Counties
- Minor Civil Divisions
- Lakes and Rivers
- KEMC Project Location
- Highways
- Major Roads
- Minor Roads
- Railroads

N

Foth Infrastructure & Environment, LLC

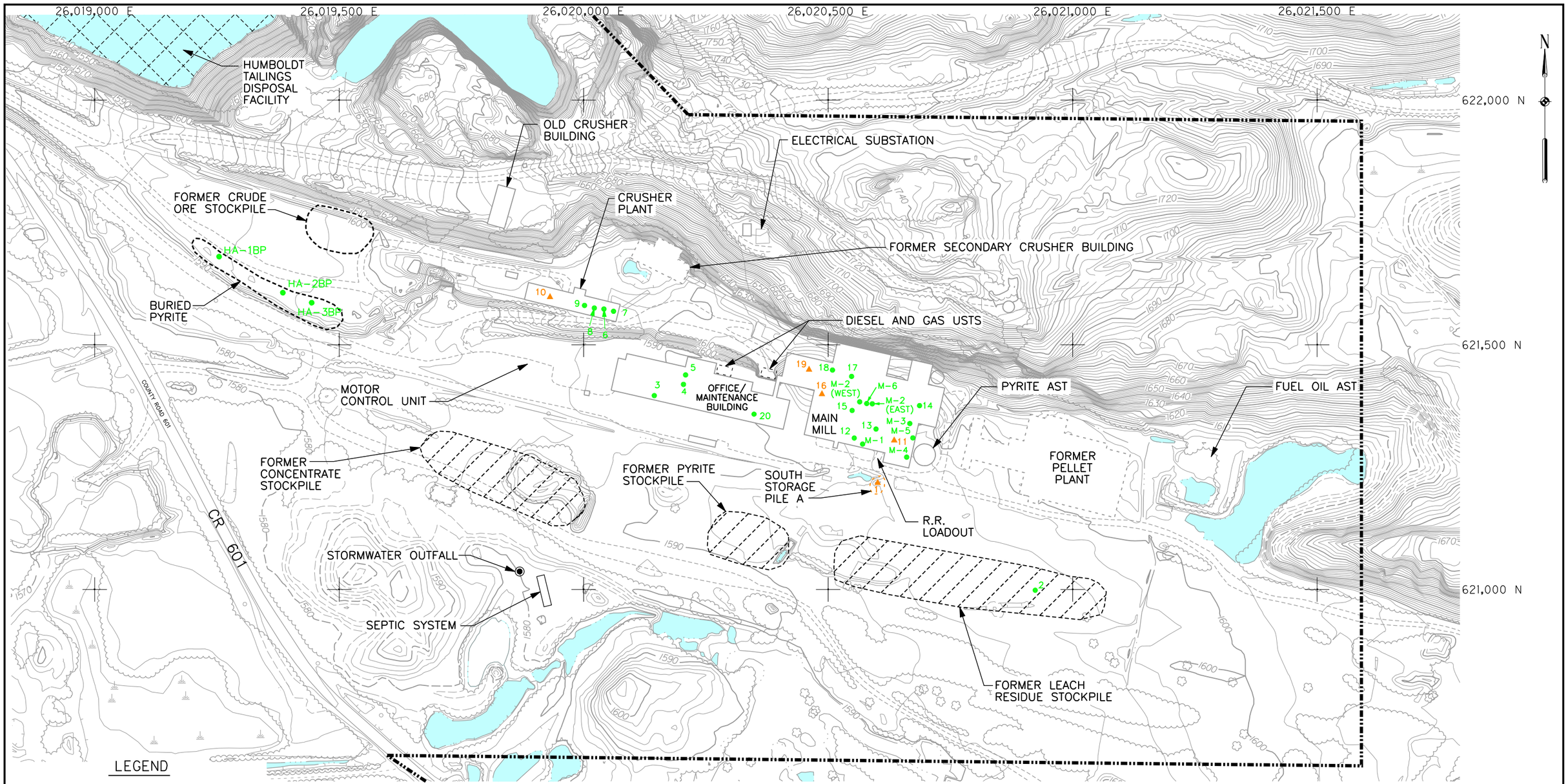
Foth Infrastructure & Environment, LLC			
REVISED	DATE	BY	DESCRIPTION
CHECKED BY:	JSL	DATE: OCT. '07	
APPROVED BY:	SVD1	DATE: OCT. '07	
APPROVED BY:		DATE:	

Kennecott Eagle Minerals

FIGURE 1-1
HUMBOLDT MILL INVESTIGATION REPORT
PROJECT LOCATION

Scale: 0 1.5 3 Miles | Date: OCTOBER 2007
Prepared by: DAT | Project No: 06W003

M:\06w003\mxd\EIA\Appendix\kmc_humboldt_ProjectLocation_appendix_11x17.mxd October 18, 2007



LEGEND

- EXISTING ELEV. CONTOUR IN FEET (1570)
- SPOT ELEVATION (X 1705.3)
- TREE
- TREE LINE
- BUILDING
- TRAIL
- PAVED ROAD
- UNPAVED ROAD
- STREAM/LAKE
- SURFACE WATER
- HUMBOLDT TAILINGS DISPOSAL FACILITY
- KEMC PROJECT LOCATION
- ▲19 COMPOSITE SAMPLE NUMBER AND LOCATION
- ● 20 SINGLE SAMPLE NUMBER AND LOCATION

NOTES:

1. TOPOGRAPHIC AND PLANIMETRIC DATA SUPPLIED BY AERO-METRIC ENGINEERING, SHEBOYGAN, WISCONSIN. DATE OF PHOTOGRAPHY: APRIL 27, 2006.
2. CONTOUR INTERVAL BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. HORIZONTAL DATUM BASED ON NAD 83/96. HORIZONTAL COORDINATES BASED ON MICHIGAN STATE PLANE.
3. KEMC PROJECT LOCATION WITHIN SECTIONS 2 AND 11, T47N, R29W, HUMBOLDT TOWNSHIP, MARQUETTE COUNTY, MICHIGAN.

Foth Infrastructure & Environment, LLC			
REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	CED1	DATE: DEC. '07
APPROVED BY:	SVD1	DATE: DEC. '07
APPROVED BY:		DATE:

Kennecott Eagle Minerals

FIGURE 2-1
HUMBOLDT MILL INVESTIGATION REPORT
MILL BUILDING SAMPLE LOCATIONS

Scale: 0 100' 200' | Date: DECEMBER, 2007

Prepared By: JOW | Project No. 06W003

L:\06w003\EIA\Appendix\hgr_mill_bldg_sample_locations.dgn
12/21/2007 jow

Appendix A

Mill Building Investigation

A-1

Field Logs

Client: Kennecott
Project: Humboldt Mill
Logged by: TAG,SDJ
Prepared by: LPV
Checked by: SVF

Project #: 06W003
Page: 1 of 1
Date: 3/39/06
Date: 8/7/07
Date: 8/7/07

Field Log of Test Boring

Test Boring No.: Shop Bin 2

Start Date: 3/29/06 Location: Shop Center No GPS in Building

Completion Date: _____ Surface Elevation: _____ Boring Depth: _____

Depth Fr. Lnd. Surf.	Sample No. Depth Interval	Type	N	Rec.	M Color	Description of Material	Class
						Very Dusty, very fine flour consistency	
						White powder in second bin very flour consistency	
						2 scoops from each bin	
						3x3x3 Bins ¾ Full	

Drilling Method: _____ Rig: _____ Depth of Water: At Completion: _____

Drilling Contractor: _____ Driller: _____ Hour Later: _____

Client: Kennecott
Project: Humboldt Mill
Logged by: TAG
Prepared by: LPV
Checked by: SVF

Project #: 06W003
Page: 1 of 1
Date: 3/29/06
Date: 8/7/07
Date: 8/7/07

Field Log of Test Boring

Test Boring No.: Shop Bin 1

Start Date: 3/29/06 Location: No GPS in Building Center of Shop

Completion Date: _____ Surface Elevation: _____ Boring Depth: _____

Depth Fr. Lnd. Surf.	Sample No. Depth Interval	Type	N	Rec.	M Color	Description of Material	Class
						Very hard fine sandy and gravel material, dusty	
						2 borings from each bin composited	
						3x3x3 Bins ¾ Full	

Drilling Method: _____ Rig: _____ Depth of Water: At Completion: _____

Drilling Contractor: _____ Driller: _____ Hour Later: _____

Client: Kennecott
Project: Humboldt Mill
Logged by: SDJ
Prepared by: LPV
Checked by: SVF

Project #: 06W003
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Date: 3/29/06
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Date: 8/7/07

Field Log of Test Boring

Test Boring No.: Leachate Residue Pile

Start Date: 3/29/06 Location: N 46 28 992 W 87 53 803

Completion Date: 3/29/06 Surface Elevation: _____ Boring Depth: _____

Depth Fr. Lnd. Surf.	Sample No. Depth Interval	Type	N	Rec.	M Color	Description of Material	Class
	0-8”					Steel pellets and sand This material is similar to south storage pile A Center of leachate residue pile	

Drilling Method: _____ Rig: _____ Depth of Water: At Completion: _____

Drilling Contractor: _____ Driller: _____ Hour Later: _____

Client: Kennecott
Project: Humboldt Mill
Logged by: SDJ
Prepared by: LPV
Checked by: SVF

Project #: 06W003
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Date: 8/7/07

Field Log of Test Boring

Test Boring No.: South Storage Pile A

Start Date: 3/29/06 Location: N 46 29 011 W 87 53 863

Completion Date: 3/29/06 Surface Elevation: _____ Boring Depth: _____

Depth Fr. Lnd. Surf.	Sample No. Depth Interval	Type	N	Rec.	M Color	Description of Material	Class
	Core 1					7.5YR 5/3 clay medium dense moist, cohesive with dark grey fines 18”	
	Core 2					Dark grey fines 3.3’ with less clay as above Some gravel	
	Core 3					2’ Dark grey fines, some gravel	
	Core 4					1.5’ Dark Grey fines and clay mixed, some gravel	
						Dimensions Pile A 11x21x4.5 is exposed entire area south of mill same material up to MW-102 to fire hydrant	

Drilling Method: _____ Rig: _____ Depth of Water: At Completion: _____

Drilling Contractor: _____ Driller: _____ Hour Later: _____

Client: Kennecott
Project: Humboldt Mill
Logged by: TAG
Prepared by: LPV
Checked by: SVF

Project #: 06W003
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Field Log of Test Boring

Test Boring No.: EE-Floor

Start Date: 3/29/06 Location: _____

Completion Date: _____ Surface Elevation: _____ Boring Depth: _____

Depth Fr. Lnd. Surf.	Sample No. Depth Interval	Type	N	Rec.	M Color	Description of Material	Class
	3					Floor	
	0-4”					8 sample locations (various in building)	
	Shovel + auger					Coarse Black Sand + Gravel with pyrite fragments	

Drilling Method: _____ Rig: _____ Depth of Water: At Completion: _____

Drilling Contractor: _____ Driller: _____ Hour Later: _____

Foth

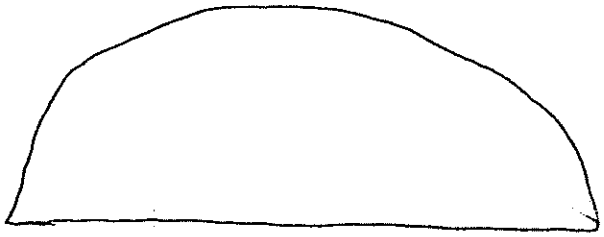
Client: Kennecott
Project: Humboldt Mill
Logged by: TAG
Prepared by: LPV
Checked by: SVF

Project #: 06W003
Page: 1 of 1
Date: 3/29/06
Date: 8/7/07
Date: 8/7/07

Field Log of Test Boring

Test Boring No.: EECB-4
Start Date: 3/29/0
Location: East End Crusher Building South Side
Completion Date: _____ Surface Elevation: _____ Boring Depth: _____

Depth Fr. Lnd. Surf.	Sample No. Depth Interval	Type	N	Rec.	M Color	Description of Material	Class
	2 cores 0-4'					Both augers same material Light gray crush powdered and small gravel size chunks, dusty 14'x25'x5'	



Drilling Method: _____ Rig: _____ Depth of Water: At Completion: _____
Drilling Contractor: _____ Driller: _____ Hour Later: _____

Foth

Client: Kennecott
Project: Humboldt Mill
Logged by: SDJ
Prepared by: LPV
Checked by: SVF

Project #: 06W003
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Date: 3/29/06
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Date: 8/7/07

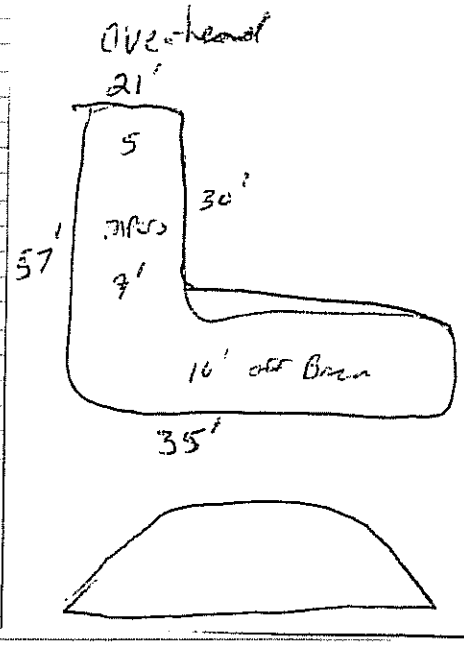
Field Log of Test Boring

Test Boring No.: EECB-3

Start Date: 3/29/06 Location: East End Crusher Building North Side

Completion Date: _____ Surface Elevation: _____ Boring Depth: _____

Depth Fr. Lnd. Surf.	Sample No. Depth Interval	Type	N	Rec.	M Color	Description of Material	Class
	0-5' x2					No GPS in Building	
	Borings					Surface of pile is sporadic	
						Yellow @ surface	
						Material below has small amount of yellow. Majority of material is dark grey with iron pellets	
	Hand Auger						
						Dark grey with iron pellets	
						Material is firm and granular except for yellow clumps and iron pellets	



Drilling Method: _____ Rig: _____ Depth of Water: At Completion: _____

Drilling Contractor: _____ Driller: _____ Hour Later: _____

Foth

Client: Kennecott
Project: Humboldt Mill
Logged by: SDJ
Prepared by: LPV
Checked by: SVF

Project #: 06W003
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Date: 8/7/07

Field Log of Test Boring

Test Boring No.: EECB-2
Start Date: 3/29/06 Location: Crusher Building East End Pile #2
Completion Date: _____ Surface Elevation: _____ Boring Depth: _____

Depth Fr. Lnd. Surf.	Sample No. Depth Interval	Type	N	Rec.	M Color	Description of Material	Class
						No GPS inside building Coarse sandy material, gray 4x3.5x1	

Drilling Method: _____ Rig: _____ Depth of Water: At Completion: _____
Drilling Contractor: _____ Driller: _____ Hour Later: _____

Foth

Client: Kennecott
Project: Humboldt Mill
Logged by: TAG
Prepared by: LPV
Checked by: SVF

Project #: 06W003
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Date: 8/7/07

Field Log of Test Boring

Test Boring No.: EECB-1
Start Date: 3/29/06 Location: Crusher Building East End
Completion Date: _____ Surface Elevation: _____ Boring Depth: _____

Depth Fr. Lnd. Surf.	Sample No. Depth Interval	Type	N	Rec.	M Color	Description of Material	Class
	0-1.5					No GPS inside building 0-1.5 Auger Depth into pile Gray finely ground material like fine sand 12'x10'x30'	

Drilling Method: _____ Rig: _____ Depth of Water: At Completion: _____
Drilling Contractor: _____ Driller: _____ Hour Later: _____

Client: Kennecott
Project: Humboldt Mill
Logged by: SDJ
Prepared by: LPV
Checked by: SVF

Project #: 06W003
Page: 1 of 1
Date: 3/29/06
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Date: 8/7/07

Field Log of Test Boring

Test Boring No.: Shop Super Sack

Start Date: 3/29/06 Location: Center of Shop No GPS

Completion Date: _____ Surface Elevation: _____ Boring Depth: _____

Depth Fr. Lnd. Surf.	Sample No. Depth Interval	Type	N	Rec.	M Color	Description of Material	Class
						2 types of material :	
						One is coarse harder material like in shop bin 2	
						White other material is soft like shop bin 2 flour	
						Total super bags in Shop: 65	
						Bag size generally 48" diameter	
						Average 2.5' high	
						Range from 50" to 12" high	

Drilling Method: _____ Rig: _____ Depth of Water: At Completion: _____

Drilling Contractor: _____ Driller: _____ Hour Later: _____

Client: Kennecott
Project: Humboldt Mill
Logged by: SDJ
Prepared by: LPV
Checked by: SVF

Project #: 06W003
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Date: 8/7/07

Field Log of Test Boring

Test Boring No.: Active Mill Product

Start Date: 3/30/06 Location:

Completion Date: Surface Elevation: Boring Depth:

Depth Fr. Lnd. Surf.	Sample No. Depth Interval	Type	N	Rec.	M Color	Description of Material	Class
						8-55 gal drums	
						Black fine powder silty type	

Drilling Method: Rig: Depth of Water: At Completion:

Drilling Contractor: Driller: Hour Later:

Client: Kennecott
Project: Humboldt Mill
Logged by: SDJ
Prepared by: LPV
Checked by: SVF

Project #: 06W003
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Field Log of Test Boring

Test Boring No.: Mill Super Sack

Start Date: 3/30/06 Location: Inside Mill Floor

Completion Date: 3/30/06 Surface Elevation: _____ Boring Depth: _____

Depth Fr. Lnd. Surf.	Sample No. Depth Interval	Type	N	Rec.	M Color	Description of Material	Class
						22 Super sack and 12 Hopper same material	
						Gray coarse sandy type material	
						Hopper Bins 3x3x3	
						Super sacks (4' cylinder x 3.5' Height)	

Drilling Method: _____ Rig: _____ Depth of Water: At Completion: _____

Drilling Contractor: _____ Driller: _____ Hour Later: _____

Client: Kennecott
Project: Humboldt Mill
Logged by: SDJ
Prepared by: LPV
Checked by: SVF

Project #: 06W003
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Field Log of Test Boring

Test Boring No.: Mill Basement Floor

Start Date: 3/30/06 Location: Mill Basement Floor Composite

Completion Date: _____ Surface Elevation: _____ Boring Depth: _____

Depth Fr. Lnd. Surf.	Sample No. Depth Interval	Type	N	Rec.	M Color	Description of Material	Class
						Dust on Floor	
						Small Shovel-Fulls	
						8 ½ shovel full of mill basement floor composited in metal pan and collect sample	
						Fine sand gray to black with fluffy material seen in bins and bags General 0-3" accumulated on floor	
						No pictures, generally dark with lantern entire mill basement no lights	

Drilling Method: _____ Rig: _____ Depth of Water: At Completion: _____

Drilling Contractor: _____ Driller: _____ Hour Later: _____

Client: Kennecott
Project: Humboldt Mill
Logged by: SDJ
Prepared by: LPV
Checked by: SVF

Project #: 06W003
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Date: 3/30/06
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Field Log of Test Boring

Test Boring No.: Mill Basement Bin

Start Date: 3/30/06 Location: Basement Floor Mill Bin

Completion Date: _____ Surface Elevation: _____ Boring Depth: _____

Depth Fr. Lnd. Surf.	Sample No. Depth Interval	Type	N	Rec.	M Color	Description of Material	Class
						14 3x3x3 Bin	
						All same material	
						md. grain brown sand all pulverized top crust.	
						Sampled below crust	

Drilling Method: _____ Rig: _____ Depth of Water: At Completion: _____

Drilling Contractor: _____ Driller: _____ Hour Later: _____

Client: Kennecott
Project: Humboldt Mill
Logged by: SDJ
Prepared by: LPV
Checked by: SVF

Project #: 06W003
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Field Log of Test Boring

Test Boring No.: Concrete Mill Floor

Start Date: 3/30/06 Location: Concrete Mill Floor by RR Tracks

Completion Date: _____ Surface Elevation: _____ Boring Depth: _____

Depth Fr. Lnd. Surf.	Sample No. Depth Interval	Type	N	Rec.	M Color	Description of Material	Class
						Inside Building	
						Number of composited areas	
						Light gray material	
						~55 gal drum quantity + black rocky material mixed together	
						Light gray material similar to other light gray material	

Drilling Method: _____ Rig: _____ Depth of Water: At Completion: _____

Drilling Contractor: _____ Driller: _____ Hour Later: _____

Client: Kennecott
Project: Humboldt Mill
Logged by: SDJ
Prepared by: LPV
Checked by: SVF

Project #: 06W003
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Date: 3/30/06
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Date: 8/7/07

Field Log of Test Boring

Test Boring No.: Gold Contact

Start Date: 3/30/06 Location: In Building No GPS

Completion Date: _____ Surface Elevation: _____ Boring Depth: _____

Depth Fr. Lnd. Surf.	Sample No. Depth Interval	Type	N	Rec.	M Color	Description of Material	Class
						Mill Floor Basement Gold Contact Pile separate from rest of basement floor	
						2x2x1'	
						Pure white powder, very light with no mass	
						Picture may be dark	

Drilling Method: _____ Rig: _____ Depth of Water: At Completion: _____

Drilling Contractor: _____ Driller: _____ Hour Later: _____

Client: Kennecott
Project: Humboldt Mill
Logged by: SDJ
Prepared by: LPV
Checked by: SVF

Project #: 06W003
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Field Log of Test Boring

Test Boring No.: Mill RR Floor

Start Date: 3/30/06 Location: Mill RR Floor-NW corner Mill

Completion Date: _____ Surface Elevation: _____ Boring Depth: _____

Depth Fr. Lnd. Surf.	Sample No. Depth Interval	Type	N	Rec.	M Color	Description of Material	Class
	0-6”					0-6” Boring	
						2 composite	
						Med. Grain brown sand with gravel	
						2nd Not Needed	
						16’x7’	
						Some super sacks and bins in area	

Drilling Method: _____ Rig: _____ Depth of Water: At Completion: _____

Drilling Contractor: _____ Driller: _____ Hour Later: _____

Client: Kennecott
Project: Humboldt Mill
Logged by: TAG
Prepared by: LPV
Checked by: SVF

Project #: 06W003
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Date: 8/7/07

Field Log of Test Boring

Test Boring No.: Filter Press Floor

Start Date: 3/30/06 Location: No GPS Filter Press Area

Completion Date: _____ Surface Elevation: _____ Boring Depth: _____

Depth Fr. Lnd. Surf.	Sample No. Depth Interval	Type	N	Rec.	M Color	Description of Material	Class
						Gold contact	
						Coarse hard brown sand size particles	
						15 gal pail along with material that looks like flour dry or cat liter.	

Drilling Method: _____ Rig: _____ Depth of Water: At Completion: _____

Drilling Contractor: _____ Driller: _____ Hour Later: _____

Client: Kennecott
Project: Humboldt Mill
Logged by: SDJ
Prepared by: LPV
Checked by: SVF

Project #: 06W003
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Date: 3/30/06
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Date: 8/7/07

Field Log of Test Boring

Test Boring No.: Mill Hopper

Start Date: 3/30/06 Location: No GPS Inside Building

Completion Date: _____ Surface Elevation: _____ Boring Depth: _____

Depth Fr. Lnd. Surf.	Sample No. Depth Interval	Type	N	Rec.	M Color	Description of Material	Class
						Ash type material (fly ash) Gray Powder material can be pulverized in finger with some sand type material Hopper appears to be ½ full with this material and scrap metal 12x16' depth unknown, maybe 1 floor deep	

Drilling Method: _____ Rig: _____ Depth of Water: At Completion: _____

Drilling Contractor: _____ Driller: _____ Hour Later: _____

Client: Kennecott
Project: Humboldt Mill
Logged by: SDJ
Prepared by: LPV
Checked by: SVF

Project #: 06W003
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Field Log of Test Boring

Test Boring No.: Lunch Room Slag

Start Date: 3/30/06 Location: No GPS inside Lunch Room next to Lab

Completion Date: _____ Surface Elevation: _____ Boring Depth: _____

Depth Fr. Lnd. Surf.	Sample No. Depth Interval	Type	N	Rec.	M Color	Description of Material	Class
						Bob Mahin reported very high with lead (Pb)	
						White powder with slag chunks With crucibles Only collected Powder	
						White powder very light hard	
						2-30 gal cardboard drums	

Drilling Method: _____ Rig: _____ Depth of Water: At Completion: _____

Drilling Contractor: _____ Driller: _____ Hour Later: _____

Client: Kennecott
Project: Humboldt Mill
Logged by: JSL
Prepared by: LPV
Checked by: SVF

Project #: 06W003
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Field Log of Test Boring

Test Boring No.: M-2-East

Start Date: 10/31/06 Location: Mill Building

Completion Date: 10/31/06 Surface Elevation: _____ Boring Depth: _____

Depth Fr. Lnd. Surf.	Sample No. Depth Interval	Type	N	Rec.	M Color	Description of Material	Class
						Electric motor control center 2nd floor	
						Wipe sample from oil stain on floor, east room	
						Collect PCB wipe sample	

Drilling Method: _____ Rig: _____ Depth of Water: At Completion: _____

Drilling Contractor: _____ Driller: _____ Hour Later: _____

Client: Kennecott
Project: Humboldt Mill
Logged by: JSL
Prepared by: LPV
Checked by: SVF

Project #: 06W003
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Date: 10/31/06
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Date: 8/7/07

Field Log of Test Boring

Test Boring No.: M-2-West

Start Date: 10/31/06 Location: Mill Building

Completion Date: 10/31/06 Surface Elevation: _____ Boring Depth: _____

Depth Fr. Lnd. Surf.	Sample No. Depth Interval	Type	N	Rec.	M Color	Description of Material	Class
						Electric motor control center 2nd floor	
						Wipe sample from oil stain on floor	
						West Room	
						Collect PCB wipe sample	

Drilling Method: _____ Rig: _____ Depth of Water: At Completion: _____

Drilling Contractor: _____ Driller: _____ Hour Later: _____

Client: Kennecott
Project: Humboldt Mill
Logged by: JSL
Prepared by: LPV
Checked by: SVF

Project #: 06W003
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Date: 10/31/06
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Field Log of Test Boring

Test Boring No.: M-1

Start Date: 10/31/06 Location: Mill Building Ground Floor South Wall

Completion Date: 10/31/06 Surface Elevation: _____ Boring Depth: _____

Depth Fr. Lnd. Surf.	Sample No. Depth Interval	Type	N	Rec.	M Color	Description of Material	Class
						Very fine grained sludge in sample along south wall	
						Dk. Gray, no odor	
						Sample for total metals, TCLP metals	

Drilling Method: _____ Rig: _____ Depth of Water: At Completion: _____

Drilling Contractor: _____ Driller: _____ Hour Later: _____

Client: Kennecott
Project: Humboldt Mill
Logged by: JSL
Prepared by: LPV
Checked by: SVF

Project #: 06W003
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Field Log of Test Boring

Test Boring No.: M-4

Start Date: 10/31/06 Location: Mill Building

Completion Date: 10/31/06 Surface Elevation: _____ Boring Depth: _____

Depth Fr. Lnd. Surf.	Sample No. Depth Interval	Type	N	Rec.	M Color	Description of Material	Class
						Very fine grain grey green material covering floor. Spreading out like a delta, w/the thickest portion closest to the east wall	
						Sample for total metals, TCLP metals, and cyanide	

Drilling Method: _____ Rig: _____ Depth of Water: At Completion: _____

Drilling Contractor: _____ Driller: _____ Hour Later: _____

Client: Kennecott
Project: Humboldt Mill
Logged by: JSL
Prepared by: LPV
Checked by: SVF

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Date: 8/7/07

Field Log of Test Boring

Test Boring No.: M-5

Start Date: 10/31/06 Location: Mill Building

Completion Date: 10/31/06 Surface Elevation: _____ Boring Depth: _____

Depth Fr. Lnd. Surf.	Sample No. Depth Interval	Type	N	Rec.	M Color	Description of Material	Class
						Very fine grain white powder encrusted inside of a discharge pipe at the base of a large storage tank	
						Sample for total metals, TCLP metals, and cyanide	

Drilling Method: _____ Rig: _____ Depth of Water: At Completion: _____

Drilling Contractor: _____ Driller: _____ Hour Later: _____

Client: Kennecott
Project: Humboldt Mill
Logged by: JSL
Prepared by: LPV
Checked by: SVF

Project #: 06W003
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Date: 10/31/06
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Date: 8/7/07

Field Log of Test Boring

Test Boring No.: M-3

Start Date: 10/31/06 Location: Mill Building open tank near east wall

Completion Date: 10/31/06 Surface Elevation: _____ Boring Depth: _____

Depth Fr. Lnd. Surf.	Sample No. Depth Interval	Type	N	Rec.	M Color	Description of Material	Class
						Collect water sample from tank	
						Bird droppings floating on water, no oil sheen observed.	
						Water looks clear w/no odor.	
						Sample for VOCs only.	

Drilling Method: _____ Rig: _____ Depth of Water: At Completion: _____

Drilling Contractor: _____ Driller: _____ Hour Later: _____

Client: Kennecott
Project: Humboldt Mill
Logged by: JSL
Prepared by: LPV
Checked by: SVF

Project #: 06W003
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Date: 8/7/07

Field Log of Test Boring

Test Boring No.: M-6

Start Date: 10/31/06 Location: Mill Building

Completion Date: 10/31/06 Surface Elevation: _____ Boring Depth: _____

Depth Fr. Lnd. Surf.	Sample No. Depth Interval	Type	N	Rec.	M Color	Description of Material	Class
						Tar-like substance on side of concrete block office 2nd floor of mill.	
						Substance appears to be originating from 1" piping running along roof line of structure.	
						Sample for PCBs	

Drilling Method: _____ Rig: _____ Depth of Water: At Completion: _____

Drilling Contractor: _____ Driller: _____ Hour Later: _____

A-2

Analytical Results

Appendix A-2
Mill Building Results

Client: Kennecott Eagle Minerals Company Project ID.: 06W003
Project: Humboldt Mill Project
Prepared by: SVF Date: 05/07/07
Checked by: JSL Date: 05/07/07

Parameter	Units	Matrix	Criteria DWPC	DWPC Code	RCDWC	RCDWC Code	Criteria DCC	DCC Code	PCB	TCLP	Sample ID	ACTIVE MILL PRODUCT	CB-FLOOR	CONCRETE MILL FLOOR	EECB-1	EECB-2	EECB-3	EECB-4	FILTER PRESS FLOOR	GOLD CONTACT	LEACHATE RESIDUE PILE	LUNCH ROOM SLAG	M-1	M-2-East	M-2-West	M-3	M-4	M-5	M-6	MILL BASEMENT BIN	MILL BASEMENT FLOOR	MILL HOPPER	MILL RR FLOOR	MILL SUPER SACK	SHOP BIN 1	SHOP BIN 2	SHOP SUPER SACK	SOUTH STORAGE PILE A
											Collection Date	3/30/2006	3/29/2006	3/30/2006	3/29/2006	3/29/2006	3/29/2006	3/29/2006	3/30/2006	3/30/2006	3/29/2006	3/30/2006	10/31/2006	10/31/2006	10/31/2006	10/31/2006	10/31/2006	10/31/2006	10/31/2006	3/30/2006	3/30/2006	3/30/2006	3/30/2006	3/30/2006	3/29/2006	3/29/2006	3/29/2006	3/29/2006
											Criteria Compared to	DCC	DCC	DCC	DCC	DCC	DCC	DCC	DCC	DCC	DWPC	DCC	DCC	PCB	PCB	DWPC	DCC	DCC	PCB	DCC	DCC	DCC	DCC	DCC	DCC	DCC	DCC	DWPC
Metal																																						
Aluminum	mg/kg	SOIL	1				50000	DD				340	28000	1000	7700	180000	1700	1000	6500	480	1700	32	1500				1700	230		3800	10000	2600	7800	150000	1600	5300	180000	3300
Antimony	mg/kg	SOIL	4.3	M			180					0.71	8.1	0.57	3.4	14	55	0.49	90	2.7	12	<0.063 U	590				170	1700		540	160	0.44	11	14	25	0.75	11	81
Arsenic	mg/kg	SOIL	4.6				7.6					2.4	19	2.5	25	1.0 B	62	4.1	100	6.9	26	0.21 B	140				260	670		250	200	0.99 B	44	1.2 B	53	0.70 B	0.96 B	120
Barium	mg/kg	SOIL	1300				37000					8.9	33	52	8.7	100	5.2	96	64	6.4	18	1.4	5.5				2.6	7.3		8.8	290	58	29	130	4.5	110	130	14
Beryllium	mg/kg	SOIL	51				410					0.070 B	0.83	0.076 B	0.27 B	0.76	0.10 B	0.041 B	0.8	0.058 B	0.10 B	<0.015 U	0.022 B				0.024 B	0.043 B		0.23 B	1.2	1.6	0.38 B	1.4	0.031 B	1.4	1.8	0.093 B
Boron	mg/kg	SOIL	10				48000	DD															3.1 B				1.3 B	29										
Cadmium	mg/kg	SOIL	6				550					0.84	0.5	0.72	0.21 B	1.3	0.41 B	1.2	43	0.57	0.13 B	<0.020 U	3.3				0.84	<0.025 U		3	5.9	1.8	1.4	1.5	0.59	4.6	4.7	0.66
Chromium	mg/kg	SOIL	30	D			2500					120	53	9	63	72	120	3.1	150	7.7	87	0.20 B	170				140	84		430	270	1100	250	97	50	210	180	240
Cobalt	mg/kg	SOIL	0.8				2600					23	20	1.2	11	2.9	36	0.86 B	21	3.2	8.7	0.059 B	310				380	6.1		59	180	220	38	2.3	42	82	2.5	75
Copper	mg/kg	SOIL	5800				20000					13000	330	21	28	4900	170	13	2300	32	51	0.33 B	1100				630	500		170	510	36	220	3700	110	46	3700	270
Iron	mg/kg	SOIL	6				160000					250000	31000	5100	30000	4600	37000	4300	160000	3000	26000	110	370000				310000	250000		51000	110000	8500	45000	5800	36000	4500	6000	73000
Lead	mg/kg	SOIL	700				400					7.9 B	28	270	16	110	180	200	1200	320	200	430	730				120	5.1		3300	400	1.9	110	120	77	3.8	120	280
Lithium	mg/kg	SOIL	3.4				4200	DD															2.4				2.1	<0.26 U										
Magnesium	mg/kg	SOIL	8000				1000000	DD				450	11000	24000	12000	5000	2100	33000	5800	580	1200	21	2200				4100	1000		13000	7100	230	9000	6500	410	490	2900	3900
Manganese	mg/kg	SOIL	1				25000					3800	400	620	290	660	45	830	740	28	76	1.5	53				47	1200		210	430	120	500	600	32	93	730	71
Mercury	mg/kg	SOIL	1.7				160					<0.0017 U	0.0057 B	0.2	0.0080 B	0.0027 B	0.074	0.12	1.2	0.041	0.062	0.0023 U	0.15				0.075	0.041		0.19	0.18	0.022	0.16	0.0051 B	0.021	0.018	0.077	0.061
Molybdenum	mg/kg	SOIL	1.5				2600																230				150	5.7										
Nickel	mg/kg	SOIL	100				40000					40000	73	27	74	210	100	18	950	58	40	0.14 B	520				760	730		200	920	1300	510	110	92	490	170	160
Selenium	mg/kg	SOIL	4				2600					1.8 B	0.55 B	0.14 B	0.47 B	2.1 B	1.4 B	0.24 B	9.6	0.12 B	1.1 B	<0.11 U	9.1				9.9	4.1		5.3	2.8	0.49 B	0.68 B	6.1	0.89 B	0.45 B	1.0 B	2.9 B
Silver	mg/kg	SOIL	4.5				2500					0.31	1.6	0.21 B	1.2	1.1	16	0.17 B	500	1.9	5	0.030 B	180				61	3		14	48	0.25 B	3	0.84	7.7	0.61	0.85	23
Thallium	mg/kg	SOIL	2.3				35					0.20 B	0.045 B	0.043 B	0.039 B	0.053 B	0.042 B	0.042 B	0.13 B	0.021 B	0.070 B	<0.0042 U	0.088 B				0.055 B	<0.016 U		0.031 B	0.043 B	0.025 B	0.069 B	0.054 B	0.025 B	<0.0031 U	0.75 B	0.10 B
Vanadium	mg/kg	SOIL	72				750	DD				22	25	2.1	16	27	5.5	2.7	20	3.8	13	0.32 B	1				1.9	2.1		8.6	19	<0.34 U	23	66	2	3.3	38	10
Zinc	mg/kg	SOIL	2400				170000					97000	200	430	34	3200	33	550	7800	1100	32	<1.5 U	170				79	10000		210	680	15	1000	1900	24	17	2700	54
TCLP																																						
Arsenic - TCLP	mg/L	SOIL								5		<0.038 U	<0.038 U	<0.038 U	<0.038 U	<0.038 U	<0.038 U	<0.038 U	<0.038 U	<0.038 U	<0.038 U	<0.038 U	<0.038 U				<0.038 U	0.47 B		<0.038 U	<0.038 U	<0.038 U	<0.038 U	<0.038 U	0.079 B	<0.038 U	<0.038 U	<0.038 U
Barium - TCLP	mg/L	SOIL								100		0.27 B	0.55 B	0.30 B	0.14 B	0.78 B	0.026 B	0.49 B	0.11 B	0.054 B	0.040 B	0.066 B	0.088 B				0.068 B	0.11 B		0.055 B	0.24 B	0.25 B	0.17 B	1.3	0.028 B	0.40 B	1.3	0.038 B
Cadmium - TCLP	mg/L	SOIL								1		<0.0037 U	0.0037 B	0.015 B	<0.0037 U	0.011 B	0.026 B	0.014 B	0.45	0.028 B	<0.0037 U	<0.0037 U	0.024 B				0.016 B	<0.0037 U		0.057 B	0.042 B	<0.0037 U	0.017 B	0.012 B	0.0092 B	<0.0037 U	0.0082 B	<0.0037 U
Chromium - TCLP	mg/L	SOIL								5		<0.0066 U	0.021 B	<0.0066 U	<0.0066 U	<0.0066 U	0.57	0.084 B	<0.0066 U	0.014 B	<0.0066 U	<0.0066 U	0.011 B				0.0090 B	<0.0066 U		0.010 B	0.11 B	0.29	<0.0066 U	0.011 B	0.21 B	0.083 B	0.29	0.16 B
Lead - TCLP	mg/L	SOIL								5		0.061 B	0.12 B	8.3	0.023 B	0.17 B	0.022 B	0.20 B	0.14 B	19	<0.017 U	24	<0.017 U				<0.017 U	<0.017 U		2	0.53 B	0.24 B	0.12 B	0.38 B	<0.017 U	<0.017 U	0.29 B	<0.017 U
Mercury - TCLP	mg/L	SOIL								0.1		<0.029 U	<0.029 U	<0.029 U	<0.029 U	<0.029 U	<0.029 U	<0.029 U	0.076 B	<0.029 U	<0.029 U	<0.029 U	<0.000072 U				<0.000072 U	0.00052		<0.029 U	<0.029 U	<0.029 U	<0.029 U	<0.029 U	<0.029 U	<0.029 U	<0.029 U	<0.029 U
Selenium - TCLP	mg/L	SOIL								1		<0.042 U	<0.042 U	<0.042 U	<0.042 U	<0.042 U	<0.042 U	<0.042 U	<0.042 U	<0.042 U	<0.042 U	<0.042 U	<0.042 U				<0.042 U	<0.042 U		<0.042 U	<0.042 U	<0.042 U	<0.042 U	<0.042 U	<0.042 U	<0.042 U	<0.042 U	<0.042 U
Silver - TCLP	mg/L	SOIL								5		<0.013 U	<0.013 U	0.068 B	<0.013 U	<0.013 U	<0.013 U	<0.013 U	0.46	<0.013 U	<0.013 U	<0.013 U	<0.013 U				<0.013 U	<0.013 U		<0.013 U	<0.013 U	<0.013 U	<0.013 U	<0.013 U	<0.013 U	<0.013 U	<0.013 U	<0.013 U
PCBs																																						
Aroclor-1016	ug/kg	SOIL							1000																				<28 U									
Aroclor-1221	ug/kg	SOIL							1000																				<28 U									
Aroclor-1232	ug/kg	SOIL							1000																				<28 U									
Aroclor-1242	ug/kg	SOIL							1000																				560									
Aroclor-1248	ug/kg	SOIL							1000																				<28 U									
Aroclor-1254	ug/kg	SOIL							1000																				490									
Aroclor-1260	ug/kg	SOIL							1000																				270									
Total PCBs	ug/Kg	SOIL						T	1000																				1300									
Aroclor-1016	ug/wipe	WIPE							10															<0.080 U	<0.080 U													
Aroclor-1221	ug/wipe	WIPE							10															<0.080 U	<0.080 U													
Aroclor-1232	ug/wipe	WIPE							10															<0.080 U	<0.080 U													
Aroclor-1242	ug/wipe	WIPE							10															0.59 J	<0.080 U													
Aroclor-1248	ug/wipe	WIPE							10															<0.080 U	<0.080 U													
Aroclor-1254	ug/wipe	WIPE							10															<0.080 U	<0.080 U													
Aroclor-1260	ug/wipe	WIPE							10															6.5	8.6													
Total PCBs	ug/wipe	WIPE							10															7.1	8.6													
Physical Property																																						
Cyanide, total	mg/kg	SOIL	4		1	E	12					<0.28 U	0.61	<0.28 U	<0.28 U	0.41 B	2.7	<0.29 U	2800	5.7	0.34 B	<0.38 U					8.8	460		59	41	0.34 B	9.2	2.5	0.63	0.38 B	1.2	1.7
Percent Solids	%	SOIL										99.7	97.5	99.5	99.7	84.7	89.1	96.2	91.3	94.1	85.4	74.4	79.9				72.7	92	96	97.2	98.2	99.8	95.7	92.3	98.2	99.8	91	85.8
VOC																																						
1,1,1,2-Tetrachloroethane	ug/L	WASTE			77																					<0.92 U											
1,1,1-Trichloroethane	ug/L	WASTE			200	A																				<0.90 U											
1,1,2,2-Tetrachloroethane	ug/L	WASTE			8.5																					<0.20 U											
1,1,2-Trichloroethane	ug/L	WASTE			5	A																				<0.42 U											
1,1-Dichloroethane	ug/L	WASTE			880																					<0.75 U											
1,1-Dichloroethene	ug/L	WASTE			7	A																				<0.57 U											
1,1-Dichloropropene	ug/L	WASTE																								<0.75 U											
1,2,3-Trichlorobenzene	ug/L	WASTE																								<0.74 U											
1,2,3-Trichloropropane	ug/L	WASTE			42																					<0.99 U											
1,2,4-Trichlorobenzene	ug/L	WASTE			70	A																				<0.97 U											
1,2,4-Trimethylbenzene	ug/L	WASTE			63	E																				<0.97 U											
1,2-Dibromo-3-chloropropane	ug/L	WASTE			0.2	A																				<0.87 U											
1,2-Dibromoethane	ug/L	WASTE																								<0.56 U											
1,2-Dichlorobenzene	ug/L	WASTE			600	A																				<0.83 U											
1,2-Dichloroethane	ug/L	WASTE			5	A																				<0.36 U											
1,2-Dichloropropane	ug/L	WASTE			5	A																				<0.46 U											
1,3,5-Trimethylbenzene	ug/L	WASTE			72	E																				<0.83 U											
1,3-Dichlorobenzene	ug/L	WASTE			6.6																					<0.87 U											
1,3-Dichloropropane	ug/L	WASTE			8.5																					<0.61 U											
1,4-Dichlorobenzene	ug/L	WASTE			75	A																				<0.95 U											
2,2-Dichloropropane	ug/L	WASTE																								<0.62 U											
2-Chlorotoluene	ug/L	WASTE			150																					<0.85 U											
4-Chlorotoluene	ug/L	WASTE																								<0.74 U											
Benzene	ug/L	WASTE			5	A																				<0.41 U											
Bromobenzene	ug/L	WASTE			18																					<0.82 U											
Bromochloromethane	ug/L	WASTE																								<0.97 U											
Bromodichloromethane	ug/L	WASTE			100	A,W																				<0.56 U											
Bromoform	ug/L	WASTE			100	A,W																				<0.94 U											
Bromomethane	ug/L	WASTE			10																					<0.91 U											
Carbon Tetrachloride	ug/L	WASTE			5	A																				<0.49 U											
Chlorobenzene	ug/L	WASTE			100	A																				<0.41 U											
Chlorodibromomethane	ug/L	WASTE			100	A,W																				<0.81 U											
Chloroethane	ug/L	WASTE			430																					<0.97 U											
Chloroform	ug/L	WASTE			100	A,W																				<0.37 U											
Chloromethane	ug/L	WASTE			260																					<0.24 U											
cis-1,2-Dichloroethene	ug/L	WASTE			70	S																				<0.83 U											
cis-1,3-Dichloropropene	ug/L	WASTE			8.5																					<0.19 U											
Dibromomethane	ug/L	WASTE			80																					<0.60 U											
Dichlorodifluoromethane	ug/L	WASTE			1700																					<0.99 U											
Diisopropyl Ether	ug/L	WASTE			30																					<0.76 U											
Ethylbenzene	ug/l	WASTE			74	E																				<0.54 U											
Fluorotrichloromethane	ug/L	WASTE			2600																					<0.79 U											
Hexachlorobutadiene	ug/L	WASTE			15																					<0.67 U											
Isopropylbenzene	ug/L	WASTE			800																					<0.59 U											
Methyl T-Butyl ether	ug/L	WASTE			40	E																				<0.61 U											
Methylene Chloride	ug/L	WASTE			5	A																				<0.43 U											
n-Butylbenzene	ug/L	WASTE			80																					<0.93 U											
n-Propylbenzene	ug/L	WASTE			80																					<0.81 U											
p-Isopropyltoluene	ug/L	WASTE																								<0.67 U											
s-Butylbenzene	ug/L	WASTE			80																					<0.89 U											
Styrene	ug/L	WASTE			100	A																				<0.86 U											

Prepared by: SVF
Checked by: JSL

Appendix A-2
Mill Building Results

			Criteria								Samples																												
Parameter	Units	Matrix	DWPC	DWPC Code	RCDWC	RCDWC Code	DCC	DCC Code	PCB	TCLP	Sample ID	ACTIVE MILL PRODUCT	CB-FLOOR	CONCRETE MILL FLOOR	EECB-1	EECB-2	EECB-3	EECB-4	FILTER PRESS FLOOR	GOLD CONTACT	LEACHATE RESIDUE PILE	LUNCH ROOM SLAG	M-1	M-2-East	M-2-West	M-3	M-4	M-5	M-6	MILL BASEMENT BIN	MILL BASEMENT FLOOR	MILL HOPPER	MILL RR FLOOR	MILL SUPER SACK	SHOP BIN 1	SHOP BIN 2	SHOP SUPER SACK	SOUTH STORAGE PILE A
											Collection Date	3/30/2006	3/29/2006	3/30/2006	3/29/2006	3/29/2006	3/29/2006	3/29/2006	3/30/2006	3/30/2006	3/29/2006	3/30/2006	10/31/2006	10/31/2006	10/31/2006	10/31/2006	10/31/2006	10/31/2006	10/31/2006	3/30/2006	3/30/2006	3/30/2006	3/30/2006	3/30/2006	3/29/2006	3/29/2006	3/29/2006	3/29/2006
											Criteria Compared to	DCC	DCC	DCC	DCC	DCC	DCC	DCC	DCC	DCC	DWPC	DCC	DCC	DCC	DWPC	DCC	DCC	PCB	DCC	DCC	DCC	DCC	DCC	DCC	DCC	DCC	DCC	DWPC
t-Butylbenzene	ug/L	WASTE			80																					<0.97 U												
Tetrachloroethene	ug/L	WASTE			5	A																				<0.45 U												
Toluene	ug/L	WASTE			790	E																				<0.67 U												
trans-1,2-Dichloroethene	ug/L	WASTE			100	A																				<0.89 U												
trans-1,3-Dichloropropene	ug/L	WASTE			8.5																					<0.19 U												
Trichloroethene	ug/L	WASTE			5	A																				<0.48 U												
Vinyl Chloride	ug/L	WASTE			2	A																				<0.18 U												
Xylenes, m + p	ug/L	WASTE			280	E																				<1.8 U												
Xylenes, o	ug/L	WASTE			280	E																				<0.83 U												
Naphthalene	ug/L	WASTE			520																					<0.74 U												

Footnotes:
< = The analyte was not detected at or above the reporting limit.
B = The analyte was detected between the method detection limit and the reporting limit.
DCC = Direct Contact Criteria for soil
DWPC = Drinking Water Protection Criteria - soil
J = Concentration detected equal to or greater than the method detection limit but less than the reporting limit.
mg/kg = milligrams/kilogram
PCB = Poly chlorinated biphenyls
RCDWC = Residential/Commercial Drinking Water Criteria - water
U = The analyte was not detected at or above the reporting limit.
ug/kg = micrograms/kilogram
ug/L = micrograms/liter
TCLP = Toxicity characteristic leaching procedure
M = Calculated criterion is below the analytical target detection lmit, therefore the criterion defaults to the target detection limit
D = Calculated criterion exceed the 100%, hence it is reduced to 100% or 1.0E + 9 parts per billion
T = Refer to the Federal Toxic Substances Control Act (TSCA), 40 CFR §761, Subpart D and 40 CFR, §761 Subpart G to determine the applicability of TSCA clean up standards. See MDEQ operational memoranda for the Part 201 and Part 231 programs for more details.
DD = Hazardous substances causes developmental effects. See MDEQ operational memoranda for the Part 201 and Part 231 programs for more details.
VOC = Volatile organic compound
mg/L = milligrams/Liter

Client:	Kennecott Eagle Minerals Company	Project ID.: 06W003
Project:	Humboldt Mill Project	
Prepared by:	SVF	Date: 05/07/07
Checked by:	JSL	Date: 05/07/07

Buried Pyrite Material

Field ID	HA-1BP			HA-2BP			HA-3BP			Soil: Residential and Commercial I Generic Cleanup Criteria and Screening Levels (mg/kg)			
Sample Date	6/6/2006			6/6/2006			6/6/2006						
Parameter		Result	Units		Result	Units		Result	Units	State-Wide Default Background Levels	Drinking Water Protection Criteria	Direct Contact Criteria	EPA TCLP Criteria (mg/L)
Arsenic		320	mg/Kg		60	mg/Kg		32	mg/Kg	5.8	23	7.6	
Arsenic - SPLP		0.2	mg/L	<	0.02	mg/L	<	0.02	mg/L				5.0
Arsenic - TCLP	<	1.0	mg/L	<	1.0	mg/L	<	1.0	mg/L				5.0
Barium		6.1	mg/Kg		24	mg/Kg		18	mg/Kg	75	1,300	37,000	
Barium - SPLP		0.29	mg/L		0.3	mg/L		0.39	mg/L				100
Barium - TCLP	<	1.0	mg/L	<	1.0	mg/L	<	1.0	mg/L				100
Cadmium	<	5.8	mg/Kg	<	0.54	mg/Kg	<	0.52	mg/Kg	1.2	6.0	550	
Cadmium - SPLP		0.015	mg/L	<	0.005	mg/L	<	0.005	mg/L				1.0
Cadmium - TCLP	<	0.25	mg/L	<	0.25	mg/L	<	0.25	mg/L				1.0
Chromium		250	mg/Kg		64	mg/Kg		54	mg/Kg	18	30	2,500	
Chromium - SPLP		1.7	mg/L		0.032	mg/L	<	0.005	mg/L				5.0
Chromium - TCLP	<	0.25	mg/L	<	0.25	mg/L	<	0.25	mg/L				5.0
Copper		310	mg/Kg		63	mg/Kg		27	mg/Kg	32	5,800	20,000	
Copper - SPLP		11	mg/L		0.24	mg/L		0.046	mg/L				
Copper - TCLP		1.3	mg/L	<	0.25	mg/L	<	0.25	mg/L				
Lead		350	mg/Kg		64	mg/Kg		10	mg/Kg	21	700	400	
Lead - SPLP		0.037	mg/L	<	0.01	mg/L	<	0.01	mg/L				5.0
Lead - TCLP	<	1.0	mg/L	<	1.0	mg/L	<	1.0	mg/L				5.0
Mercury		0.061	mg/Kg		0.022	mg/Kg		0.016	mg/Kg	0.13	1.7	160	
Mercury - SPLP	<	0.0002	mg/L	<	0.0002	mg/L	<	0.0002	mg/L				0.2
Mercury - TCLP	<	0.080	mg/L	<	0.080	mg/L	<	0.080	mg/L				0.2
Nickel		300	mg/Kg		34	mg/Kg		27	mg/Kg	20	100	40,000	
Nickel - SPLP		2.6	mg/L		0.058	mg/L		0.029	mg/L				
Nickel - TCLP		1.7	mg/L	<	0.25	mg/L	<	0.25	mg/L				
Percent Solids		86.0	%		93.2	%		95.6	%				
Selenium	<	23	mg/Kg	<	2.1	mg/Kg	<	2.1	mg/Kg	0.41	4	2,600	
Selenium - SPLP	<	0.02	mg/L	<	0.02	mg/L	<	0.02	mg/L				1.0
Selenium - TCLP	<	1.0	mg/L	<	1.0	mg/L	<	1.0	mg/L				1.0
Silver		18	mg/Kg		3.4	mg/Kg	<	1.0	mg/Kg	1	4.5	2,500	
Silver - SPLP	<	0.01	mg/L	<	0.01	mg/L	<	0.01	mg/L				5.0
Silver - TCLP	<	0.25	mg/L	<	0.25	mg/L	<	0.25	mg/L				5.0

Notes:

SPLP = Synthetic Precipitation Leaching Procedure
TCLP = Toxicity Characteristic Leaching Procedure
< = The analyte was not detected at or above the reporting limit
mg/kg = milligrams/kilogram
mg/L = millograms/Liter

Yellow shading indicates exceedance of drinking water protection criteria.
Blue shading indicates exceedance of direct contact criteria.
Red shading indicates exceedance of TCLP criteria.

A-3

Laboratory Analytical Reports

Batch No. 870383
Stockpile Sample Data

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, Inc.
1241 Bellevue Street, Suite 9
Green Bay, WI 54302
Phone: 920.469.2436
Fax: 920.469.8827

May 3, 2006

Janis Kesy
Foth & Van Dyke
2737 South Ridge Road
Green Bay, WI 54304

Dear Ms. Kesy:

Enclosed is a report for the analysis of environmental samples and associated QC samples for the KEMC project (06W003). The samples were assigned to batch number 870383 for laboratory tracking purposes.

A table of the results has also been sent to you via e-mail.

If you have any questions regarding this data please call me at (608) 232-3300 ext. 302.

Sincerely,

Tod Noltemeyer
Project Manager

Pace Analytical®

MASTER FILE COPY

Scope 06W003 Classification 10,500

Copy To SVDI, CEDI, JSK

1241 Bellevue Street, Suite 9
Green Bay, WI 54302
920-469-2436, Fax: 920-469-8827

Analytical Report Number: 870383

Client: FOTH & VAN DYKE

Lab Contact: Tod Noltemeyer

Project Name: KEMC

Project Number: 06W003

Lab Sample Number	Field ID	Matrix	Collection Date
870383-001	SOUTH STORAGE PILE A	SOIL	03/29/06
870383-002	LEACHATE RESIDUE PILE	SOIL	03/29/06
870383-003	SHOP SUPER SACK	SOIL	03/29/06
870383-004	SHOP BIN 2	SOIL	03/29/06
870383-005	SHOP BIN 1	SOIL	03/29/06
870383-006	EECB-2	SOIL	03/29/06
870383-007	EECB-1	SOIL	03/29/06
870383-008	EECB-4	SOIL	03/29/06
870383-009	EECB-3	SOIL	03/29/06
870383-010	CB-FLOOR	SOIL	03/29/06
870383-011	MILL BASEMENT FLOOR	SOIL	03/30/06
870383-012	GOLD CONTACT	SOIL	03/30/06
870383-013	MILL BASEMENT BIN	SOIL	03/30/06
870383-014	ACTIVE MILL PRODUCT	SOIL	03/30/06
870383-015	FILTER PRESS FLOOR	SOIL	03/30/06
870383-016	CONCRETE MILL FLOOR	SOIL	03/30/06
870383-017	MILL HOPPER	SOIL	03/30/06
870383-018	MILL SUPER SACK	SOIL	03/30/06
870383-019	MILL RR FLOOR	SOIL	03/30/06
870383-020	LUNCH ROOM SLAG	SOIL	03/30/06
870383-021	BELOW BEAVER POND	WATER	03/30/06

I certify that the data contained in this Final Report has been generated and reviewed in accordance with approved methods and Laboratory Standard Operating Procedure. Exceptions, if any, are discussed in the accompanying sample comments. Release of this final report is authorized by Laboratory management, as is verified by the following signature. This report shall not be reproduced, except in full, without the written consent of Pace Analytical Services, Inc. The sample results relate only to the analytes of interest tested.

Approval Signature

5/3/06

Date

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436

Analytical Report Number: 870383

Client : FOTH & VAN DYKE
Project Name : KEMC
Project Number : 06W003
Field ID : SOUTH STORAGE PILE A

Matrix Type : SOIL
Collection Date : 03/29/06
Report Date : 04/26/06
Lab Sample Number : 870383-001

INORGANICS

Test	Result		MDL	EQL	Dil.	Units	Code	Anl Date	Prep Method	Anl Method
Leach Date - Conventionals	Done				1			04/05/06	SW846 1311	
Aluminum	3300		26	170	10	mg/kg		04/21/06	SW846 3050B	SW846 6020
Antimony	81		0.056	0.35	1	mg/kg	N*	04/17/06	3050B Sec7.5	SW846 6020
Arsenic	120		0.17	1.7	5	mg/kg	*	04/19/06	SW846 3050B	SW846 6020
Arsenic - TCLP	0.038	U	0.038	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Barium	14		0.093	1.7	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Barium - TCLP	0.038	B	0.0050	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Beryllium	0.093	B	0.064	0.58	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cadmium	0.66		0.087	0.58	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cadmium - TCLP	0.0037	U	0.0037	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Chromium	240		0.29	1.7	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Chromium - TCLP	0.16	B	0.0066	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Cobalt	75		0.031	1.2	5	mg/kg	N*	04/19/06	SW846 3050B	SW846 6020
Copper	270		0.19	5.8	5	mg/kg	*	04/19/06	SW846 3050B	SW846 6020
Iron	73000		420	7000	200	mg/kg	*	04/19/06	SW846 3050B	SW846 6020
Lead	280		0.087	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Lead - TCLP	0.017	U	0.017	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Magnesium	3900		8.2	87	5	mg/kg	N	04/19/06	SW846 3050B	SW846 6020
Manganese	71		0.076	1.2	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Mercury	0.061		0.0017	0.010	1	mg/kg		04/10/06	SW846 7471A	SW846 7471A
Mercury - TCLP	0.029	U	0.029	0.080	1	mg/L		04/12/06	SW846 7470A	SW846 7470A
Nickel	160		0.12	1.7	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Selenium	2.9	B	0.48	2.9	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Selenium - TCLP	0.042	U	0.042	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Silver	23		0.016	0.35	1	mg/kg	N*	04/17/06	3050B Sec7.5	SW846 6020
Silver - TCLP	0.013	U	0.013	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Thallium	0.10	B	0.018	1.7	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Vanadium	10		0.099	1.7	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Zinc	54		6.4	17	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cyanide, Total	1.7		0.33	0.70	1	mg/kg		04/10/06	SW846 9012A	SW846 9012A
Percent Solids	85.8		---	---	1	%		04/03/06	SM M2540G	SM M2540G

All soil results are reported on a dry weight basis unless otherwise noted.

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436

Analytical Report Number: 870383

Client : FOTH & VAN DYKE
Project Name : KEMC
Project Number : 06W003
Field ID : LEACHATE RESIDUE PILE

Matrix Type : SOIL
Collection Date : 03/29/06
Report Date : 04/26/06
Lab Sample Number : 870383-002

INORGANICS

Test	Result		MDL	EQL	Dil.	Units	Code	Anl Date	Prep Method	Anl Method
Leach Date - Conventionals	Done				1			04/05/06	SW846 1311	
Aluminum	1700		13	88	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Antimony	12		0.056	0.35	1	mg/kg		04/17/06	3050B Sec7.5	SW846 6020
Arsenic	26		0.17	1.8	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Arsenic - TCLP	0.038	U	0.038	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Barium	18		0.094	1.8	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Barium - TCLP	0.040	B	0.0050	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Beryllium	0.10	B	0.064	0.59	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cadmium	0.13	B	0.088	0.59	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cadmium - TCLP	0.0037	U	0.0037	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Chromium	87		0.29	1.8	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Chromium - TCLP	0.0066	U	0.0066	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Cobalt	8.7		0.031	1.2	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Copper	51		0.19	5.9	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Iron	26000		11	180	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Lead	200		0.088	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Lead - TCLP	0.017	U	0.017	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Magnesium	1200		8.2	88	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Manganese	76		0.076	1.2	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Mercury	0.062		0.0017	0.010	1	mg/kg		04/10/06	SW846 7471A	SW846 7471A
Mercury - TCLP	0.029	U	0.029	0.080	1	mg/L		04/12/06	SW846 7470A	SW846 7470A
Nickel	40		0.12	1.8	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Selenium	1.1	B	0.48	2.9	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Selenium - TCLP	0.042	U	0.042	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Silver	5.0		0.016	0.35	1	mg/kg		04/17/06	3050B Sec7.5	SW846 6020
Silver - TCLP	0.013	U	0.013	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Thallium	0.070	B	0.018	1.8	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Vanadium	13		0.10	1.8	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Zinc	32		6.4	18	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cyanide, Total	0.34	B	0.32	0.67	1	mg/kg		04/10/06	SW846 9012A	SW846 9012A
Percent Solids	85.4		---	---	1	%		04/03/06	SM M2540G	SM M2540G

All soil results are reported on a dry weight basis unless otherwise noted.

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436

Analytical Report Number: 870383

Client : FOTH & VAN DYKE
Project Name : KEMC
Project Number : 06W003
Field ID : SHOP SUPER SACK

Matrix Type : SOIL
Collection Date : 03/29/06
Report Date : 04/26/06
Lab Sample Number : 870383-003

INORGANICS

Test	Result		MDL	EQL	Dil.	Units	Code	Anl Date	Prep Method	Anl Method
Leach Date - Conventionals	Done				1			04/05/06	SW846 1311	
Aluminum	180000		240	1600	100	mg/kg		04/24/06	SW846 3050B	SW846 6020
Antimony	11		0.053	0.33	1	mg/kg		04/17/06	3050B Sec7.5	SW846 6020
Arsenic	0.96	B	0.16	1.6	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Arsenic - TCLP	0.038	U	0.038	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Barium	130		0.086	1.6	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Barium - TCLP	1.3		0.0050	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Beryllium	1.8		0.059	0.54	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cadmium	4.7		0.081	0.54	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cadmium - TCLP	0.0082	B	0.0037	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Chromium	180		0.26	1.6	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Chromium - TCLP	0.29		0.0066	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Cobalt	2.5		0.029	1.1	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Copper	3700		0.18	5.4	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Iron	6000		9.7	160	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Lead	120		1.6	27	100	mg/kg		04/19/06	SW846 3050B	SW846 6020
Lead - TCLP	0.29	B	0.017	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Magnesium	2900		7.5	81	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Manganese	730		0.070	1.1	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Mercury	0.077		0.0017	0.010	1	mg/kg		04/10/06	SW846 7471A	SW846 7471A
Mercury - TCLP	0.029	U	0.029	0.080	1	mg/L		04/12/06	SW846 7470A	SW846 7470A
Nickel	170		0.11	1.6	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Selenium	1.0	B	0.44	2.7	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Selenium - TCLP	0.042	U	0.042	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Silver	0.85		0.015	0.33	1	mg/kg		04/17/06	3050B Sec7.5	SW846 6020
Silver - TCLP	0.013	U	0.013	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Thallium	0.75	B	0.33	32	100	mg/kg		04/19/06	SW846 3050B	SW846 6020
Vanadium	38		0.092	1.6	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Zinc	2700		5.9	16	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cyanide, Total	1.2		0.31	0.66	1	mg/kg		04/10/06	SW846 9012A	SW846 9012A
Percent Solids	91.0		---	---	1	%		04/03/06	SM M2540G	SM M2540G

All soil results are reported on a dry weight basis unless otherwise noted.

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436

Analytical Report Number: 870383

Client : FOTH & VAN DYKE
Project Name : KEMC
Project Number : 06W003
Field ID : SHOP BIN 2

Matrix Type : SOIL
Collection Date : 03/29/06
Report Date : 04/26/06
Lab Sample Number : 870383-004

INORGANICS

Test	Result		MDL	EQL	Dil.	Units	Code	Anl Date	Prep Method	Anl Method
Leach Date - Conventionals	Done				1			04/05/06	SW846 1311	
Aluminum	5300		11	75	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Antimony	0.75		0.047	0.29	1	mg/kg		04/17/06	3050B Sec7.5	SW846 6020
Arsenic	0.70	B	0.15	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Arsenic - TCLP	0.038	U	0.038	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Barium	110		0.080	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Barium - TCLP	0.40	B	0.0050	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Beryllium	1.4		0.055	0.50	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cadmium	4.6		0.075	0.50	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cadmium - TCLP	0.0037	U	0.0037	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Chromium	210		0.25	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Chromium - TCLP	0.083	B	0.0066	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Cobalt	82		0.027	1.0	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Copper	46		0.17	5.0	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Iron	4500		9.0	150	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Lead	3.8		0.075	1.3	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Lead - TCLP	0.017	U	0.017	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Magnesium	490		7.0	75	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Manganese	93		0.065	1.0	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Mercury	0.018		0.0017	0.010	1	mg/kg		04/10/06	SW846 7471A	SW846 7471A
Mercury - TCLP	0.029	U	0.029	0.080	1	mg/L		04/12/06	SW846 7470A	SW846 7470A
Nickel	490		0.10	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Selenium	0.45	B	0.41	2.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Selenium - TCLP	0.042	U	0.042	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Silver	0.61		0.014	0.29	1	mg/kg		04/17/06	3050B Sec7.5	SW846 6020
Silver - TCLP	0.013	U	0.013	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Thallium	0.0031	U	0.0031	0.30	1	mg/kg		04/21/06	SW846 3050B	SW846 6020
Vanadium	3.3		0.085	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Zinc	17		5.5	15	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cyanide, Total	0.38	B	0.28	0.60	1	mg/kg		04/10/06	SW846 9012A	SW846 9012A
Percent Solids	99.8		---	---	1	%		04/03/06	SM M2540G	SM M2540G

All soil results are reported on a dry weight basis unless otherwise noted.

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436

Analytical Report Number: 870383

Client : FOTH & VAN DYKE
Project Name : KEMC
Project Number : 06W003
Field ID : SHOP BIN 1

Matrix Type : SOIL
Collection Date : 03/29/06
Report Date : 04/26/06
Lab Sample Number : 870383-005

INORGANICS

Test	Result		MDL	EQL	Dil.	Units	Code	Anl Date	Prep Method	Anl Method
Leach Date - Conventionals	Done				1			04/05/06	SW846 1311	
Aluminum	1600		11	75	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Antimony	25		0.047	0.29	1	mg/kg		04/17/06	3050B Sec7.5	SW846 6020
Arsenic	53		0.14	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Arsenic - TCLP	0.079	B	0.038	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Barium	4.5		0.080	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Barium - TCLP	0.028	B	0.0050	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Beryllium	0.031	B	0.011	0.10	1	mg/kg		04/21/06	SW846 3050B	SW846 6020
Cadmium	0.59		0.075	0.50	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cadmium - TCLP	0.0092	B	0.0037	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Chromium	50		0.24	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Chromium - TCLP	0.21	B	0.0066	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Cobalt	42		0.026	1.0	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Copper	110		0.16	5.0	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Iron	36000		9.0	150	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Lead	77		0.075	1.2	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Lead - TCLP	0.017	U	0.017	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Magnesium	410		7.0	75	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Manganese	32		0.065	1.0	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Mercury	0.021		0.0017	0.010	1	mg/kg		04/10/06	SW846 7471A	SW846 7471A
Mercury - TCLP	0.029	U	0.029	0.080	1	mg/L		04/12/06	SW846 7470A	SW846 7470A
Nickel	92		0.10	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Selenium	0.89	B	0.41	2.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Selenium - TCLP	0.042	U	0.042	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Silver	7.7		0.014	0.29	1	mg/kg		04/17/06	3050B Sec7.5	SW846 6020
Silver - TCLP	0.013	U	0.013	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Thallium	0.025	B	0.015	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Vanadium	2.0		0.085	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Zinc	24		5.5	15	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cyanide, Total	0.63		0.26	0.56	1	mg/kg		04/10/06	SW846 9012A	SW846 9012A
Percent Solids	98.2		---	---	1	%		04/03/06	SM M2540G	SM M2540G

All soil results are reported on a dry weight basis unless otherwise noted.

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436

Analytical Report Number: 870383

Client : FOTH & VAN DYKE
Project Name : KEMC
Project Number : 06W003
Field ID : EECB-2

Matrix Type : SOIL
Collection Date : 03/29/06
Report Date : 04/26/06
Lab Sample Number : 870383-006

INORGANICS

Test	Result		MDL	EQL	Dil.	Units	Code	Anl Date	Prep Method	Anl Method
Leach Date - Conventionals	Done				1			04/05/06	SW846 1311	
Aluminum	180000		260	1800	100	mg/kg		04/24/06	SW846 3050B	SW846 6020
Antimony	14		0.057	0.35	1	mg/kg		04/17/06	3050B Sec7.5	SW846 6020
Arsenic	1.0	B	0.17	1.8	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Arsenic - TCLP	0.038	U	0.038	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Barium	100		0.094	1.8	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Barium - TCLP	0.78	B	0.0050	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Beryllium	0.76		0.065	0.59	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cadmium	1.3		0.089	0.59	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cadmium - TCLP	0.011	B	0.0037	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Chromium	72		0.29	1.8	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Chromium - TCLP	0.0066	U	0.0066	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Cobalt	2.9		0.031	1.2	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Copper	4900		0.19	5.9	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Iron	4600		11	180	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Lead	110		0.089	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Lead - TCLP	0.17	B	0.017	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Magnesium	5000		8.3	89	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Manganese	660		0.077	1.2	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Mercury	0.0027	B	0.0017	0.010	1	mg/kg		04/10/06	SW846 7471A	SW846 7471A
Mercury - TCLP	0.029	U	0.029	0.080	1	mg/L		04/12/06	SW846 7470A	SW846 7470A
Nickel	210		0.12	1.8	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Selenium	2.1	B	0.48	3.0	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Selenium - TCLP	0.042	U	0.042	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Silver	1.1		0.017	0.35	1	mg/kg		04/17/06	3050B Sec7.5	SW846 6020
Silver - TCLP	0.013	U	0.013	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Thallium	0.053	B	0.018	1.8	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Vanadium	27		0.10	1.8	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Zinc	3200		6.5	18	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cyanide, Total	0.41	B	0.32	0.67	1	mg/kg		04/10/06	SW846 9012A	SW846 9012A
Percent Solids	84.7		---	---	1	%		04/03/06	SM M2540G	SM M2540G

All soil results are reported on a dry weight basis unless otherwise noted.

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436

Analytical Report Number: 870383

Client : FOTH & VAN DYKE
Project Name : KEMC
Project Number : 06W003
Field ID : EECB-1

Matrix Type : SOIL
Collection Date : 03/29/06
Report Date : 04/26/06
Lab Sample Number : 870383-007

INORGANICS

Test	Result		MDL	EQL	Dil.	Units	Code	Anl Date	Prep Method	Anl Method
Leach Date - Conventionals	Done				1			04/05/06	SW846 1311	
Aluminum	7700		11	74	5	mg/kg		04/24/06	SW846 3050B	SW846 6020
Antimony	3.4		0.047	0.30	1	mg/kg		04/17/06	3050B Sec7.5	SW846 6020
Arsenic	25		0.14	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Arsenic - TCLP	0.038	U	0.038	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Barium	8.7		0.079	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Barium - TCLP	0.14	B	0.0050	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Beryllium	0.27	B	0.054	0.49	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cadmium	0.21	B	0.074	0.49	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cadmium - TCLP	0.0037	U	0.0037	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Chromium	63		0.24	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Chromium - TCLP	0.0066	U	0.0066	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Cobalt	11		0.026	0.98	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Copper	28		0.16	4.9	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Iron	30000		8.9	150	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Lead	16		0.074	1.2	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Lead - TCLP	0.023	B	0.017	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Magnesium	12000		6.9	74	5	mg/kg		04/24/06	SW846 3050B	SW846 6020
Manganese	290		0.064	0.98	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Mercury	0.0080	B	0.0017	0.010	1	mg/kg		04/10/06	SW846 7471A	SW846 7471A
Mercury - TCLP	0.029	U	0.029	0.080	1	mg/L		04/12/06	SW846 7470A	SW846 7470A
Nickel	74		0.098	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Selenium	0.47	B	0.40	2.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Selenium - TCLP	0.042	U	0.042	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Silver	1.2		0.014	0.30	1	mg/kg		04/17/06	3050B Sec7.5	SW846 6020
Silver - TCLP	0.013	U	0.013	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Thallium	0.039	B	0.015	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Vanadium	16		0.084	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Zinc	34		5.4	15	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cyanide, Total	0.28	U	0.28	0.60	1	mg/kg		04/10/06	SW846 9012A	SW846 9012A
Percent Solids	99.7		---	---	1	%		04/03/06	SM M2540G	SM M2540G

All soil results are reported on a dry weight basis unless otherwise noted.

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436

Analytical Report Number: 870383

Client : FOTH & VAN DYKE
Project Name : KEMC
Project Number : 06W003
Field ID : EECB-4

Matrix Type : SOIL
Collection Date : 03/29/06
Report Date : 04/26/06
Lab Sample Number : 870383-008

INORGANICS

Test	Result		MDL	EQL	Dil.	Units	Code	Anl Date	Prep Method	Anl Method
Leach Date - Conventionals	Done				1			04/05/06	SW846 1311	
Aluminum	1000		11	78	5	mg/kg		04/24/06	SW846 3050B	SW846 6020
Antimony	0.49		0.050	0.31	1	mg/kg		04/17/06	3050B Sec7.5	SW846 6020
Arsenic	4.1		0.15	1.6	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Arsenic - TCLP	0.038	U	0.038	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Barium	96		0.083	1.6	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Barium - TCLP	0.49	B	0.0050	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Beryllium	0.041	B	0.011	0.10	1	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cadmium	1.2		0.078	0.52	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cadmium - TCLP	0.014	B	0.0037	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Chromium	3.1		0.25	1.6	5	mg/kg	A	04/19/06	SW846 3050B	SW846 6020
Chromium - TCLP	0.084	B	0.0066	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Cobalt	0.86	B	0.028	1.0	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Copper	13		0.17	5.2	5	mg/kg	A	04/19/06	SW846 3050B	SW846 6020
Iron	4300		9.4	160	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Lead	200		0.078	1.3	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Lead - TCLP	0.20	B	0.017	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Magnesium	33000		7.3	78	5	mg/kg		04/24/06	SW846 3050B	SW846 6020
Manganese	830		0.068	1.0	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Mercury	0.12		0.0017	0.010	1	mg/kg		04/10/06	SW846 7471A	SW846 7471A
Mercury - TCLP	0.029	U	0.029	0.080	1	mg/L		04/12/06	SW846 7470A	SW846 7470A
Nickel	18		0.10	1.6	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Selenium	0.24	B	0.085	0.52	1	mg/kg		04/19/06	SW846 3050B	SW846 6020
Selenium - TCLP	0.042	U	0.042	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Silver	0.17	B	0.015	0.31	1	mg/kg		04/17/06	3050B Sec7.5	SW846 6020
Silver - TCLP	0.013	U	0.013	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Thallium	0.042	B	0.016	1.6	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Vanadium	2.7		0.088	1.6	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Zinc	550		5.7	16	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cyanide, Total	0.29	U	0.29	0.62	1	mg/kg		04/10/06	SW846 9012A	SW846 9012A
Percent Solids	96.2		---	---	1	%		04/03/06	SM M2540G	SM M2540G

All soil results are reported on a dry weight basis unless otherwise noted.

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436

Analytical Report Number: 870383

Client : FOTH & VAN DYKE
Project Name : KEMC
Project Number : 06W003
Field ID : EECB-3

Matrix Type : SOIL
Collection Date : 03/29/06
Report Date : 04/26/06
Lab Sample Number : 870383-009

INORGANICS

Test	Result		MDL	EQL	Dil.	Units	Code	Anl Date	Prep Method	Anl Method
Leach Date - Conventionals	Done				1			04/05/06	SW846 1311	
Aluminum	1700		12	79	5	mg/kg		04/24/06	SW846 3050B	SW846 6020
Antimony	55		0.053	0.33	1	mg/kg		04/17/06	3050B Sec7.5	SW846 6020
Arsenic	62		0.15	1.6	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Arsenic - TCLP	0.038	U	0.038	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Barium	5.2		0.085	1.6	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Barium - TCLP	0.026	B	0.0050	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Beryllium	0.10	B	0.058	0.53	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cadmium	0.41	B	0.079	0.53	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cadmium - TCLP	0.026	B	0.0037	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Chromium	120		0.26	1.6	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Chromium - TCLP	0.57		0.0066	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Cobalt	36		0.028	1.1	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Copper	170		0.17	5.3	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Iron	37000		9.5	160	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Lead	180		0.079	1.3	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Lead - TCLP	0.022	B	0.017	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Magnesium	2100		7.4	79	5	mg/kg		04/24/06	SW846 3050B	SW846 6020
Manganese	45		0.069	1.1	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Mercury	0.074		0.0017	0.010	1	mg/kg		04/10/06	SW846 7471A	SW846 7471A
Mercury - TCLP	0.029	U	0.029	0.080	1	mg/L		04/12/06	SW846 7470A	SW846 7470A
Nickel	100		0.11	1.6	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Selenium	1.4	B	0.43	2.6	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Selenium - TCLP	0.042	U	0.042	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Silver	16		0.015	0.33	1	mg/kg		04/17/06	3050B Sec7.5	SW846 6020
Silver - TCLP	0.013	U	0.013	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Thallium	0.042	B	0.016	1.6	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Vanadium	5.5		0.090	1.6	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Zinc	33		5.8	16	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cyanide, Total	2.7		0.32	0.67	1	mg/kg		04/10/06	SW846 9012A	SW846 9012A
Percent Solids	89.1		---	---	1	%		04/03/06	SM M2540G	SM M2540G

All soil results are reported on a dry weight basis unless otherwise noted.

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436

Analytical Report Number: 870383

Client : FOTH & VAN DYKE
Project Name : KEMC
Project Number : 06W003
Field ID : CB-FLOOR

Matrix Type : SOIL
Collection Date : 03/29/06
Report Date : 04/26/06
Lab Sample Number : 870383-010

INORGANICS

Test	Result		MDL	EQL	Dil.	Units	Code	Anl Date	Prep Method	Anl Method
Leach Date - Conventionals	Done				1			04/05/06	SW846 1311	
Aluminum	28000		11	75	5	mg/kg		04/24/06	SW846 3050B	SW846 6020
Antimony	8.1		0.048	0.30	1	mg/kg		04/17/06	3050B Sec7.5	SW846 6020
Arsenic	19		0.15	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Arsenic - TCLP	0.038	U	0.038	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Barium	33		0.080	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Barium - TCLP	0.55	B	0.0050	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Beryllium	0.83		0.055	0.50	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cadmium	0.50		0.075	0.50	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cadmium - TCLP	0.0037	B	0.0037	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Chromium	53		0.25	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Chromium - TCLP	0.021	B	0.0066	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Cobalt	20		0.027	1.0	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Copper	330		0.17	5.0	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Iron	31000		9.0	150	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Lead	28		0.075	1.3	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Lead - TCLP	0.12	B	0.017	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Magnesium	11000		7.0	75	5	mg/kg		04/24/06	SW846 3050B	SW846 6020
Manganese	400		0.065	1.0	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Mercury	0.0057	B	0.0017	0.010	1	mg/kg		04/10/06	SW846 7471A	SW846 7471A
Mercury - TCLP	0.029	U	0.029	0.080	1	mg/L		04/12/06	SW846 7470A	SW846 7470A
Nickel	73		0.10	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Selenium	0.55	B	0.41	2.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Selenium - TCLP	0.042	U	0.042	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Silver	1.6		0.014	0.30	1	mg/kg		04/17/06	3050B Sec7.5	SW846 6020
Silver - TCLP	0.013	U	0.013	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Thallium	0.045	B	0.016	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Vanadium	25		0.085	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Zinc	200		5.5	15	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cyanide, Total	0.61		0.26	0.56	1	mg/kg		04/10/06	SW846 9012A	SW846 9012A
Percent Solids	97.5		---	---	1	%		04/03/06	SM M2540G	SM M2540G

All soil results are reported on a dry weight basis unless otherwise noted.

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436

Analytical Report Number: 870383

Client : FOTH & VAN DYKE
Project Name : KEMC
Project Number : 06W003
Field ID : MILL BASEMENT FLOOR

Matrix Type : SOIL
Collection Date : 03/30/06
Report Date : 04/26/06
Lab Sample Number : 870383-011

INORGANICS

Test	Result		MDL	EQL	Dil.	Units	Code	Anl Date	Prep Method	Anl Method
Leach Date - Conventionals	Done				1			04/05/06	SW846 1311	
Aluminum	10000		11	72	5	mg/kg		04/24/06	SW846 3050B	SW846 6020
Antimony	160		0.047	0.29	1	mg/kg		04/17/06	3050B Sec7.5	SW846 6020
Arsenic	200		0.14	1.4	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Arsenic - TCLP	0.038	U	0.038	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Barium	290		0.077	1.4	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Barium - TCLP	0.24	B	0.0050	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Beryllium	1.2		0.053	0.48	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cadmium	5.9		0.072	0.48	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cadmium - TCLP	0.042	B	0.0037	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Chromium	270		0.24	1.4	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Chromium - TCLP	0.11	B	0.0066	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Cobalt	180		0.025	0.96	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Copper	510		0.16	4.8	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Iron	110000		35	580	20	mg/kg		04/21/06	SW846 3050B	SW846 6020
Lead	400		0.072	1.2	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Lead - TCLP	0.53	B	0.017	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Magnesium	7100		6.7	72	5	mg/kg		04/24/06	SW846 3050B	SW846 6020
Manganese	430		0.062	0.96	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Mercury	0.18		0.0017	0.010	1	mg/kg		04/10/06	SW846 7471A	SW846 7471A
Mercury - TCLP	0.029	U	0.029	0.080	1	mg/L		04/12/06	SW846 7470A	SW846 7470A
Nickel	920		0.096	1.4	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Selenium	2.8		0.39	2.4	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Selenium - TCLP	0.042	U	0.042	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Silver	48		0.014	0.29	1	mg/kg		04/17/06	3050B Sec7.5	SW846 6020
Silver - TCLP	0.013	U	0.013	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Thallium	0.043	B	0.015	1.4	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Vanadium	19		0.082	1.4	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Zinc	680		5.3	14	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cyanide, Total	41		1.4	3.1	5	mg/kg		04/10/06	SW846 9012A	SW846 9012A
Percent Solids	98.2		---	---	1	%		04/04/06	SM M2540G	SM M2540G

All soil results are reported on a dry weight basis unless otherwise noted.

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436

Analytical Report Number: 870383

Client : FOTH & VAN DYKE
Project Name : KEMC
Project Number : 06W003
Field ID : GOLD CONTACT

Matrix Type : SOIL
Collection Date : 03/30/06
Report Date : 04/26/06
Lab Sample Number : 870383-012

INORGANICS

Test	Result		MDL	EQL	Dil.	Units	Code	Anl Date	Prep Method	Anl Method
Leach Date - Conventionals	Done				1			04/05/06	SW846 1311	
Aluminum	480		12	80	5	mg/kg		04/25/06	SW846 3050B	SW846 6020
Antimony	2.7		0.051	0.32	1	mg/kg		04/17/06	3050B Sec7.5	SW846 6020
Arsenic	6.9		0.15	1.6	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Arsenic - TCLP	0.038	U	0.038	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Barium	6.4		0.085	1.6	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Barium - TCLP	0.054	B	0.0050	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Beryllium	0.058	B	0.058	0.53	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cadmium	0.57		0.080	0.53	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cadmium - TCLP	0.028	B	0.0037	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Chromium	7.7		0.26	1.6	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Chromium - TCLP	0.014	B	0.0066	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Cobalt	3.2		0.028	1.1	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Copper	32		0.18	5.3	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Iron	3000		9.6	160	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Lead	320		0.080	1.3	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Lead - TCLP	19		0.017	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Magnesium	580		7.4	80	5	mg/kg		04/24/06	SW846 3050B	SW846 6020
Manganese	28		0.069	1.1	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Mercury	0.041		0.0017	0.010	1	mg/kg		04/10/06	SW846 7471A	SW846 7471A
Mercury - TCLP	0.029	U	0.029	0.080	1	mg/L		04/12/06	SW846 7470A	SW846 7470A
Nickel	58		0.11	1.6	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Selenium	0.12	B	0.087	0.53	1	mg/kg		04/19/06	SW846 3050B	SW846 6020
Selenium - TCLP	0.042	U	0.042	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Silver	1.9		0.015	0.32	1	mg/kg		04/17/06	3050B Sec7.5	SW846 6020
Silver - TCLP	0.013	U	0.013	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Thallium	0.021	B	0.016	1.6	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Vanadium	3.8		0.090	1.6	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Zinc	1100		5.8	16	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cyanide, Total	5.7		0.30	0.64	1	mg/kg		04/10/06	SW846 9012A	SW846 9012A
Percent Solids	94.1		---	---	1	%		04/03/06	SM M2540G	SM M2540G

All soil results are reported on a dry weight basis unless otherwise noted.

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436

Analytical Report Number: 870383

Client : FOTH & VAN DYKE
Project Name : KEMC
Project Number : 06W003
Field ID : MILL BASEMENT BIN

Matrix Type : SOIL
Collection Date : 03/30/06
Report Date : 04/26/06
Lab Sample Number : 870383-013

INORGANICS

Test	Result		MDL	EQL	Dil.	Units	Code	Anl Date	Prep Method	Anl Method
Leach Date - Conventionals	Done				1			04/06/06	SW846 1311	
Aluminum	3800		11	77	5	mg/kg		04/25/06	SW846 3050B	SW846 6020
Antimony	540		0.048	0.30	1	mg/kg		04/17/06	3050B Sec7.5	SW846 6020
Arsenic	250		0.15	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Arsenic - TCLP	0.038	U	0.038	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Barium	8.8		0.082	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Barium - TCLP	0.055	B	0.0050	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Beryllium	0.23	B	0.057	0.51	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cadmium	3.0		0.077	0.51	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cadmium - TCLP	0.057	B	0.0037	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Chromium	430		0.25	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Chromium - TCLP	0.010	B	0.0066	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Cobalt	59		0.027	1.0	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Copper	170		0.17	5.1	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Iron	51000		9.3	150	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Lead	3300		0.077	1.3	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Lead - TCLP	2.0		0.017	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Magnesium	13000		7.2	77	5	mg/kg		04/24/06	SW846 3050B	SW846 6020
Manganese	210		0.067	1.0	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Mercury	0.19		0.0017	0.010	1	mg/kg		04/10/06	SW846 7471A	SW846 7471A
Mercury - TCLP	0.029	U	0.029	0.080	1	mg/L		04/12/06	SW846 7470A	SW846 7470A
Nickel	200		0.10	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Selenium	5.3		0.42	2.6	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Selenium - TCLP	0.042	U	0.042	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Silver	14		0.014	0.30	1	mg/kg		04/17/06	3050B Sec7.5	SW846 6020
Silver - TCLP	0.013	U	0.013	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Thallium	0.031	B	0.016	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Vanadium	8.6		0.087	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Zinc	210		5.7	15	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cyanide, Total	59		1.5	3.1	5	mg/kg		04/10/06	SW846 9012A	SW846 9012A
Percent Solids	97.2		---	---	1	%		04/03/06	SM M2540G	SM M2540G

All soil results are reported on a dry weight basis unless otherwise noted.

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436

Analytical Report Number: 870383

Client : FOTH & VAN DYKE
Project Name : KEMC
Project Number : 06W003
Field ID : ACTIVE MILL PRODUCT

Matrix Type : SOIL
Collection Date : 03/30/06
Report Date : 04/26/06
Lab Sample Number : 870383-014

INORGANICS

Test	Result		MDL	EQL	Dil.	Units	Code	Anl Date	Prep Method	Anl Method
Leach Date - Conventionals	Done				1			04/06/06	SW846 1311	
Aluminum	340		11	75	5	mg/kg		04/25/06	SW846 3050B	SW846 6020
Antimony	0.71		0.046	0.29	1	mg/kg		04/17/06	3050B Sec7.5	SW846 6020
Arsenic	2.4		0.15	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Arsenic - TCLP	0.038	U	0.038	1.0	1	mg/L		04/10/06	SW846 3010A	SW846.6010B
Barium	8.9		0.080	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Barium - TCLP	0.27	B	0.0050	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Beryllium	0.070	B	0.055	0.50	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cadmium	0.84		0.075	0.50	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cadmium - TCLP	0.0037	U	0.0037	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Chromium	120		0.25	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Chromium - TCLP	0.0066	U	0.0066	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Cobalt	23		0.027	1.0	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Copper	13000		0.17	5.0	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Iron	250000		90	1500	50	mg/kg		04/19/06	SW846 3050B	SW846 6020
Lead	7.9	B	0.75	13	50	mg/kg	A	04/19/06	SW846 3050B	SW846 6020
Lead - TCLP	0.061	B	0.017	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Magnesium	450		7.0	75	5	mg/kg		04/24/06	SW846 3050B	SW846 6020
Manganese	3800		0.065	1.0	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Mercury	0.0017	U	0.0017	0.010	1	mg/kg		04/10/06	SW846 7471A	SW846 7471A
Mercury - TCLP	0.029	U	0.029	0.080	1	mg/L		04/12/06	SW846 7470A	SW846 7470A
Nickel	40000		1.0	15	50	mg/kg		04/19/06	SW846 3050B	SW846 6020
Selenium	1.8	B	0.41	2.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Selenium - TCLP	0.042	U	0.042	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Silver	0.31		0.014	0.29	1	mg/kg		04/17/06	3050B Sec7.5	SW846 6020
Silver - TCLP	0.013	U	0.013	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Thallium	0.20	B	0.16	15	50	mg/kg		04/19/06	SW846 3050B	SW846 6020
Vanadium	22		0.085	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Zinc	97000		55	150	50	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cyanide, Total	0.28	U	0.28	0.60	1	mg/kg		04/10/06	SW846 9012A	SW846 9012A
Percent Solids	99.7		---	---	1	%		04/04/06	SM M2540G	SM M2540G

All soil results are reported on a dry weight basis unless otherwise noted.

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436

Analytical Report Number: 870383

Client : FOTH & VAN DYKE
Project Name : KEMC
Project Number : 06W003
Field ID : FILTER PRESS FLOOR

Matrix Type : SOIL
Collection Date : 03/30/06
Report Date : 04/26/06
Lab Sample Number : 870383-015

INORGANICS

Test	Result		MDL	EQL	Dil.	Units	Code	Anl Date	Prep Method	Anl Method
Leach Date - Conventionals	Done				1			04/06/06	SW846 1311	
Aluminum	6500		12	82	5	mg/kg		04/25/06	SW846 3050B	SW846 6020
Antimony	90		0.53	3.3	10	mg/kg		04/17/06	3050B Sec7.5	SW846 6020
Arsenic	100		0.16	1.6	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Arsenic - TCLP	0.038	U	0.038	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Barium	64		0.088	1.6	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Barium - TCLP	0.11	B	0.0050	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Beryllium	0.80		0.060	0.55	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cadmium	43		0.082	0.55	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cadmium - TCLP	0.45		0.0037	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Chromium	150		0.27	1.6	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Chromium - TCLP	0.0066	U	0.0066	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Cobalt	21		0.029	1.1	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Copper	2300		0.18	5.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Iron	160000		39	660	20	mg/kg		04/19/06	SW846 3050B	SW846 6020
Lead	1200		0.082	1.4	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Lead - TCLP	0.14	B	0.017	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Magnesium	5800		7.7	82	5	mg/kg		04/24/06	SW846 3050B	SW846 6020
Manganese	740		0.071	1.1	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Mercury	1.2		0.0085	0.050	5	mg/kg		04/10/06	SW846 7471A	SW846 7471A
Mercury - TCLP	0.076	B	0.029	0.080	1	mg/L		04/12/06	SW846 7470A	SW846 7470A
Nickel	950		0.11	1.6	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Selenium	9.6		0.45	2.7	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Selenium - TCLP	0.042	U	0.042	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Silver	500		0.15	3.3	10	mg/kg		04/17/06	3050B Sec7.5	SW846 6020
Silver - TCLP	0.46		0.013	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Thallium	0.13	B	0.017	1.6	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Vanadium	20		0.093	1.6	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Zinc	7800		6.0	16	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cyanide, Total	2800		120	260	400	mg/kg		04/10/06	SW846 9012A	SW846 9012A
Percent Solids	91.3		---	---	1	%		04/03/06	SM M2540G	SM M2540G

All soil results are reported on a dry weight basis unless otherwise noted.

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436

Analytical Report Number: 870383

Client : FOTH & VAN DYKE
Project Name : KEMC
Project Number : 06W003
Field ID : CONCRETE MILL FLOOR

Matrix Type : SOIL
Collection Date : 03/30/06
Report Date : 04/26/06
Lab Sample Number : 870383-016

INORGANICS

Test	Result		MDL	EQL	Dil.	Units	Code	Anl Date	Prep Method	Anl Method
Leach Date - Conventionals	Done				1			04/06/06	SW846 1311	
Aluminum	1000		10	71	5	mg/kg		04/25/06	SW846 3050B	SW846 6020
Antimony	0.57		0.048	0.30	1	mg/kg		04/17/06	3050B Sec7.5	SW846 6020
Arsenic	2.5		0.14	1.4	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Arsenic - TCLP	0.038	U	0.038	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Barium	52		0.076	1.4	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Barium - TCLP	0.30	B	0.0050	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Beryllium	0.076	B	0.052	0.47	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cadmium	0.72		0.071	0.47	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cadmium - TCLP	0.015	B	0.0037	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Chromium	9.0		0.23	1.4	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Chromium - TCLP	0.0066	U	0.0066	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Cobalt	1.2		0.025	0.95	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Copper	21		0.16	4.7	5	mg/kg	A	04/19/06	SW846 3050B	SW846 6020
Iron	5100		8.5	140	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Lead	270		0.071	1.2	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Lead - TCLP	8.3		0.017	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Magnesium	24000		6.6	71	5	mg/kg		04/24/06	SW846 3050B	SW846 6020
Manganese	620		0.062	0.95	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Mercury	0.20		0.0017	0.010	1	mg/kg		04/10/06	SW846 7471A	SW846 7471A
Mercury - TCLP	0.029	U	0.029	0.080	1	mg/L		04/12/06	SW846 7470A	SW846 7470A
Nickel	27		0.095	1.4	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Selenium	0.14	B	0.078	0.47	1	mg/kg		04/19/06	SW846 3050B	SW846 6020
Selenium - TCLP	0.042	U	0.042	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Silver	0.21	B	0.014	0.30	1	mg/kg		04/17/06	3050B Sec7.5	SW846 6020
Silver - TCLP	0.068	B	0.013	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Thallium	0.043	B	0.015	1.4	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Vanadium	2.1		0.081	1.4	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Zinc	430		5.2	14	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cyanide, Total	0.28	U	0.28	0.60	1	mg/kg		04/10/06	SW846 9012A	SW846 9012A
Percent Solids	99.5		---	---	1	%		04/03/06	SM M2540G	SM M2540G

All soil results are reported on a dry weight basis unless otherwise noted.

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436

Analytical Report Number: 870383

Client : FOTH & VAN DYKE
Project Name : KEMC
Project Number : 06W003
Field ID : MILL HOPPER

Matrix Type : SOIL
Collection Date : 03/30/06
Report Date : 04/26/06
Lab Sample Number : 870383-017

INORGANICS

Test	Result		MDL	EQL	Dil.	Units	Code	Anl Date	Prep Method	Anl Method
Leach Date - Conventionals	Done				1			04/06/06	SW846 1311	
Aluminum	2600		11	75	5	mg/kg		04/25/06	SW846 3050B	SW846 6020
Antimony	0.44		0.047	0.29	1	mg/kg		04/17/06	3050B Sec7.5	SW846 6020
Arsenic	0.99	B	0.15	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Arsenic - TCLP	0.038	U	0.038	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Barium	58		0.080	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Barium - TCLP	0.25	B	0.0050	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Beryllium	1.6		0.055	0.50	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cadmium	1.8		0.075	0.50	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cadmium - TCLP	0.0037	U	0.0037	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Chromium	1100		0.25	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Chromium - TCLP	0.29		0.0066	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Cobalt	220		0.027	1.0	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Copper	36		0.17	5.0	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Iron	8500		9.0	150	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Lead	1.9		0.075	1.3	5	mg/kg	A	04/19/06	SW846 3050B	SW846 6020
Lead - TCLP	0.24	B	0.017	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Magnesium	230		7.0	75	5	mg/kg		04/24/06	SW846 3050B	SW846 6020
Manganese	120		0.065	1.0	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Mercury	0.022		0.0017	0.010	1	mg/kg		04/10/06	SW846 7471A	SW846 7471A
Mercury - TCLP	0.029	U	0.029	0.080	1	mg/L		04/12/06	SW846 7470A	SW846 7470A
Nickel	1300		0.10	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Selenium	0.49	B	0.41	2.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Selenium - TCLP	0.042	U	0.042	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Silver	0.25	B	0.014	0.29	1	mg/kg		04/17/06	3050B Sec7.5	SW846 6020
Silver - TCLP	0.013	U	0.013	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Thallium	0.025	B	0.016	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Vanadium	0.34	U	0.34	6.0	20	mg/kg	C	04/24/06	SW846 3050B	SW846 6020
Zinc	15		5.5	15	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cyanide, Total	0.34	B	0.25	0.52	1	mg/kg		04/10/06	SW846 9012A	SW846 9012A
Percent Solids	99.8		---	---	1	%		04/04/06	SM M2540G	SM M2540G

All soil results are reported on a dry weight basis unless otherwise noted.

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436

Analytical Report Number: 870383

Client : FOTH & VAN DYKE
Project Name : KEMC
Project Number : 06W003
Field ID : MILL SUPER SACK

Matrix Type : SOIL
Collection Date : 03/30/06
Report Date : 04/26/06
Lab Sample Number : 870383-018

INORGANICS

Test	Result		MDL	EQL	Dil.	Units	Code	Anl Date	Prep Method	Anl Method
Leach Date - Conventionals	Done				1			04/06/06	SW846 1311	
Aluminum	150000		120	810	50	mg/kg		04/25/06	SW846 3050B	SW846 6020
Antimony	14		0.050	0.31	1	mg/kg		04/17/06	3050B Sec7.5	SW846 6020
Arsenic	1.2	B	0.16	1.6	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Arsenic - TCLP	0.038	U	0.038	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Barium	130		0.087	1.6	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Barium - TCLP	1.3		0.0050	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Beryllium	1.4		0.060	0.54	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cadmium	1.5		0.081	0.54	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cadmium - TCLP	0.012	B	0.0037	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Chromium	97		0.27	1.6	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Chromium - TCLP	0.011	B	0.0066	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Cobalt	2.3		0.029	1.1	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Copper	3700		0.18	5.4	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Iron	5800		9.8	160	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Lead	120		0.081	1.4	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Lead - TCLP	0.38	B	0.017	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Magnesium	6500		7.6	81	5	mg/kg		04/25/06	SW846 3050B	SW846 6020
Manganese	600		0.070	1.1	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Mercury	0.0051	B	0.0017	0.010	1	mg/kg		04/10/06	SW846 7471A	SW846 7471A
Mercury - TCLP	0.029	U	0.029	0.080	1	mg/L		04/12/06	SW846 7470A	SW846 7470A
Nickel	110		0.11	1.6	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Selenium	6.1		0.44	2.7	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Selenium - TCLP	0.042	U	0.042	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Silver	0.84		0.015	0.31	1	mg/kg		04/17/06	3050B Sec7.5	SW846 6020
Silver - TCLP	0.013	U	0.013	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Thallium	0.054	B	0.017	1.6	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Vanadium	66		0.092	1.6	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Zinc	1900		6.0	16	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cyanide, Total	2.5		0.28	0.59	1	mg/kg		04/10/06	SW846 9012A	SW846 9012A
Percent Solids	92.3		---	---	1	%		04/03/06	SM M2540G	SM M2540G

All soil results are reported on a dry weight basis unless otherwise noted.

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436

Analytical Report Number: 870383

Client : FOTH & VAN DYKE
Project Name : KEMC
Project Number : 06W003
Field ID : MILL RR FLOOR

Matrix Type : SOIL
Collection Date : 03/30/06
Report Date : 04/26/06
Lab Sample Number : 870383-019

INORGANICS

Test	Result		MDL	EQL	Dil.	Units	Code	Anl Date	Prep Method	Anl Method
Leach Date - Conventionals	Done				1			04/06/06	SW846 1311	
Aluminum	7800		11	74	5	mg/kg		04/25/06	SW846 3050B	SW846 6020
Antimony	11		0.048	0.30	1	mg/kg		04/17/06	3050B Sec7.5	SW846 6020
Arsenic	44		0.14	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Arsenic - TCLP	0.038	U	0.038	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Barium	29		0.079	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Barium - TCLP	0.17	B	0.0050	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Beryllium	0.38	B	0.054	0.49	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cadmium	1.4		0.074	0.49	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cadmium - TCLP	0.017	B	0.0037	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Chromium	250		0.24	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Chromium - TCLP	0.0066	U	0.0066	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Cobalt	38		0.026	0.99	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Copper	220		0.16	4.9	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Iron	45000		8.9	150	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Lead	110		0.074	1.2	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Lead - TCLP	0.12	B	0.017	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Magnesium	9000		6.9	74	5	mg/kg		04/25/06	SW846 3050B	SW846 6020
Manganese	500		0.064	0.99	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Mercury	0.16		0.0017	0.010	1	mg/kg		04/10/06	SW846 7471A	SW846 7471A
Mercury - TCLP	0.029	U	0.029	0.080	1	mg/L		04/12/06	SW846 7470A	SW846 7470A
Nickel	510		0.099	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Selenium	0.68	B	0.40	2.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Selenium - TCLP	0.042	U	0.042	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Silver	3.0		0.014	0.30	1	mg/kg		04/17/06	3050B Sec7.5	SW846 6020
Silver - TCLP	0.013	U	0.013	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Thallium	0.069	B	0.015	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Vanadium	23		0.084	1.5	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Zinc	1000		5.4	15	5	mg/kg		04/19/06	SW846 3050B	SW846 6020
Cyanide, Total	9.2		0.30	0.63	1	mg/kg		04/10/06	SW846 9012A	SW846 9012A
Percent Solids	95.7		---	---	1	%		04/04/06	SM M2540G	SM M2540G

All soil results are reported on a dry weight basis unless otherwise noted.

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436

Analytical Report Number: 870383

Client : FOTH & VAN DYKE
Project Name : KEMC
Project Number : 06W003
Field ID : LUNCH ROOM SLAG

Matrix Type : SOIL
Collection Date : 03/30/06
Report Date : 04/26/06
Lab Sample Number : 870383-020

INORGANICS

Test	Result		MDL	EQL	Dil.	Units	Code	Anl Date	Prep Method	Anl Method
Leach Date - Conventionals	Done				1			04/06/06	SW846 1311	
Aluminum	32		3.0	20	1	mg/kg		04/24/06	SW846 3050B	SW846 6020
Antimony	0.063	U	0.063	0.40	1	mg/kg		04/17/06	3050B Sec7.5	SW846 6020
Arsenic	0.21	B	0.039	0.40	1	mg/kg		04/21/06	SW846 3050B	SW846 6020
Arsenic - TCLP	0.038	U	0.038	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Barium	1.4		0.021	0.40	1	mg/kg		04/21/06	SW846 3050B	SW846 6020
Barium - TCLP	0.066	B	0.0050	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Beryllium	0.015	U	0.015	0.13	1	mg/kg		04/21/06	SW846 3050B	SW846 6020
Cadmium	0.020	U	0.020	0.13	1	mg/kg		04/21/06	SW846 3050B	SW846 6020
Cadmium - TCLP	0.0037	U	0.0037	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Chromium	0.20	B	0.066	0.40	1	mg/kg	A	04/21/06	SW846 3050B	SW846 6020
Chromium - TCLP	0.0066	U	0.0066	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Cobalt	0.059	B	0.0071	0.27	1	mg/kg		04/21/06	SW846 3050B	SW846 6020
Copper	0.33	B	0.044	0.67	1	mg/kg	A	04/21/06	SW846 3050B	SW846 6020
Iron	110		2.4	40	1	mg/kg		04/21/06	SW846 3050B	SW846 6020
Lead	430		0.020	0.34	1	mg/kg		04/21/06	SW846 3050B	SW846 6020
Lead - TCLP	24		0.017	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Magnesium	21		1.9	20	1	mg/kg		04/24/06	SW846 3050B	SW846 6020
Manganese	1.5		0.017	0.27	1	mg/kg		04/21/06	SW846 3050B	SW846 6020
Mercury	0.0023	U	1.7	10	1	mg/kg		04/10/06	SW846 7471A	SW846 7471A
Mercury - TCLP	0.029	U	0.029	0.080	1	mg/L		04/12/06	SW846 7470A	SW846 7470A
Nickel	0.14	B	0.027	0.40	1	mg/kg		04/24/06	SW846 3050B	SW846 6020
Selenium	0.11	U	0.11	0.67	1	mg/kg		04/21/06	SW846 3050B	SW846 6020
Selenium - TCLP	0.042	U	0.042	1.0	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Silver	0.030	B	0.018	0.40	1	mg/kg		04/17/06	3050B Sec7.5	SW846 6020
Silver - TCLP	0.013	U	0.013	0.25	1	mg/L		04/10/06	SW846 3010A	SW846 6010B
Thallium	0.0042	U	0.0042	0.40	1	mg/kg		04/21/06	SW846 3050B	SW846 6020
Vanadium	0.32	B	0.023	0.40	1	mg/kg		04/21/06	SW846 3050B	SW846 6020
Zinc	1.5	U	1.5	4.0	1	mg/kg		04/24/06	SW846 3050B	SW846 6020
Cyanide, Total	0.38	U	0.38	0.81	1	mg/kg		04/10/06	SW846 9012A	SW846 9012A
Percent Solids	74.4		---	---	1	%		04/03/06	SM M2540G	SM M2540G

All soil results are reported on a dry weight basis unless otherwise noted.

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436

Analytical Report Number: 870383

Client : FOTH & VAN DYKE
Project Name : KEMC
Project Number : 06W003
Field ID : BELOW BEAVER POND

Matrix Type : WATER
Collection Date : 03/30/06
Report Date : 04/26/06
Lab Sample Number : 870383-021

INORGANICS

Test	Result		MDL	EQL	Dil.	Units	Code	Anl Date	Prep Method	Anl Method
Aluminum	350		10	20	1	ug/L		04/10/06	EPA 3020	EPA 6020
Antimony	0.050	U	0.050	0.10	1	ug/L		04/10/06	EPA 3020	EPA 6020
Arsenic	8.6		0.10	0.20	1	ug/L		04/10/06	EPA 3020	EPA 6020
Barium	150		0.15	0.30	1	ug/L		04/10/06	EPA 3020	EPA 6020
Beryllium	2.4		0.10	0.20	1	ug/L		04/10/06	EPA 3020	EPA 6020
Boron	38		1.0	2.0	1	ug/L		04/12/06	EPA 3020	EPA 6020
Cadmium	0.050	U	0.050	0.10	1	ug/L		04/10/06	EPA 3020	EPA 6020
Calcium	22000		500	1000	1	ug/L		04/10/06	EPA 3020	EPA 6020
Chromium	3.2		0.25	0.50	1	ug/L		04/10/06	EPA 3020	EPA 6020
Cobalt	0.58		0.050	0.10	1	ug/L		04/10/06	EPA 3020	EPA 6020
Copper	1.0		0.10	0.20	1	ug/L		04/10/06	EPA 3020	EPA 6020
Iron	120000		1200	2500	1	ug/L		04/10/06	EPA 3020	EPA 6020
Lead	2.3		0.050	0.10	1	ug/L		04/10/06	EPA 3020	EPA 6020
Lithium	0.36		0.050	0.10	1	ug/L		04/10/06	EPA 3020	EPA 6020
Magnesium	7700		12	25	1	ug/L		04/10/06	EPA 3020	EPA 6020
Manganese	2600		5.0	10	1	ug/L		04/10/06	EPA 3020	EPA 6020
Mercury	0.072	U	0.072	0.20	1	ug/L		04/10/06	SW846 7470A	SW846 7470A
Molybdenum	0.45		0.050	0.10	1	ug/L		04/10/06	EPA 3020	EPA 6020
Nickel	1.0		0.050	0.10	1	ug/L		04/10/06	EPA 3020	EPA 6020
Potassium	1800		10	20	1	ug/L		04/10/06	EPA 3020	EPA 6020
Selenium	0.36	B	0.25	0.50	1	ug/L		04/10/06	EPA 3020	EPA 6020
Silver	10	U	10	0.20	1	ug/L		04/10/06	EPA 3020	EPA 6020
Sodium	1400		25	50	1	ug/L		04/10/06	EPA 3020	EPA 6020
Zinc	9.3		2.5	5.0	1	ug/L		04/10/06	EPA 3020	EPA 6020
Cyanide, Total	0.0037	U	0.0037	0.020	1	mg/L		04/10/06	EPA 335.4	EPA 335.4

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436
Fax: 920-469-8827

Lab Number	TestGroupID	Field ID	Comment
870383-008	M-CR-S	EECB-4	A - Analyte is detected in the method blank at a concentration of 0.057 mg/Kg.
870383-008	M-CU-S	EECB-4	A - Analyte is detected in the method blank at a concentration of 0.23 mg/Kg.
870383-014	M-PB-S	ACTIVE MILL	A - Analyte is detected in the method blank at a concentration of 0.029 mg/Kg.
870383-016	M-CU-S	CONCRETE	A - Analyte is detected in the method blank at a concentration of 0.23 mg/Kg.
870383-017	M-PB-S	MILL HOPPER	A - Analyte is detected in the method blank at a concentration of 0.029 mg/Kg.
870383-017	M-V-S	MILL HOPPER	C - Elevated detection limit due to matrix effect. This result was verified by analyzing the sample undiluted and at varying dilutions.
870383-020	M-CR-S	LUNCH ROOM	A - Analyte is detected in the method blank at a concentration of 0.057 mg/Kg.
870383-020	M-CU-S	LUNCH ROOM	A - Analyte is detected in the method blank at a concentration of 0.23 mg/Kg.

Qualifier Codes

Flag	Applies To	Explanation
A	Inorganic	Analyte is detected in the method blank. Method blank criteria is evaluated to the laboratory method detection limit. Additionally, method blank acceptance may be based on project specific criteria or determined from analyte concentrations in the sample and are evaluated on a sample by sample basis.
B	Inorganic	The analyte has been detected between the method detection limit and the reporting limit.
B	Organic	Analyte is present in the method blank. Method blank criteria is evaluated to the laboratory method detection limit. Additionally, method blank acceptance may be based on project specific criteria or determined from analyte concentrations in the sample and are evaluated on a sample by sample basis.
C	All	Elevated detection limit.
D	All	Analyte value from diluted analysis or surrogate result not applicable due to sample dilution.
E	Inorganic	Estimated concentration due to matrix interferences. During the metals analysis the serial dilution failed to meet the established control limits of 0-10%. The sample concentration is greater than 50 times the IDL for analysis done on the ICP or 100 times the IDL for analysis done on the ICP-MS. The result was flagged with the E qualifier to indicate that a physical interference was observed.
E	Organic	Analyte concentration exceeds calibration range.
F	Inorganic	Due to potential interferences for this analysis by Inductively Coupled Plasma techniques (SW-846 Method 6010), this analyte has been confirmed by and reported from an alternate method.
F	Organic	Surrogate results outside control criteria.
G	All	The result is estimated because the concentration is less than the lowest calibration standard concentration utilized in the initial calibration. The method detection limit is less than the reporting limit specified for this project.
H	All	Preservation, extraction or analysis performed past holding time.
HF	Inorganic	This test is considered a field parameter, and the recommended holding time is 15 minutes from collection. The analysis was performed in the laboratory beyond the recommended holding time.
J	All	Concentration detected equal to or greater than the method detection limit but less than the reporting limit.
K	Inorganic	Sample received unpreserved. Sample was either preserved at the time of receipt or at the time of sample preparation.
K	Organic	Detection limit may be elevated due to the presence of an unrequested analyte.
L	All	Elevated detection limit due to low sample volume.
M	Organic	Sample pH was greater than 2
N	All	Spiked sample recovery not within control limits.
O	Organic	Sample received overweight.
P	Organic	The relative percent difference between the two columns for detected concentrations was greater than 40%.
Q	All	The analyte has been detected between the limit of detection (LOD) and limit of quantitation (LOQ). The results are qualified due to the uncertainty of analyte concentrations within this range.
S	Organic	The relative percent difference between quantitation and confirmation columns exceeds internal quality control criteria. Because the result is unconfirmed, it has been reported as a non-detect with an elevated detection limit.
U	All	The analyte was not detected at or above the reporting limit.
V	All	Sample received with headspace.
W	All	A second aliquot of sample was analyzed from a container with headspace.
X	All	See Sample Narrative.
Z	Organics	This compound was separated in the check standard but it did not meet the resolution criteria as set forth in SW846.
&	All	Laboratory Control Spike recovery not within control limits.
*	All	Precision not within control limits.
+	Inorganic	The sample result is greater than four times the spike level: therefore, the percent recovery is not evaluated.
<	All	The analyte was not detected at or above the reporting limit.
1	Inorganic	Dissolved analyte or filtered analyte greater than total analyte; analyses passed QC based on precision criteria.
2	Inorganic	Dissolved analyte or filtered analyte greater than total analyte; analyses failed QC based on precision criteria.
3	Inorganic	BOD result is estimated due to the BOD blank exceeding the allowable oxygen depletion.
4	Inorganic	BOD duplicate precision not within control limits. Due to the 48 hour holding time for this test, it is not practical to reanalyze and try to correct the deficiency.
5	Inorganic	BOD result is estimated due to insufficient oxygen depletion. Due to the 48 hour holding time for this test, it is not practical to reanalyze and try to correct the deficiency.
6	Inorganic	BOD laboratory control sample not within control limits. Due to the 48 hour holding time for this test, it is not practical to reanalyze and try to correct the deficiency.
7	Inorganic	BOD result is estimated due to complete oxygen depletion. Due to the 48 hour holding time for this test, it is not practical to reanalyze and try to correct the deficiency.

Pace Analytical Services, Inc.

Analysis Summary by Laboratory

1241 Bellevue Street
Green Bay, WI 54302

Test Group Name	870383-001	870383-002	870383-003	870383-004	870383-005	870383-006	870383-007	870383-008	870383-009	870383-010	870383-011	870383-012	870383-013	870383-014	870383-015	870383-016	870383-017	870383-018	870383-019	870383-020	870383-021
ALUMINUM	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	M
ANTIMONY	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	M
ARSENIC	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	M
ARSENIC - TCLP	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	
BARIUM	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	M
BARIUM - TCLP	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	
BERYLLIUM	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	M
BORON																					M
CADMIUM	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	M
CADMIUM - TCLP	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	
CALCIUM																					M
CHROMIUM	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	M
CHROMIUM - TCLP	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	
COBALT	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	M
COPPER	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	M
CYANIDE, TOTAL	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
IRON	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	M
LEAD	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	M
LEAD - TCLP	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	
LITHIUM																					M
MAGNESIUM	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	M
MANGANESE	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	M
MERCURY	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	B
MERCURY - TCLP	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	
MOLYBDENUM																					M
NICKEL	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	M
PERCENT SOLIDS	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	
POTASSIUM																					M
SELENIUM	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	M
SELENIUM - TCLP	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	
SILVER	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	M
SILVER - TCLP	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	
SODIUM																					M
THALLIUM	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	
VANADIUM	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	
ZINC	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	M

Pace Analytical Services, Inc.

Analysis Summary by Laboratory

1241 Bellevue Street
Green Bay, WI 54302

Code	Facility	Address	MI Certification
B	Green Bay Lab (Bellevue St)	1241 Bellevue Street, Suite 9 Green Bay, WI 54302	Not Certified
K	Kimberly Laboratory	1090 Kennedy Ave. Kimberly, WI 54136	Not Certified
M	Minnesota Laboratory	1700 Elm Street, Suite 200 Minneapolis, MN	Not Certified

Sample Condition Upon Receipt

Pace Analytical

Client Name: KEM Project # 870383

Courier: ☐ Fed Ex ☐ UPS ☐ USPS ☐ Client ☐ Commercial ☐ Pace Other_____

Custody Seal on Cooler/Box Present: ☐ yes ☐ no Seals intact: ☐ yes ☐ no

Optional
Proj. Due Date:
Proj. Name:

Packing Material: ☐ Bubble Wrap ☐ Bubble Bags ☐ None ☐ Other_____

Thermometer Used NA Type of Ice: Wet Blue None ☐ Samples on ice, cooling process has begun

Cooler Temperature R01 Biological Tissue is Frozen: Yes No

Temp should be above freezing to 6°C

Date and Initials of person examining contents: 4-1-06 AB
4/1/06

		Comments:
Chain of Custody Present:	☑Yes ☐No ☐N/A	1.
Chain of Custody Filled Out:	☑Yes ☐No ☐N/A	2.
Chain of Custody Relinquished:	☑Yes ☐No ☐N/A	3.
Sampler Name & Signature on COC:	☑Yes ☐No ☐N/A	4.
Samples Arrived within Hold Time:	☑Yes ☐No ☐N/A	5.
Short Hold Time Analysis (<72hr):	☐Yes ☐No ☐N/A	6.
Rush Turn Around Time Requested:	☐Yes ☐No ☐N/A	7.
Sufficient Volume:	☐Yes ☐No ☐N/A	8.
Correct Containers Used:	☐Yes ☐No ☐N/A	9.
-Pace Containers Used:	☐Yes ☐No ☐N/A	
Containers Intact:	☐Yes ☐No ☐N/A	10.
Filtered volume received for Dissolved tests	☐Yes ☐No ☐N/A	11.
Sample Labels match COC:	☐Yes ☐No ☐N/A	12.
-Includes date/time/ID/Analysis Matrix:_____		
All containers needing preservation have been checked.	☑Yes ☐No ☐N/A	13.
All containers needing preservation are found to be in compliance with EPA recommendation.	☑Yes ☐No ☐N/A	AB
exceptions: VOA, coliform, TOC, O&G, WI-DRO (water)	☐Yes ☐No	Initial when completed
Samples checked for dechlorination:	☐Yes ☐No ☑N/A	14.
Headspace in VOA Vials (>6mm):	☐Yes ☐No ☑N/A	15.
Trip Blank Present:	☐Yes ☐No ☑N/A	16.
Trip Blank Custody Seals Present	☐Yes ☐No ☑N/A	
Pace Trip Blank Lot # (if purchased):_____		

Client Notification/ Resolution: Field Data Required? Y / N

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: _____

Project Manager Review: KK for TW **Date:** 5/3/06

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers)

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Pace Analytical®

0952379

Section A Required Client Information:	Section B Required Project Information:	Section C Invoice Information:
Company: FOTH: VAN DYKE	Report To: JANIS KEST	Attention:
Address: P.O. BOX 19012	Copy To:	Company Name: FOTH: VAN DYKE
GREEN BAY, WI 54307		Address:
Email To:	Purchase Order No.:	Pace Quote Reference:
Phone: 920-497-2500 Fax:	Project Name: KEMC	Pace Project Manager:
Requested Due Date/TAT:	Project Number: 06W003	Pace Profile #:

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☐ Other_____

SITE LOCATION ☐GA ☐IL ☐IN ☒MI ☐MN ☐NC ☐OH ☐SC ☐WI ☐OTHER_____

Section D Required Client Information

Valid Matrix Codes: DRINKING WATER DW; WATER WT; WASTE WATER WW; PRODUCT P; SOIL/SOLID SL; OIL OL; WIPE WP; AIR AR; OTHER OT; TISSUE TS

ITEM #	SAMPLE ID (One Character per box. (A-Z, 0-9 / -) Samples IDs MUST BE UNIQUE)	MATRIX CODE	SAMPLE TYPE G=GRAB C=COMP	COLLECTED COMPOSITE START DATE	COLLECTED COMPOSITE START TIME	COLLECTED COMPOSITE END/GRAB DATE	COLLECTED COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Filtered (Y/N)	Requested Analysis: See Attached List TABLE 2	Residual Chlorine (Y/N)	Pace Project Number / Lab I.D
1	SOUTH STOCKPILE A 001	SL	C			3/29/06	940		1								N				870383 HLP01Y A
2	LEACHATE RESIDUE PILE 002	SL	C			3/29/06	950		1												
3	Shop Super Sack 003	SL	G			3/29/06	1205		1												
4	Shop Bin 2 004	SL	C			3/29/06	1137		1												
5	Shop Bin 1 005	SL	C			3/29/06	1155		1												
6	EECB-2 006	SL	G			3/29/06	1250		1												
7	EECB-1 007	SL	G			3/29/06	1300		1												
8	EECB-4 008	SL	C			3/29/06	1315		1												
9	EECB-3 009	SL	C			3/29/06	1330		1												
10	~~EE~~ SOS CB-FLOOR 010	SL	C			3/29/06	1405		1												
11																					
12																					

Additional Comments:

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITION
Scott Janssen	3/31/06	1030	Dawn Whitebird Pace WI	3/31/06	1030	Y/N
						Y/N
						Y/N

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Scott Janssen

SIGNATURE of SAMPLER: DATE Signed (MM / DD / YY)

Temp in °C	Received on Ice	Custody Sealed Cooler	Samples Intact
	Y/N	Y/N	Y/N

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CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

0952380

Section A Required Client Information:	Section B Required Project Information:	Section C Invoice Information:
Company: Foth & Van Dyke	Report To: Janis Kesy	Attention:
Address: P.O. Box 19012	Copy To:	Company Name: Foth & Van Dyke
Green Bay, WI 54307		Address:
Email To:	Purchase Order No.:	Pace Quote Reference:
Phone: 920-497-2500 Fax:	Project Name: KEMC	Pace Project Manager:
Requested Due Date/TAT:	Project Number: 06W003	Pace Profile #:

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☐ Other_____

SITE LOCATION ☐GA ☐IL ☐IN ☒MI ☐MN ☐NC ☐OH ☐SC ☐WI ☐OTHER_____

Filtered (Y/N): N

Requested Analysis: See Attached List TABLE 2

870383

Pace Project Number

Section D Required Client Information

SAMPLE ID

One Character per box. (A-Z, 0-9 / .-) Samples IDs MUST BE UNIQUE

Valid Matrix Codes: MATRIX / CODE — DRINKING WATER DW; WATER WT; WASTE WATER WW; PRODUCT P; SOIL/SOLID SL; OIL OL; WIPE WP; AIR AR; OTHER OT; TISSUE TS

ITEM #	SAMPLE ID	MATRIX CODE	SAMPLE TYPE G=GRAB C=COMP	COLLECTED COMPOSITE START DATE	COMPOSITE START TIME	COMPOSITE END/GRAB DATE	COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Residual Chlorine (Y/N)	Lab I.D
1	Mill Basement Floor 011	SL	C			3/30/06	0735			1									1-1L poly^
2	Gold Contact 012	SL	G			3/30/06	0750			1									
3	Mill Basement Bin 013	SL	G			3/30/06	0800			1									
4	Active Mill Product 014	SL	G			3/30/06	0815			1									
5	Filter Press Floor 015	SL	C			3/30/06	0830			1									
6	Concrete Mill Floor 016	SL	C			3/30/06	0835			1									
7	Mill Hopper 017	SL	G			3/30/06	0840			1									
8	Mill Super Sack 018	SL	G			3/30/06	0850			1									
9	Mill RR Floor 019	SL	C			3/30/06	0900			1									
10	Lunch Room Slag 020	SL	G			3/30/06	0930			1									
11	Below Beaver Pond 021	WT	G			3/30/06	1540		2			1		1					2-1L poly^
12																			

Additional Comments:

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITION
Scott Janssen	3/31/06	1030	[illegible]	3/31/06	1030	RUT

Temp in °C	Received on Ice	Custody Sealed Cooler	Samples Intact
	Y/N	Y/N	Y/N
	Y/N	Y/N	Y/N
	Y/N	Y/N	Y/N
	Y/N	Y/N	Y/N

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Scott Janssen

SIGNATURE of SAMPLER: [illegible] DATE Signed (MM / DD / YY)

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436
Fax: 920-469-8827

QC Summary

Batch: 870383
Lab Section: WETCHEM
QC Batch Number: 10446
Prep Method: EPA 335.4
Analytical Method: EPA 335.4

QC Type	Client Sample ID	Lab Sample ID
MB	WCG1878-013MB	WCG1878-013MB
LCS	WCG1878-013MBLCS	WCG1878-013MBLCS
MS	870499-003MS	870499-003MS
MS	870413-008MS	870413-008MS
MSD	870499-003MSD	870499-003MSD
MSD	870413-008MSD	870413-008MSD

Client Sample ID	Lab Sample ID	MB ID	Client Sample ID	Lab Sample ID	MB ID
BELOW BEAVER POND	870383-021	MB			

Test Name	Method Blank Result Conc	LCS Spiked Conc	LCS Recovery Conc	%	C	LCSD Spiked Conc	LCSD Recovery Conc	%	C	LCS/LCSD RPD	C	LCS/LCSD Control Limits LCL %	UCL %	RPD %	Parent Sample Number	Parent Result Conc	MS Spiked Conc	MS Recovery Conc	%	C	MSD Spiked Conc	MSD Recovery Conc	%	C	MS/MSD RPD	C	MS/MSD Control Limits LCL %	UCL %	RPD %
Cyanide, Total	< 0.0037	0.10	0.11	110.3		--	--	--		--		90	110	20	870413-008	0.27	0.10	0.38	102.9		0.10	0.37	101.7		0.3		90	110	20
Cyanide, Total	< 0.0037	0.10	0.11	110.3		--	--	--		--		90	110	20	870499-003	0.0085	0.10	0.085	77.0	N	0.10	0.079	70.6	N	7.7		90	110	20

Conc = mg/L unless otherwise noted
C = QC Code, see Qualifer Sheet
Parent Result is reported down to MDL in order to allow Validation of this worksheet
The %R and RPD results are calculated from raw data values with more significant figures than are reported on this form.

Report Date: 8/31/2006
QC Batch Number: 10446

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436
Fax: 920-469-8827

QC Summary

Batch: 870383
Lab Section: WETCHEM
QC Batch Number: 10447
Prep Method: SW846 9012A
Analytical Method: SW846 9012A

QC Type	Client Sample ID	Lab Sample ID
MB	WCG1878-014MB	WCG1878-014MB
LCS	WCG1878-014MBLCS	WCG1878-014MBLCS
MS	LUNCH ROOM SLAGMS	870383-020MS
MS	CB-FLOORMS	870383-010MS
MSD	LUNCH ROOM SLAGMSD	870383-020MSD
MSD	CB-FLOORMSD	870383-010MSD

Client Sample ID	Lab Sample ID	MB ID
SOUTH STORAGE PILE A	870383-001	MB
SHOP SUPER SACK	870383-003	MB
SHOP BIN 1	870383-005	MB
EECB-1	870383-007	MB
EECB-3	870383-009	MB
MILL BASEMENT FLOOR	870383-011	MB
MILL BASEMENT BIN	870383-013	MB
FILTER PRESS FLOOR	870383-015	MB
MILL HOPPER	870383-017	MB
MILL RR FLOOR	870383-019	MB

Client Sample ID	Lab Sample ID	MB ID
LEACHATE RESIDUE PILE	870383-002	MB
SHOP BIN 2	870383-004	MB
EECB-2	870383-006	MB
EECB-4	870383-008	MB
CB-FLOOR	870383-010	MB
GOLD CONTACT	870383-012	MB
ACTIVE MILL PRODUCT	870383-014	MB
CONCRETE MILL FLOOR	870383-016	MB
MILL SUPER SACK	870383-018	MB
LUNCH ROOM SLAG	870383-020	MB

Test Name	Method Blank Result	Conc	LCS Spiked Conc	LCS Recovery Conc	%	C	LCSD Spiked Conc	LCSD Recovery Conc	%	C	LCS/LCSD RPD %	C	LCS/LCSD Control Limits LCL %	UCL %	RPD %	Parent Sample Number		Parent Result Conc	MS Spiked Conc	MS Recovery Conc	%	C	MSD Spiked Conc	MSD Recovery Conc	%	C	MS/MSD RPD %	C	MS/MSD Control Limits LCL %	UCL %	RPD %
Cyanide, Total	<	0.28	3.0	3.4	112.6		–	–	–		–		81	119	20	870383-010		0.61	2.8	3.7	110.6		2.8	3.9	117.3		4.9		70	122	20
Cyanide, Total	<	0.28	3.0	3.4	112.6		–	–	–		–		81	119	20	870383-020	<	0.38	4.0	4.7	117.1		4.0	4.8	118.6		1.2	*	70	122	20

Conc = mg/kg unless otherwise noted
C = QC Code, see Qualifer Sheet
Parent Result is reported down to MDL in order to allow Validation of this worksheet
The %R and RPD results are calculated from raw data values with more significant figures than are reported on this form.

Report Date: 8/31/2006
QC Batch Number: 10447

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436
Fax: 920-469-8827

QC Summary

Batch: 870383
Lab Section: METALS
QC Batch Number: 10454
Prep Method: SW846 3010A
Analytical Method: SW846 6010B

QC Type	Client Sample ID	Lab Sample ID
MB	MBTMTG1884-23	MBTMTG1884-23
LCS	LCSTMTG1884-23	LCSTMTG1884-23
MS	GOLD CONTACTMS	870383-012MS
MS	MILL BASEMENT FLOOR	870383-011MS
MS	CB-FLOORMS	870383-010MS
MS	EECB-4MS	870383-008MS
MS	EECB-1MS	870383-007MS
MS	EECB-2MS	870383-006MS
MS	SOUTH STORAGE PILE	870383-001MS
MSD	SOUTH STORAGE PILE	870383-001MSD

Client Sample ID	Lab Sample ID	MB ID	Client Sample ID	Lab Sample ID	MB ID
SOUTH STORAGE PILE A	870383-001	MB	LEACHATE RESIDUE PILE	870383-002	MB
SHOP SUPER SACK	870383-003	MB	SHOP BIN 2	870383-004	MB
SHOP BIN 1	870383-005	MB	EECB-2	870383-006	MB
EECB-1	870383-007	MB	EECB-4	870383-008	MB
EECB-3	870383-009	MB	CB-FLOOR	870383-010	MB
MILL BASEMENT FLOOR	870383-011	MB	GOLD CONTACT	870383-012	MB
MILL BASEMENT BIN	870383-013	MB	ACTIVE MILL PRODUCT	870383-014	MB

Test Name	Method Blank Result	Conc	LCS Spiked Conc	LCS Recovery Conc	%	C	LCSD Spiked Conc	LCSD Recovery Conc	%	C	LCS/LCSD RPD %	C	LCS/LCSD Control Limits LCL %	UCL %	RPD %	Parent Sample Number	Parent Result	Conc	MS Spiked Conc	MS Recovery Conc	%	C	MSD Spiked Conc	MSD Recovery Conc	%	C	MS/MSD RPD %	C	MS/MSD Control Limits LCL %	UCL %	RPD %
Arsenic - TCLP	<	0.2	0.50	0.48	96.5		–	–	–		–		80	120	–	870383-001	<	0.038	2.5	2.5	98.7		2.5	2.5	98.1		0.6		75	125	20
Barium - TCLP	<	0.2	0.50	0.47	94.6		–	–	–		–		80	120	–	870383-001		0.038	2.5	2.4	95.6		2.5	2.4	93.8		1.9		75	125	20
Cadmium - TCLP	<	0.05	0.50	0.5	99.1		–	–	–		–		80	120	–	870383-001	<	0.0037	2.5	2.5	99.8		2.5	2.4	97.4		2.4		75	125	20
Chromium - TCLP	<	0.05	0.50	0.5	99.8		–	–	–		–		80	120	–	870383-001		0.16	2.5	2.7	102.0		2.5	2.6	98.7		3.0		75	125	20
Lead - TCLP	<	0.2	0.50	0.49	98.8		–	–	–		–		80	120	–	870383-001	<	0.017	2.5	2.5	98.6		2.5	2.4	96.6		2.1		75	125	20
Selenium - TCLP	<	0.2	0.50	0.49	97.7		–	–	–		–		80	120	–	870383-001	<	0.042	2.5	2.6	102.2		2.5	2.5	99.5		2.6		75	125	20
Silver - TCLP	<	0.05	0.25	0.24	96.5		–	–	–		–		80	120	–	870383-001	<	0.013	1.2	1.2	99.2		1.2	1.2	97.6		1.7		75	125	20
Arsenic - TCLP	<	0.2	0.50	0.48	96.5		–	–	–		–		80	120	–	870383-006	<	0.038	2.5	2.5	101.4		–	–	–		–		75	125	20
Barium - TCLP	<	0.2	0.50	0.47	94.6		–	–	–		–		80	120	–	870383-006		0.78	2.5	3.2	96.9		–	–	–		–		75	125	20
Cadmium - TCLP	<	0.05	0.50	0.5	99.1		–	–	–		–		80	120	–	870383-006		0.011	2.5	2.4	96.1		–	–	–		–		75	125	20
Chromium - TCLP	<	0.05	0.50	0.5	99.8		–	–	–		–		80	120	–	870383-006	<	0.0066	2.5	2.4	97.2		–	–	–		–		75	125	20
Lead - TCLP	<	0.2	0.50	0.49	98.8		–	–	–		–		80	120	–	870383-006		0.17	2.5	2.6	95.9		–	–	–		–		75	125	20
Selenium - TCLP	<	0.2	0.50	0.49	97.7		–	–	–		–		80	120	–	870383-006	<	0.042	2.5	2.6	103.1		–	–	–		–		75	125	20
Silver - TCLP	<	0.05	0.25	0.24	96.5		–	–	–		–		80	120	–	870383-006	<	0.013	1.2	1.3	107.4		–	–	–		–		75	125	20

Conc = mg/L unless otherwise noted
C = QC Code, see Qualifer Sheet
Parent Result is reported down to MDL in order to allow Validation of this worksheet
The %R and RPD results are calculated from raw data values with more significant figures than are reported on this form.

Report Date: 8/31/2006
QC Batch Number: 10454

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436
Fax: 920-469-8827

QC Summary

Test Name	Method Blank Result		LCS Spiked Conc	LCS Recovery Conc	LCS Recovery %	LCS Recovery C	LCSD Spiked Conc	LCSD Recovery Conc	LCSD Recovery %	LCSD Recovery C	LCS/LCSD RPD %	LCS RPD C	LCS/LCSD Control Limits LCL %	LCS/LCSD Control Limits UCL %	LCS/LCSD Control Limits RPD %	Parent Sample Number	Parent Result		MS Spiked Conc	MS Recovery Conc	MS Recovery %	MS Recovery C	MSD Spiked Conc	MSD Recovery Conc	MSD Recovery %	MSD Recovery C	MS/MSD RPD %	MS/MSD RPD C	MS/MSD Control Limits LCL %	MS/MSD Control Limits UCL %	MS/MSD Control Limits RPD %
Arsenic - TCLP	<	0.2	0.50	0.48	96.5		–	–	–		–		80	120	–	870383-007	<	0.038	2.5	2.4	95.5		–	–	–		–		75	125	20
Barium - TCLP	<	0.2	0.50	0.47	94.6		–	–	–		–		80	120	–	870383-007		0.14	2.5	2.4	92.1		–	–	–		–		75	125	20
Cadmium - TCLP	<	0.05	0.50	0.5	99.1		–	–	–		–		80	120	–	870383-007	<	0.0037	2.5	2.4	95.8		–	–	–		–		75	125	20
Chromium - TCLP	<	0.05	0.50	0.5	99.8		–	–	–		–		80	120	–	870383-007	<	0.0066	2.5	2.5	98.8		–	–	–		–		75	125	20
Lead - TCLP	<	0.2	0.50	0.49	98.8		–	–	–		–		80	120	–	870383-007		0.023	2.5	2.4	94.8		–	–	–		–		75	125	20
Selenium - TCLP	<	0.2	0.50	0.49	97.7		–	–	–		–		80	120	–	870383-007	<	0.042	2.5	2.4	97.6		–	–	–		–		75	125	20
Silver - TCLP	<	0.05	0.25	0.24	96.5		–	–	–		–		80	120	–	870383-007	<	0.013	1.2	1.2	95.1		–	–	–		–		75	125	20
Arsenic - TCLP	<	0.2	0.50	0.48	96.5		–	–	–		–		80	120	–	870383-008	<	0.038	2.5	2.4	97.6		–	–	–		–		75	125	20
Barium - TCLP	<	0.2	0.50	0.47	94.6		–	–	–		–		80	120	–	870383-008		0.49	2.5	2.9	94.4		–	–	–		–		75	125	20
Cadmium - TCLP	<	0.05	0.50	0.5	99.1		–	–	–		–		80	120	–	870383-008		0.014	2.5	2.4	95.7		–	–	–		–		75	125	20
Chromium - TCLP	<	0.05	0.50	0.5	99.8		–	–	–		–		80	120	–	870383-008		0.084	2.5	2.5	96.9		–	–	–		–		75	125	20
Lead - TCLP	<	0.2	0.50	0.49	98.8		–	–	–		–		80	120	–	870383-008		0.20	2.5	2.6	95.5		–	–	–		–		75	125	20
Selenium - TCLP	<	0.2	0.50	0.49	97.7		–	–	–		–		80	120	–	870383-008	<	0.042	2.5	2.5	98.9		–	–	–		–		75	125	20
Silver - TCLP	<	0.05	0.25	0.24	96.5		–	–	–		–		80	120	–	870383-008	<	0.013	1.2	1.2	99.5		–	–	–		–		75	125	20
Arsenic - TCLP	<	0.2	0.50	0.48	96.5		–	–	–		–		80	120	–	870383-010	<	0.038	2.5	2.3	90.3		–	–	–		–		75	125	20
Barium - TCLP	<	0.2	0.50	0.47	94.6		–	–	–		–		80	120	–	870383-010		0.55	2.5	2.6	82.7		–	–	–		–		75	125	20
Cadmium - TCLP	<	0.05	0.50	0.5	99.1		–	–	–		–		80	120	–	870383-010		0.0037	2.5	2.2	89.3		–	–	–		–		75	125	20
Chromium - TCLP	<	0.05	0.50	0.5	99.8		–	–	–		–		80	120	–	870383-010		0.021	2.5	2.3	91.1		–	–	–		–		75	125	20
Lead - TCLP	<	0.2	0.50	0.49	98.8		–	–	–		–		80	120	–	870383-010		0.12	2.5	2.3	89.3		–	–	–		–		75	125	20
Selenium - TCLP	<	0.2	0.50	0.49	97.7		–	–	–		–		80	120	–	870383-010	<	0.042	2.5	2.4	94.8		–	–	–		–		75	125	20
Silver - TCLP	<	0.05	0.25	0.24	96.5		–	–	–		–		80	120	–	870383-010	<	0.013	1.2	1.2	93.4		–	–	–		–		75	125	20
Arsenic - TCLP	<	0.2	0.50	0.48	96.5		–	–	–		–		80	120	–	870383-011	<	0.038	2.5	2.4	94.3		–	–	–		–		75	125	20
Barium - TCLP	<	0.2	0.50	0.47	94.6		–	–	–		–		80	120	–	870383-011		0.24	2.5	2.6	92.8		–	–	–		–		75	125	20
Cadmium - TCLP	<	0.05	0.50	0.5	99.1		–	–	–		–		80	120	–	870383-011		0.042	2.5	2.3	91.7		–	–	–		–		75	125	20
Chromium - TCLP	<	0.05	0.50	0.5	99.8		–	–	–		–		80	120	–	870383-011		0.11	2.5	2.5	97.3		–	–	–		–		75	125	20
Lead - TCLP	<	0.2	0.50	0.49	98.8		–	–	–		–		80	120	–	870383-011		0.53	2.5	2.9	92.9		–	–	–		–		75	125	20
Selenium - TCLP	<	0.2	0.50	0.49	97.7		–	–	–		–		80	120	–	870383-011	<	0.042	2.5	2.4	97.3		–	–	–		–		75	125	20
Silver - TCLP	<	0.05	0.25	0.24	96.5		–	–	–		–		80	120	–	870383-011	<	0.013	1.2	1.2	96.7		–	–	–		–		75	125	20
Arsenic - TCLP	<	0.2	0.50	0.48	96.5		–	–	–		–		80	120	–	870383-012	<	0.038	2.5	2.4	97.4		–	–	–		–		75	125	20
Barium - TCLP	<	0.2	0.50	0.47	94.6		–	–	–		–		80	120	–	870383-012		0.054	2.5	2.4	94.3		–	–	–		–		75	125	20
Cadmium - TCLP	<	0.05	0.50	0.5	99.1		–	–	–		–		80	120	–	870383-012		0.028	2.5	2.4	94.9		–	–	–		–		75	125	20
Chromium - TCLP	<	0.05	0.50	0.5	99.8		–	–	–		–		80	120	–	870383-012		0.014	2.5	2.5	99.8		–	–	–		–		75	125	20

Conc = mg/L unless otherwise noted

C = QC Code, see Qualifer Sheet

Parent Result is reported down to MDL in order to allow Validation of this worksheet

The %R and RPD results are calculated from raw data values with more significant figures than are reported on this form.

Report Date: 8/31/2006

QC Batch Number: 10454

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436
Fax: 920-469-8827

QC Summary

Test Name	Method Blank Result Conc	LCS Spiked Conc	LCS Recovery Conc	%	C	LCSD Spiked Conc	LCSD Recovery Conc	%	C	LCS/LCSD RPD %	C	LCS/LCSD Control Limits LCL %	UCL %	RPD %	Parent Sample Number	Parent Result Conc	MS Spiked Conc	MS Recovery Conc	%	C	MSD Spiked Conc	MSD Recovery Conc	%	C	MS/MSD RPD %	C	MS/MSD Control Limits LCL %	UCL %	RPD %
Lead - TCLP	< 0.2	0.50	0.49	98.8		–	–	–		–		80	120	–	870383-012	19	2.5	20	52.3	+	–	–	–		–		75	125	20
Selenium - TCLP	< 0.2	0.50	0.49	97.7		–	–	–		–		80	120	–	870383-012	< 0.042	2.5	2.5	100.5		–	–	–		–		75	125	20
Silver - TCLP	< 0.05	0.25	0.24	96.5		–	–	–		–		80	120	–	870383-012	< 0.013	1.2	1.2	98.8		–	–	–		–		75	125	20

Conc = mg/L unless otherwise noted

C = QC Code, see Qualifer Sheet

Parent Result is reported down to MDL in order to allow Validation of this worksheet

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Report Date: 8/31/2006

QC Batch Number: 10454

Pace Analytical Services, Inc.

QC Summary

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436
Fax: 920-469-8827

Batch: 870383
Lab Section: METALS
QC Batch Number: 10455
Prep Method: SW846 3010A
Analytical Method: SW846 6010B

QC Type	Client Sample ID	Lab Sample ID
MB	MBTMTG1884-24	MBTMTG1884-24
LCS	LCSTMTG1884-24	LCSTMTG1884-24
MS	CONCRETE MILL FLOOR	870383-016MS
MSD	CONCRETE MILL FLOOR	870383-016MSD

Client Sample ID	Lab Sample ID	MB ID
FILTER PRESS FLOOR	870383-015	MB
MILL HOPPER	870383-017	MB
MILL RR FLOOR	870383-019	MB

Client Sample ID	Lab Sample ID	MB ID
CONCRETE MILL FLOOR	870383-016	MB
MILL SUPER SACK	870383-018	MB
LUNCH ROOM SLAG	870383-020	MB

Conc = mg/L unless otherwise noted
C = QC Code, see Qualifer Sheet
Parent Result is reported down to MDL in order to allow Validation of this worksheet
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Report Date: 8/31/2006
QC Batch Number: 10455

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436
Fax: 920-469-8827

QC Summary

Batch: 870383
Lab Section: METALS
QC Batch Number: 10457
Prep Method: SW846 7470A
Analytical Method: SW846 7470A

QC Type	Client Sample ID	Lab Sample ID
MB	MBWMTG1845-43	MBWMTG1845-43
LCS	LCSWMTG1845-43	LCSWMTG1845-43
MS	870605-003MS	870605-003MS
MSD	870605-003MSD	870605-003MSD

Client Sample ID	Lab Sample ID	MB ID
BELOW BEAVER POND	870383-021	MB

Client Sample ID	Lab Sample ID	MB ID

Test Name	Method Blank Result Conc	LCS Spiked Conc	LCS Recovery Conc	%	C	LCSD Spiked Conc	LCSD Recovery Conc	%	C	LCS/LCSD RPD %	C	LCS/LCSD Control Limits LCL %	UCL %	RPD %	Parent Sample Number	Parent Result Conc	MS Spiked Conc	MS Recovery Conc	%	C	MSD Spiked Conc	MSD Recovery Conc	%	C	MS/MSD RPD %	C	MS/MSD Control Limits LCL %	UCL %	RPD %
Mercury	< 0.072	5.0	4.8	95.2		–	–	–		–		85	115	20	870605-003	< 0.072	5.0	4.9	97.8		5.0	4.9	98.3		0.4		85	115	20

Conc = ug/L unless otherwise noted
C = QC Code, see Qualifer Sheet
Parent Result is reported down to MDL in order to allow Validation of this worksheet
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Report Date: 8/31/2006
QC Batch Number: 10457

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436
Fax: 920-469-8827

QC Summary

Batch: 870383
Lab Section: METALS-K
QC Batch Number: 10462
Prep Method: SW846 7471A
Analytical Method: SW846 7471A

QC Type	Client Sample ID	Lab Sample ID
MB	MBSMTK1136-16	MBSMTK1136-16
LCS	LCSSMTK1136-16	LCSSMTK1136-16
MS	SOUTH STORAGE PILE	870383-001MS
MSD	SOUTH STORAGE PILE	870383-001MSD

Client Sample ID	Lab Sample ID	MB ID	Client Sample ID	Lab Sample ID	MB ID
SOUTH STORAGE PILE A	870383-001	MB	LEACHATE RESIDUE PILE	870383-002	MB
SHOP SUPER SACK	870383-003	MB	SHOP BIN 2	870383-004	MB
SHOP BIN 1	870383-005	MB	EECB-2	870383-006	MB
EECB-1	870383-007	MB	EECB-4	870383-008	MB
EECB-3	870383-009	MB	CB-FLOOR	870383-010	MB
MILL BASEMENT FLOOR	870383-011	MB	GOLD CONTACT	870383-012	MB
MILL BASEMENT BIN	870383-013	MB	ACTIVE MILL PRODUCT	870383-014	MB
FILTER PRESS FLOOR	870383-015	MB	CONCRETE MILL FLOOR	870383-016	MB
MILL HOPPER	870383-017	MB	MILL SUPER SACK	870383-018	MB
MILL RR FLOOR	870383-019	MB	LUNCH ROOM SLAG	870383-020	MB

Test Name	Method Blank Result Conc		LCS Spiked Conc	LCS Recovery Conc	LCS Recovery %	LCS Recovery C	LCSD Spiked Conc	LCSD Recovery Conc	LCSD Recovery %	LCSD Recovery C	LCS/LCSD RPD %	LCS/LCSD RPD C	LCS/LCSD Control Limits LCL %	LCS/LCSD Control Limits UCL %	LCS/LCSD Control Limits RPD %	Parent Sample Number		Parent Result Conc	MS Spiked Conc	MS Recovery Conc	MS Recovery %	MS Recovery C	MSD Spiked Conc	MSD Recovery Conc	MSD Recovery %	MSD Recovery C	MS/MSD RPD %	MS/MSD RPD C	MS/MSD Control Limits LCL %	MS/MSD Control Limits UCL %	MS/MSD Control Limits RPD %
Mercury	<	0.0017	0.25	0.26	103.8		–	–	–		–		85	115	10	870383-001		0.061	0.29	0.34	95.3		0.29	0.34	97.0		1.4		71	119	10

Conc = mg/kg unless otherwise noted
C = QC Code, see Qualifer Sheet
Parent Result is reported down to MDL in order to allow Validation of this worksheet
The %R and RPD results are calculated from raw data values with more significant figures than are reported on this form.

Report Date: 8/31/2006
QC Batch Number: 10462

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436
Fax: 920-469-8827

QC Summary

Batch: 870383
Lab Section: METALS
QC Batch Number: 10512
Prep Method: SW846 7470A
Analytical Method: SW846 7470A

QC Type	Client Sample ID	Lab Sample ID
MB	MBTMTG1845-46	MBTMTG1845-46
LCS	LCSTMTG1845-46	LCSTMTG1845-46
MS	GOLD CONTACTMS	870383-012MS
MS	MILL BASEMENT FLOOR	870383-011MS
MS	CB-FLOORMS	870383-010MS
MS	EECB-4MS	870383-008MS
MS	EECB-1MS	870383-007MS
MS	EECB-2MS	870383-006MS
MS	SOUTH STORAGE PILE	870383-001MS
MSD	SOUTH STORAGE PILE	870383-001MSD

Client Sample ID	Lab Sample ID	MB ID
SOUTH STORAGE PILE A	870383-001	MB
SHOP SUPER SACK	870383-003	MB
SHOP BIN 1	870383-005	MB
EECB-1	870383-007	MB
EECB-3	870383-009	MB
MILL BASEMENT FLOOR	870383-011	MB

Client Sample ID	Lab Sample ID	MB ID
LEACHATE RESIDUE PILE	870383-002	MB
SHOP BIN 2	870383-004	MB
EECB-2	870383-006	MB
EECB-4	870383-008	MB
CB-FLOOR	870383-010	MB
GOLD CONTACT	870383-012	MB

Test Name	Method Blank Result	Conc	LCS Spiked Conc	LCS Recovery Conc	%	C	LCSD Spiked Conc	LCSD Recovery Conc	%	C	LCS/LCSD RPD %	C	LCS/LCSD Control Limits LCL %	UCL %	RPD %	Parent Sample Number	Parent Result	Conc	MS Spiked Conc	MS Recovery Conc	%	C	MSD Spiked Conc	MSD Recovery Conc	%	C	MS/MSD RPD %	C	MS/MSD Control Limits LCL %	UCL %	RPD %
Mercury - TCLP	<	0.2	5.0	5	99.6		–	–	–		–		85	115	20	870383-001	<	0.029	2.0	2	100.1		2.0	2	99.2		0.9		85	115	20
Mercury - TCLP	<	0.2	5.0	5	99.6		–	–	–		–		85	115	20	870383-005	<	0.029	2.0	2	99.4		–	–	–		–		85	115	20
Mercury - TCLP	<	0.2	5.0	5	99.6		–	–	–		–		85	115	20	870383-007	<	0.029	2.0	2.1	104.3		–	–	–		–		85	115	20
Mercury - TCLP	<	0.2	5.0	5	99.6		–	–	–		–		85	115	20	870383-008	<	0.029	2.0	2.1	104.4		–	–	–		–		85	115	20
Mercury - TCLP	<	0.2	5.0	5	99.6		–	–	–		–		85	115	20	870383-010	<	0.029	2.0	2.1	102.9		–	–	–		–		85	115	20
Mercury - TCLP	<	0.2	5.0	5	99.6		–	–	–		–		85	115	20	870383-011	<	0.029	2.0	2	100.2		–	–	–		–		85	115	20
Mercury - TCLP	<	0.2	5.0	5	99.6		–	–	–		–		85	115	20	870383-012	<	0.029	2.0	1.9	95.1		–	–	–		–		85	115	20

Conc = mg/L unless otherwise noted
C = QC Code, see Qualifer Sheet
Parent Result is reported down to MDL in order to allow Validation of this worksheet
The %R and RPD results are calculated from raw data values with more significant figures than are reported on this form.

Report Date: 8/31/2006
QC Batch Number: 10512

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436
Fax: 920-469-8827

QC Summary

Batch: 870383
Lab Section: METALS
QC Batch Number: 10515
Prep Method: SW846 7470A
Analytical Method: SW846 7470A

QC Type	Client Sample ID	Lab Sample ID
MB	MBWMTG1845-48	MBWMTG1845-48
MB	MBTMTG1845-48	MBTMTG1845-48
LCS	LCSWMTG1845-48	LCSWMTG1845-48
LCS	LCSTMTG1845-48	LCSTMTG1845-48
MS	870435-002MS	870435-002MS
MS	MILL BASEMENT BINMS	870383-013MS
MSD	870435-002MSD	870435-002MSD
MSD	MILL BASEMENT BINMS	870383-013MSD

Client Sample ID	Lab Sample ID	MB ID
MILL BASEMENT BIN	870383-013	MB
FILTER PRESS FLOOR	870383-015	MB
MILL HOPPER	870383-017	MB
MILL RR FLOOR	870383-019	MB
ACTIVE MILL PRODUCT	870383-014	MB
CONCRETE MILL FLOOR	870383-016	MB
MILL SUPER SACK	870383-018	MB
LUNCH ROOM SLAG	870383-020	MB

Test Name	Method Blank Result Conc	LCS Spiked Conc	LCS Recovery Conc	LCS Recovery %	LCS Recovery C	LCSD Spiked Conc	LCSD Recovery Conc	LCSD Recovery %	LCSD Recovery C	LCS/LCSD RPD %	LCS/LCSD RPD C	LCS/LCSD Control Limits LCL %	LCS/LCSD Control Limits UCL %	LCS/LCSD Control Limits RPD %	Parent Sample Number	Parent Result Conc	MS Spiked Conc	MS Recovery Conc	MS Recovery %	MS Recovery C	MSD Spiked Conc	MSD Recovery Conc	MSD Recovery %	MSD Recovery C	MS/MSD RPD %	MS/MSD RPD C	MS/MSD Control Limits LCL %	MS/MSD Control Limits UCL %	MS/MSD Control Limits RPD %
Mercury - TCLP	< 0.2	5.0	4.9	98.4		–	–	–		–		85	115	20	870383-013	< 0.029	2.0	1.9	93.9		2.0	2	100.3		6.5		85	115	20

Conc = ug/L unless otherwise noted
C = QC Code, see Qualifer Sheet
Parent Result is reported down to MDL in order to allow Validation of this worksheet
The %R and RPD results are calculated from raw data values with more significant figures than are reported on this form.

Report Date: 8/31/2006
QC Batch Number: 10515

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436
Fax: 920-469-8827

QC Summary

Batch: 870383
Lab Section: METALS-K
QC Batch Number: 10635
Prep Method: 3050B Sec7.5
Analytical Method: SW846 6020

QC Type	Client Sample ID	Lab Sample ID
MB	MBSMTK1142-28	MBSMTK1142-28
LCS	LCSSMTK1142-28	LCSSMTK1142-28
MS	SOUTH STORAGE PILE	870383-001MS
MSD	SOUTH STORAGE PILE	870383-001MSD

Client Sample ID	Lab Sample ID	MB ID
SOUTH STORAGE PILE A	870383-001	MB
SHOP SUPER SACK	870383-003	MB
SHOP BIN 1	870383-005	MB
EECB-1	870383-007	MB
EECB-3	870383-009	MB
MILL BASEMENT FLOOR	870383-011	MB
MILL BASEMENT BIN	870383-013	MB
FILTER PRESS FLOOR	870383-015	MB
MILL HOPPER	870383-017	MB
MILL RR FLOOR	870383-019	MB

Client Sample ID	Lab Sample ID	MB ID
LEACHATE RESIDUE PILE	870383-002	MB
SHOP BIN 2	870383-004	MB
EECB-2	870383-006	MB
EECB-4	870383-008	MB
CB-FLOOR	870383-010	MB
GOLD CONTACT	870383-012	MB
ACTIVE MILL PRODUCT	870383-014	MB
CONCRETE MILL FLOOR	870383-016	MB
MILL SUPER SACK	870383-018	MB
LUNCH ROOM SLAG	870383-020	MB

Test Name	Method Blank Result Conc		LCS Spiked Conc	LCS Recovery Conc	LCS Recovery %	LCS Recovery C	LCSD Spiked Conc	LCSD Recovery Conc	LCSD Recovery %	LCSD Recovery C	LCS/LCSD RPD %	LCS/LCSD RPD C	LCS/LCSD Control Limits LCL %	LCS/LCSD Control Limits UCL %	LCS/LCSD Control Limits RPD %	Parent Sample Number	Parent Result Conc	MS Spiked Conc	MS Recovery Conc	MS Recovery %	MS Recovery C	MSD Spiked Conc	MSD Recovery Conc	MSD Recovery %	MSD Recovery C	MS/MSD RPD %	MS/MSD RPD C	MS/MSD Control Limits LCL %	MS/MSD Control Limits UCL %	MS/MSD Control Limits RPD %
Antimony	<	0.048	20	20	100.5		–	–	–		–		80	120	10	870383-001	81	23	99	79.8		23	80	-3.3	N	21.6	*	73	125	10
Silver	<	0.014	5.0	4.7	94.3		–	–	–		–		80	120	10	870383-001	23	5.8	27	74.2		5.8	21	-33.8	N	26.1	*	50	130	10

Conc = mg/kg unless otherwise noted
C = QC Code, see Qualifer Sheet
Parent Result is reported down to MDL in order to allow Validation of this worksheet
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Report Date: 8/31/2006
QC Batch Number: 10635

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436
Fax: 920-469-8827

QC Summary

Batch: 870383
Lab Section: METALS-K
QC Batch Number: 10707
Prep Method: SW846 3050B
Analytical Method: SW846 6020

QC Type	Client Sample ID	Lab Sample ID
MB	MBSMTK1126-23	MBSMTK1126-23
LCS	LCSSMTK1126-23	LCSSMTK1126-23
MS	SOUTH STORAGE PILE	870383-001MS
MSD	SOUTH STORAGE PILE	870383-001MSD

Client Sample ID	Lab Sample ID	MB ID
SOUTH STORAGE PILE A	870383-001	MB
SHOP SUPER SACK	870383-003	MB
SHOP BIN 1	870383-005	MB
EECB-1	870383-007	MB
EECB-3	870383-009	MB
MILL BASEMENT FLOOR	870383-011	MB
MILL BASEMENT BIN	870383-013	MB
FILTER PRESS FLOOR	870383-015	MB
MILL HOPPER	870383-017	MB
MILL RR FLOOR	870383-019	MB

Client Sample ID	Lab Sample ID	MB ID
LEACHATE RESIDUE PILE	870383-002	MB
SHOP BIN 2	870383-004	MB
EECB-2	870383-006	MB
EECB-4	870383-008	MB
CB-FLOOR	870383-010	MB
GOLD CONTACT	870383-012	MB
ACTIVE MILL PRODUCT	870383-014	MB
CONCRETE MILL FLOOR	870383-016	MB
MILL SUPER SACK	870383-018	MB
LUNCH ROOM SLAG	870383-020	MB

Test Name	Method Blank Result	Conc	LCS Spiked Conc	LCS Recovery Conc	%	C	LCSD Spiked Conc	LCSD Recovery Conc	%	C	LCS/LCSD RPD	%	C	LCS/LCSD Control Limits LCL %	UCL %	RPD %	Parent Sample Number	Parent Result Conc	MS Spiked Conc	MS Recovery Conc	%	C	MSD Spiked Conc	MSD Recovery Conc	%	C	MS/MSD RPD	%	C	MS/MSD Control Limits LCL %	UCL %	RPD %
Aluminum		3.3	100.0	92	91.8		--	--	--		--			59	120	10	870383-001	3348	116.6	4404	905.0	+	116.6	4032	586.0	+	8.8			75	125	10
Arsenic	<	0.029	20.0	18	91.4		--	--	--		--			66	120	13	870383-001	123	23.3	260	584.5	+	23.3	191	288.7	+	30.6	*		52	125	13
Barium		0.038	20	18	91.2		--	--	--		--			64	120	16	870383-001	14	23	36	95.3		23	37	99.9		2.9			50	132	16
Beryllium	<	0.011	20	19	95.8		--	--	--		--			64	120	17	870383-001	0.093	23	20	85.5		23	20	86.9		1.6			52	125	17
Cadmium	<	0.015	20	18	92.0		--	--	--		--			79	120	13	870383-001	0.66	23	23	94.1		23	23	96.4		2.4			68	125	13
Chromium		0.057	20.0	18	89.3		--	--	--		--			55	120	13	870383-001	240	23.3	342	434.1	+	23.3	325	363.5	+	4.9			59	125	13
Cobalt	<	0.0053	20.0	18	91.1		--	--	--		--			50	120	10	870383-001	74.6	23.3	129	232.0	N	23.3	109	145.7	N	16.9	*		63	125	10
Copper		0.23	20.0	18	90.8		--	--	--		--			50	120	10	870383-001	269	23.3	365	415.5	+	23.3	312	187.7	+	15.7	*		50	125	10
Iron	<	1.8	100.00	90	90.4		--	--	--		--			52	121	14	870383-001	72916	116.59	100000	26860.0	+	116.59	88329	13220.0	+	16.5	*		50	150	14
Lead		0.029	20.0	18	89.2		--	--	--		--			74	120	15	870383-001	276	23.3	327	217.2	+	23.3	335	253.5	+	2.6			50	134	15
Magnesium	<	1.4	1000	894	89.4		--	--	--		--			65	120	15	870383-001	3907	1166	6121	189.9	N	1166	5533	139.4		10.1			50	150	15
Manganese	<	0.013	20.0	18	89.6		--	--	--		--			54	120	12	870383-001	71.1	23.3	100	126.0		23.3	105	143.5		4.0			50	150	12
Nickel	<	0.02	20.0	18	90.8		--	--	--		--			50	120	10	870383-001	157	23.3	232	322.5	+	23.3	244	371.8	+	4.8			61	125	10
Selenium	<	0.082	20	19	94.3		--	--	--		--			78	120	13	870383-001	2.9	23	26	100.5		23	27	102.3		1.6			75	125	13
Thallium	<	0.0031	20	18	89.4		--	--	--		--			71	120	12	870383-001	0.10	23	21	89.8		23	21	89.2		0.6			57	133	12
Vanadium	<	0.017	20	17	87.2		--	--	--		--			61	120	17	870383-001	10	23	32	91.9		23	34	104.6		9.0			50	125	17
Zinc	<	1.1	20	19	92.8		--	--	--		--			56	120	10	870383-001	54	23	80	112.3		23	80	109.5		0.8			50	150	10

Conc = mg/kg unless otherwise noted
C = QC Code, see Qualifer Sheet
Parent Result is reported down to MDL in order to allow Validation of this worksheet
The %R and RPD results are calculated from raw data values with more significant figures than are reported on this form.

Report Date: 8/31/2006
QC Batch Number: 10707

Batch No. 877999
Additional Mill Building Sample Data

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, Inc.
1241 Bellevue Street, Suite 9
Green Bay, WI 54302
Phone: 920.469.2436
Fax: 920.469.8827

December 18, 2006

Janis Kesy
Foth & Van Dyke
2737 South Ridge Road
Green Bay, WI 54304

Dear Ms. Kesy:

Enclosed is a report for the analysis of environmental samples and associated QC samples for the Humboldt Mill project (06W003). The samples were assigned to batch number 877999 for laboratory tracking purposes.

A table of the results has also been sent to you via e-mail.

If you have any questions regarding this data please call me at (608) 232-3300 ext. 302.

Sincerely,

for TN

Tod Noltemeyer
Project Manager

Pace Analytical®

1241 Bellevue Street, Suite 9
Green Bay, WI 54302
920-469-2436, Fax: 920-469-8827

Analytical Report Number: 877999

Client: FOTH & VAN DYKE
Lab Contact: Tod Noltemeyer
Project Name: KEMC-HUMBOLDT MILL
Project Number: 06W003

Lab Sample Number	Field ID	Matrix	Collection Date
877999-001	M-1	SOIL	10/31/06 14:00
877999-002	M-2-WEST	WIPE	10/31/06 14:30
877999-003	M-2-EAST	WIPE	10/31/06 15:00
877999-004	M-3	WW	10/31/06 14:45
877999-005	M-4	SOIL	10/31/06 13:00
877999-006	M-5	SOIL	10/31/06 13:30
877999-007	M-6	SOIL	10/31/06 13:45

I certify that the data contained in this Final Report has been generated and reviewed in accordance with approved methods and Laboratory Standard Operating Procedure. Exceptions, if any, are discussed in the accompanying sample comments. Release of this final report is authorized by Laboratory management, as is verified by the following signature. This report shall not be reproduced, except in full, without the written consent of Pace Analytical Services, Inc. The sample results relate only to the analytes of interest tested.

Approval Signature: for TH

Date: 12/18/06

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436

Analytical Report Number: 877999

Client : FOTH & VAN DYKE
Project Name : KEMC-HUMBOLDT MILL
Project Number : 06W003
Field ID : M-1

Matrix Type : SOIL
Collection Date : 10/31/06
Report Date : 12/14/06
Lab Sample Number : 877999-001

INORGANICS

Test	Result		MDL	EQL	Dil.	Units	Code	Anl Date	Prep Method	Anl Method
Leach Date - Conventionals	DONE				1			11/06/06	SW846 1311	SW846 1311
Aluminum	1500		1.0	16	5	mg/Kg	N	11/22/06	SW846 3050B	SW846 6020
Antimony	590		0.14	1.3	10	mg/Kg		11/18/06	3050B sec7.5	SW846 6020
Arsenic	140		0.046	0.31	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Arsenic - TCLP	0.038	U	0.038	1.0	1	mg/L		11/07/06	SW846 3010A	SW846 6010B
Barium	5.5		0.019	0.31	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Barium - TCLP	0.088	B	0.0050	1.0	1	mg/L		11/07/06	SW846 3010A	SW846 6010B
Beryllium	0.022	B	0.021	0.31	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Boron	3.1	B	0.51	3.1	5	mg/Kg	N	11/22/06	SW846 3050B	SW846 6020
Cadmium	3.3		0.029	0.31	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Cadmium - TCLP	0.024	B	0.0037	0.25	1	mg/L		11/07/06	SW846 3010A	SW846 6010B
Chromium	170		0.051	0.31	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Chromium - TCLP	0.011	B	0.0066	0.25	1	mg/L		11/07/06	SW846 3010A	SW846 6010B
Cobalt	310		0.011	0.31	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Copper	1100		0.035	0.31	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Iron	370000		190	1600	500	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Lead	730		0.014	0.31	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Lead - TCLP	0.017	U	0.017	1.0	1	mg/L		11/07/06	SW846 3010A	SW846 6010B
Lithium	2.4		0.14	0.27	1	mg/kg		11/10/06	EPA 3020	EPA 6020
Magnesium	2200		0.79	160	5	mg/Kg	N	11/22/06	SW846 3050B	SW846 6020
Manganese	53		0.28	0.31	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Mercury	0.15		0.0019	0.013	1	mg/Kg		11/08/06	SW846 7471A	SW846 7471A
Mercury - TCLP	7.2E-5	U	7.2E-5	2.0E-4	1	mg/L		11/08/06	SW846 7470A	SW846 7470A
Molybdenum	230		0.059	3.1	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Nickel	520		0.024	0.31	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Selenium	9.1		0.21	0.31	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Selenium - TCLP	0.042	U	0.042	1.0	1	mg/L		11/07/06	SW846 3010A	SW846 6010B
Silver	180		0.064	0.63	10	mg/Kg		11/18/06	3050B sec7.5	SW846 6020
Silver - TCLP	0.013	U	0.013	0.25	1	mg/L		11/07/06	SW846 3010A	SW846 6010B
Thallium	0.088	B	0.018	0.31	5	mg/Kg	N	11/22/06	SW846 3050B	SW846 6020
Vanadium	1.0		0.027	0.31	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Zinc	170		0.88	3.1	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Percent Solids	79.9		---	---	1	%		11/03/06	SM M2540G	SM M2540G

All soil results are reported on a dry weight basis unless otherwise noted.

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436

Analytical Report Number: 877999

Client : FOTH & VAN DYKE
Project Name : KEMC-HUMBOLDT MILL
Project Number : 06W003
Field ID : M-2-WEST

Matrix Type : WIPE
Collection Date : 10/31/06
Report Date : 12/14/06
Lab Sample Number : 877999-002

PCB — Prep Date: 11/14/06

Analyte	Result		MDL	EQL	Dil.	Units	Code	Anal Date	Prep Method	Anl Method
Aroclor 1016	0.080	U	0.080	1.0	1	ug/wipe		11/18/06	SW846 3580A	SW846 8082
Aroclor 1221	0.080	U	0.080	1.0	1	ug/wipe		11/18/06	SW846 3580A	SW846 8082
Aroclor 1232	0.080	U	0.080	1.0	1	ug/wipe		11/18/06	SW846 3580A	SW846 8082
Aroclor 1242	0.080	U	0.080	1.0	1	ug/wipe		11/18/06	SW846 3580A	SW846 8082
Aroclor 1248	0.080	U	0.080	1.0	1	ug/wipe		11/18/06	SW846 3580A	SW846 8082
Aroclor 1254	0.080	U	0.080	1.0	1	ug/wipe		11/18/06	SW846 3580A	SW846 8082
Aroclor 1260	8.6		0.080	1.0	1	ug/wipe		11/18/06	SW846 3580A	SW846 8082
Total PCBs	8.6		0.080	1.0	1	ug/wipe		11/18/06	SW846 3580A	SW846 8082
Surrogate			**LCL**	**UCL**						
Tetrachloro-m-xylene	70		50	150	1	%		11/18/06	SW846 3580A	SW846 8082
Decachlorobiphenyl	68		50	150	1	%		11/18/06	SW846 3580A	SW846 8082

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436

Analytical Report Number: 877999

Client : FOTH & VAN DYKE
Project Name : KEMC-HUMBOLDT MILL
Project Number : 06W003
Field ID : M-2-EAST

Matrix Type : WIPE
Collection Date : 10/31/06
Report Date : 12/14/06
Lab Sample Number : 877999-003

PCB

Prep Date: 11/14/06

Analyte	Result		MDL	EQL	Dil.	Units	Code	Anal Date	Prep Method	Anl Method
Aroclor 1016	0.080	U	0.080	1.0	1	ug/wipe		11/18/06	SW846 3580A	SW846 8082
Aroclor 1221	0.080	U	0.080	1.0	1	ug/wipe		11/18/06	SW846 3580A	SW846 8082
Aroclor 1232	0.080	U	0.080	1.0	1	ug/wipe		11/18/06	SW846 3580A	SW846 8082
Aroclor 1242	0.59	J	0.080	1.0	1	ug/wipe		11/18/06	SW846 3580A	SW846 8082
Aroclor 1248	0.080	U	0.080	1.0	1	ug/wipe		11/18/06	SW846 3580A	SW846 8082
Aroclor 1254	0.080	U	0.080	1.0	1	ug/wipe		11/18/06	SW846 3580A	SW846 8082
Aroclor 1260	6.5		0.080	1.0	1	ug/wipe		11/18/06	SW846 3580A	SW846 8082
Total PCBs	7.1		0.080	1.0	1	ug/wipe		11/18/06	SW846 3580A	SW846 8082
Surrogate			**LCL**	**UCL**						
Tetrachloro-m-xylene	66		50	150	1	%		11/18/06	SW846 3580A	SW846 8082
Decachlorobiphenyl	54		50	150	1	%		11/18/06	SW846 3580A	SW846 8082

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436

Analytical Report Number: 877999

Client : FOTH & VAN DYKE
Project Name : KEMC-HUMBOLDT MILL
Project Number : 06W003
Field ID : M-3

Matrix Type : WASTEWATER
Collection Date : 10/31/06
Report Date : 12/14/06
Lab Sample Number : 877999-004

VOLATILES

Prep Date: 11/03/06

Analyte	Result		MDL	EQL	Dil.	Units	Code	Anal Date	Prep Method	Anl Method
1,1,1,2-Tetrachloroethane	0.92	U	0.92	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
1,1,1-Trichloroethane	0.90	U	0.90	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
1,1,2,2-Tetrachloroethane	0.20	U	0.20	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
1,1,2-Trichloroethane	0.42	U	0.42	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
1,1-Dichloroethane	0.75	U	0.75	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
1,1-Dichloroethene	0.57	U	0.57	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
1,1-Dichloropropene	0.75	U	0.75	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
1,2,3-Trichlorobenzene	0.74	U	0.74	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
1,2,3-Trichloropropane	0.99	U	0.99	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
1,2,4-Trichlorobenzene	0.97	U	0.97	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
1,2,4-Trimethylbenzene	0.97	U	0.97	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
1,2-Dibromo-3-chloropropane	0.87	U	0.87	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
1,2-Dibromoethane	0.56	U	0.56	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
1,2-Dichlorobenzene	0.83	U	0.83	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
1,2-Dichloroethane	0.36	U	0.36	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
1,2-Dichloropropane	0.46	U	0.46	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
1,3,5-Trimethylbenzene	0.83	U	0.83	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
1,3-Dichlorobenzene	0.87	U	0.87	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
1,3-Dichloropropane	0.61	U	0.61	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
1,4-Dichlorobenzene	0.95	U	0.95	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
2,2-Dichloropropane	0.62	U	0.62	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
2-Chlorotoluene	0.85	U	0.85	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
4-Chlorotoluene	0.74	U	0.74	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
Benzene	0.41	U	0.41	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
Bromobenzene	0.82	U	0.82	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
Bromochloromethane	0.97	U	0.97	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
Bromodichloromethane	0.56	U	0.56	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
Bromoform	0.94	U	0.94	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
Bromomethane	0.91	U	0.91	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
Carbon Tetrachloride	0.49	U	0.49	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
Chlorobenzene	0.41	U	0.41	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
Chlorodibromomethane	0.81	U	0.81	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
Chloroethane	0.97	U	0.97	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
Chloroform	0.37	U	0.37	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
Chloromethane	0.24	U	0.24	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
cis-1,2-Dichloroethene	0.83	U	0.83	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
cis-1,3-Dichloropropene	0.19	U	0.19	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
Dibromomethane	0.60	U	0.60	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
Dichlorodifluoromethane	0.99	U	0.99	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
Diisopropyl Ether	0.76	U	0.76	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
Ethylbenzene	0.54	U	0.54	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
Fluorotrichloromethane	0.79	U	0.79	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
Hexachlorobutadiene	0.67	U	0.67	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
Isopropylbenzene	0.59	U	0.59	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
Methylene Chloride	0.43	U	0.43	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
Methyl-tert-butyl-ether	0.61	U	0.61	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
Naphthalene	0.74	U	0.74	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
n-Butylbenzene	0.93	U	0.93	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436

Analytical Report Number: 877999

Client : FOTH & VAN DYKE
Project Name : KEMC-HUMBOLDT MILL
Project Number : 06W003
Field ID : M-3

Matrix Type : WASTEWATER
Collection Date : 10/31/06
Report Date : 12/14/06
Lab Sample Number : 877999-004

VOLATILES

Prep Date: 11/03/06

Analyte	Result		MDL	EQL	Dil.	Units	Code	Anal Date	Prep Method	Anl Method
n-Propylbenzene	0.81	U	0.81	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
p-Isopropyltoluene	0.67	U	0.67	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
s-Butylbenzene	0.89	U	0.89	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
Styrene	0.86	U	0.86	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
t-Butylbenzene	0.97	U	0.97	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
Tetrachloroethene	0.45	U	0.45	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
Toluene	0.67	U	0.67	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
trans-1,2-Dichloroethene	0.89	U	0.89	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
trans-1,3-Dichloropropene	0.19	U	0.19	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
Trichloroethene	0.48	U	0.48	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
Vinyl Chloride	0.18	U	0.18	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
Xylene, m + p	1.8	U	1.8	2.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
Xylene, o	0.83	U	0.83	1.0	1	ug/L		11/03/06	SW846 5030B	SW846 8260B
Surrogate			**LCL**	**UCL**						
4-Bromofluorobenzene	102		64	132	1	%		11/03/06	SW846 5030B	SW846 8260B
Toluene-d8	104		73	127	1	%		11/03/06	SW846 5030B	SW846 8260B
Dibromofluoromethane	107		68	122	1	%		11/03/06	SW846 5030B	SW846 8260B

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436

Analytical Report Number: 877999

Client : FOTH & VAN DYKE
Project Name : KEMC-HUMBOLDT MILL
Project Number : 06W003
Field ID : M-4

Matrix Type : SOIL
Collection Date : 10/31/06
Report Date : 12/14/06
Lab Sample Number : 877999-005

INORGANICS

Test	Result		MDL	EQL	Dil.	Units	Code	Anl Date	Prep Method	Anl Method
Leach Date - Conventionals	DONE				1			11/06/06	SW846 1311	SW846 1311
Aluminum	1700		1.1	17	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Antimony	170		0.15	1.4	10	mg/Kg		11/18/06	3050B sec7.5	SW846 6020
Arsenic	260		0.050	0.34	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Arsenic - TCLP	0.038	U	0.038	1.0	1	mg/L		11/07/06	SW846 3010A	SW846 6010B
Barium	2.6		0.021	0.34	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Barium - TCLP	0.068	B	0.0050	1.0	1	mg/L		11/07/06	SW846 3010A	SW846 6010B
Beryllium	0.024	B	0.023	0.34	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Boron	1.3	B	0.56	3.4	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Cadmium	0.84		0.032	0.34	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Cadmium - TCLP	0.016	B	0.0037	0.25	1	mg/L		11/07/06	SW846 3010A	SW846 6010B
Chromium	140		0.056	0.34	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Chromium - TCLP	0.0090	B	0.0066	0.25	1	mg/L		11/07/06	SW846 3010A	SW846 6010B
Cobalt	380		0.012	0.34	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Copper	630		0.039	0.34	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Iron	310000		210	1700	500	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Lead	120		0.015	0.34	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Lead - TCLP	0.017	U	0.017	1.0	1	mg/L		11/07/06	SW846 3010A	SW846 6010B
Lithium	2.1		0.17	0.33	1	mg/kg		11/10/06	EPA 3020	EPA 6020
Magnesium	4100		0.86	170	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Manganese	47		0.31	0.34	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Mercury	0.075		0.0021	0.014	1	mg/Kg		11/08/06	SW846 7471A	SW846 7471A
Mercury - TCLP	7.2E-5	U	7.2E-5	2.0E-4	1	mg/L		11/08/06	SW846 7470A	SW846 7470A
Molybdenum	150		0.065	3.4	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Nickel	760		0.026	0.34	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Selenium	9.9		0.23	0.34	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Selenium - TCLP	0.042	U	0.042	1.0	1	mg/L		11/07/06	SW846 3010A	SW846 6010B
Silver	61		0.070	0.69	10	mg/Kg		11/18/06	3050B sec7.5	SW846 6020
Silver - TCLP	0.013	U	0.013	0.25	1	mg/L		11/07/06	SW846 3010A	SW846 6010B
Thallium	0.055	B	0.020	0.34	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Vanadium	1.9		0.030	0.34	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Zinc	79		0.96	3.4	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Cyanide, Total	8.8		0.28	0.55	1	mg/kg		11/14/06	SW846 9012A	SW846 9012A
Percent Solids	72.7		—	—	1	%		11/03/06	SM M2540G	SM M2540G

All soil results are reported on a dry weight basis unless otherwise noted.

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436

Analytical Report Number: 877999

Client : FOTH & VAN DYKE
Project Name : KEMC-HUMBOLDT MILL
Project Number : 06W003
Field ID : M-5

Matrix Type : SOIL
Collection Date : 10/31/06
Report Date : 12/14/06
Lab Sample Number : 877999-006

INORGANICS

Test	Result		MDL	EQL	Dil.	Units	Code	Anl Date	Prep Method	Anl Method
Leach Date - Conventionals	DONE				1			11/06/06	SW846 1311	SW846 1311
Aluminum	230		0.90	14	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Antimony	1700		0.12	1.1	10	mg/Kg		11/18/06	3050B sec7.5	SW846 6020
Arsenic	670		0.040	0.27	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Arsenic - TCLP	0.47	B	0.038	1.0	1	mg/L		11/07/06	SW846 3010A	SW846 6010B
Barium	7.3		0.017	0.27	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Barium - TCLP	0.11	B	0.0050	1.0	1	mg/L		11/07/06	SW846 3010A	SW846 6010B
Beryllium	0.043	B	0.018	0.27	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Boron	29		0.44	2.7	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Cadmium	0.025	U	0.025	0.27	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Cadmium - TCLP	0.0037	U	0.0037	0.25	1	mg/L		11/07/06	SW846 3010A	SW846 6010B
Chromium	84		0.045	0.27	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Chromium - TCLP	0.0066	U	0.0066	0.25	1	mg/L		11/07/06	SW846 3010A	SW846 6010B
Cobalt	6.1		0.0095	0.27	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Copper	500		0.030	0.27	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Iron	250000		160	1400	500	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Lead	5.1		0.012	0.27	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Lead - TCLP	0.017	U	0.017	1.0	1	mg/L		11/07/06	SW846 3010A	SW846 6010B
Lithium	0.26	U	0.26	0.52	1	mg/kg		11/10/06	EPA 3020	EPA 6020
Magnesium	1000		0.68	140	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Manganese	1200		0.25	0.27	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Mercury	0.041		0.0016	0.011	1	mg/Kg		11/08/06	SW846 7471A	SW846 7471A
Mercury - TCLP	5.2E-4		7.2E-5	2.0E-4	1	mg/L		11/08/06	SW846 7470A	SW846 7470A
Molybdenum	5.7		0.052	2.7	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Nickel	730		0.021	0.27	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Selenium	4.1		0.18	0.27	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Selenium - TCLP	0.042	U	0.042	1.0	1	mg/L		11/07/06	SW846 3010A	SW846 6010B
Silver	3.0		0.055	0.54	10	mg/Kg		11/18/06	3050B sec7.5	SW846 6020
Silver - TCLP	0.013	U	0.013	0.25	1	mg/L		11/07/06	SW846 3010A	SW846 6010B
Thallium	0.016	U	0.016	0.27	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Vanadium	2.1		0.024	0.27	5	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Zinc	10000		76	270	500	mg/Kg		11/22/06	SW846 3050B	SW846 6020
Cyanide, Total	460		46	90	200	mg/kg		11/14/06	SW846 9012A	SW846 9012A
Percent Solids	92.0		---	---	1	%		11/03/06	SM M2540G	SM M2540G

All soil results are reported on a dry weight basis unless otherwise noted.

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436

Analytical Report Number: 877999

Client : FOTH & VAN DYKE
Project Name : KEMC-HUMBOLDT MILL
Project Number : 06W003
Field ID : M-6

Matrix Type : SOIL
Collection Date : 10/31/06
Report Date : 12/14/06
Lab Sample Number : 877999-007

INORGANICS

Test	Result	MDL	EQL	Dil.	Units	Code	Anl Date	Prep Method	Anl Method
Percent Solids	96.0	---	---	1	%		11/03/06	SM M2540G	SM M2540G

PCB

Prep Date: 11/08/06

Analyte	Result		MDL	EQL	Dil.	Units	Code	Anal Date	Prep Method	Anl Method
Aroclor 1016	28	U	28	100	1	ug/Kg		11/10/06	SW846 3541	SW846 8082
Aroclor 1221	28	U	28	100	1	ug/Kg		11/10/06	SW846 3541	SW846 8082
Aroclor 1232	28	U	28	100	1	ug/Kg		11/10/06	SW846 3541	SW846 8082
Aroclor 1242	560		28	100	1	ug/Kg		11/10/06	SW846 3541	SW846 8082
Aroclor 1248	28	U	28	100	1	ug/Kg		11/10/06	SW846 3541	SW846 8082
Aroclor 1254	490		28	100	1	ug/Kg		11/10/06	SW846 3541	SW846 8082
Aroclor 1260	270		28	100	1	ug/Kg		11/10/06	SW846 3541	SW846 8082
Total PCBs	1300		28	100	1	ug/Kg		11/10/06	SW846 3541	SW846 8082
Surrogate			**LCL**	**UCL**						
Tetrachloro-m-xylene	101		50	137	1	%		11/10/06	SW846 3541	SW846 8082
Decachlorobiphenyl	78		56	130	1	%		11/10/06	SW846 3541	SW846 8082

All soil results are reported on a dry weight basis unless otherwise noted.

Qualifier Codes

Flag	Applies To	Explanation
A	Inorganic	Analyte is detected in the method blank. Method blank criteria is evaluated to the laboratory method detection limit. Additionally, method blank acceptance may be based on project specific criteria or determined from analyte concentrations in the sample and are evaluated on a sample by sample basis.
B	Inorganic	The analyte has been detected between the method detection limit and the reporting limit.
B	Organic	Analyte is present in the method blank. Method blank criteria is evaluated to the laboratory method detection limit. Additionally, method blank acceptance may be based on project specific criteria or determined from analyte concentrations in the sample and are evaluated on a sample by sample basis.
C	All	Elevated detection limit.
D	All	Analyte value from diluted analysis or surrogate result not applicable due to sample dilution.
E	Inorganic	Estimated concentration due to matrix interferences. During the metals analysis the serial dilution failed to meet the established control limits of 0-10%. The sample concentration is greater than 50 times the IDL for analysis done on the ICP or 100 times the IDL for analysis done on the ICP-MS. The result was flagged with the E qualifier to indicate that a physical interference was observed.
E	Organic	Analyte concentration exceeds calibration range.
F	Inorganic	Due to potential interferences for this analysis by Inductively Coupled Plasma techniques (SW-846 Method 6010), this analyte has been confirmed by and reported from an alternate method.
F	Organic	Surrogate results outside control criteria.
G	All	The result is estimated because the concentration is less than the lowest calibration standard concentration utilized in the initial calibration. The method detection limit is less than the reporting limit specified for this project.
H	All	Preservation, extraction or analysis performed past holding time.
HF	Inorganic	This test is considered a field parameter, and the recommended holding time is 15 minutes from collection. The analysis was performed in the laboratory beyond the recommended holding time.
J	All	Concentration detected equal to or greater than the method detection limit but less than the reporting limit.
K	Inorganic	Sample received unpreserved. Sample was either preserved at the time of receipt or at the time of sample preparation.
K	Organic	Detection limit may be elevated due to the presence of an unrequested analyte.
L	All	Elevated detection limit due to low sample volume.
M	Organic	Sample pH was greater than 2
N	All	Spiked sample recovery not within control limits.
O	Organic	Sample received overweight.
P	Organic	The relative percent difference between the two columns for detected concentrations was greater than 40%.
Q	All	The analyte has been detected between the limit of detection (LOD) and limit of quantitation (LOQ). The results are qualified due to the uncertainty of analyte concentrations within this range.
S	Organic	The relative percent difference between quantitation and confirmation columns exceeds internal quality control criteria. Because the result is unconfirmed, it has been reported as a non-detect with an elevated detection limit.
U	All	The analyte was not detected at or above the reporting limit.
V	All	Sample received with headspace.
W	All	A second aliquot of sample was analyzed from a container with headspace.
X	All	See Sample Narrative.
Z	Organics	This compound was separated in the check standard but it did not meet the resolution criteria as set forth in SW846.
&	All	Laboratory Control Spike recovery not within control limits.
*	All	Precision not within control limits.
+	Inorganic	The sample result is greater than four times the spike level: therefore, the percent recovery is not evaluated.
<	All	The analyte was not detected at or above the reporting limit.
1	Inorganic	Dissolved analyte or filtered analyte greater than total analyte; analyses passed QC based on precision criteria.
2	Inorganic	Dissolved analyte or filtered analyte greater than total analyte; analyses failed QC based on precision criteria.
3	Inorganic	BOD result is estimated due to the BOD blank exceeding the allowable oxygen depletion.
4	Inorganic	BOD duplicate precision not within control limits. Due to the 48 hour holding time for this test, it is not practical to reanalyze and try to correct the deficiency.
5	Inorganic	BOD result is estimated due to insufficient oxygen depletion. Due to the 48 hour holding time for this test, it is not practical to reanalyze and try to correct the deficiency.
6	Inorganic	BOD laboratory control sample not within control limits. Due to the 48 hour holding time for this test, it is not practical to reanalyze and try to correct the deficiency.
7	Inorganic	BOD result is estimated due to complete oxygen depletion. Due to the 48 hour holding time for this test, it is not practical to reanalyze and try to correct the deficiency.

Pace Analytical Services, Inc.

Analysis Summary by Laboratory

1241 Bellevue Street
Green Bay, WI 54302

Test Group Name	877999-001	877999-002	877999-003	877999-004	877999-005	877999-006	877999-007
ALUMINUM	B				B	B	
ANTIMONY	B				B	B	
ARSENIC	B				B	B	
ARSENIC - TCLP	B				B	B	
BARIUM	B				B	B	
BARIUM - TCLP	B				B	B	
BERYLLIUM	B				B	B	
BORON	B				B	B	
CADMIUM	B				B	B	
CADMIUM - TCLP	B				B	B	
CHROMIUM	B				B	B	
CHROMIUM - TCLP	B				B	B	
COBALT	B				B	B	
COPPER	B				B	B	
CYANIDE, TOTAL					B	B	
IRON	B				B	B	
LEAD	B				B	B	
LEAD - TCLP	B				B	B	
LITHIUM	M				M	M	
MAGNESIUM	B				B	B	
MANGANESE	B				B	B	
MERCURY	B				B	B	
MERCURY - TCLP	B				B	B	
MOLYBDENUM	B				B	B	
NICKEL	B				B	B	
PCB		K	K				K
PERCENT SOLIDS	B				B	B	B
SELENIUM	B				B	B	
SELENIUM - TCLP	B				B	B	
SILVER	B				B	B	
SILVER - TCLP	B				B	B	
THALLIUM	B				B	B	
VANADIUM	B				B	B	
VOLATILES				G			
ZINC	B				B	B	

Pace Analytical Services, Inc.

Analysis Summary by Laboratory

1241 Bellevue Street
Green Bay, WI 54302

Code	Facility	Address	MI Certification
B	Green Bay Lab (Bellevue St)	1241 Bellevue Street, Suite 9 Green Bay, WI 54302	Not Certified
G	Green Bay Lab (Industrial Dr)	1795 Industrial Drive Green Bay, WI 54302	Not Certified
K	Kimberly Laboratory	1090 Kennedy Ave. Kimberly, WI 54136	Not Certified
M	Minnesota Laboratory	1700 Elm Street, Suite 200 Minneapolis, MN	Not Certified

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436
Fax: 920-469-8827

QC Summary

Batch: 877999
Lab Section: VOA
QC Batch Number: 15779
Prep Method: SW846 5030B
Analytical Method: SW846 8260B

QC Type	Client Sample ID	Lab Sample ID
MB	vog2046-77MB	vog2046-77MB
LCS	vog2046-77LCS	vog2046-77LCS
LCSD	vog2046-77LCSD	vog2046-77LCSD
MS	877974-002MS	877974-002MS
MSD	877974-002MSD	877974-002MSD

Client Sample ID	Lab Sample ID	MB ID	Client Sample ID	Lab Sample ID	MB ID
M-3	877999-004	MB			

Test Name	Method Blank Result	Conc	LCS Spiked Conc	LCS Recovery Conc	%	C	LCSD Spiked Conc	LCSD Recovery Conc	%	C	LCS/LCSD RPD	%	C	LCS/LCSD Control Limits LCL %	UCL %	RPD %	Parent Sample Number	Parent Result	Conc	MS Spiked Conc	MS Recovery Conc	%	C	MSD Spiked Conc	MSD Recovery Conc	%	C	MS/MSD RPD	%	C	MS/MSD Control Limits LCL %	UCL %	RPD %
1,1,1,2-Tetrachloroethane	<	0.92	0	---	---		---	---	---		---			---	---	---	---		---	---	---	---		---	---	---		---		---	---	---
1,1,1-Trichloroethane	<	0.9	50.0	55.4	111		50.0	56.5	113		2.0			75	128	20	---		---	---	---	---		---	---	---		---		---	---	---
1,1,2,2-Tetrachloroethane	<	0.2	50.0	51.1	102		50.0	51.7	103		1.1			67	125	20	---		---	---	---	---		---	---	---		---		---	---	---
1,1,2-Trichloroethane	<	0.42	50.0	50.8	102		50.0	51.8	104		1.9			75	125	20	---		---	---	---	---		---	---	---		---		---	---	---
1,1-Dichloroethane	<	0.75	50.0	56.1	112		50.0	56.7	113		0.9			71	130	20	---		---	---	---	---		---	---	---		---		---	---	---
1,1-Dichloroethene	<	0.57	50.0	61	122		50.0	61.9	124		1.3			75	125	20	---		---	---	---	---		---	---	---		---		---	---	---
1,1-Dichloropropene	<	0.75	0	---	---		---	---	---		---			---	---	---	---		---	---	---	---		---	---	---		---		---	---	---
1,2,3-Trichlorobenzene	<	0.74	0	---	---		---	---	---		---			---	---	---	---		---	---	---	---		---	---	---		---		---	---	---
1,2,3-Trichloropropane	<	0.99	0	---	---		---	---	---		---			---	---	---	---		---	---	---	---		---	---	---		---		---	---	---
1,2,4-Trichlorobenzene	<	0.97	0	---	---		---	---	---		---			---	---	---	---		---	---	---	---		---	---	---		---		---	---	---
1,2,4-Trimethylbenzene	<	0.97	0	---	---		---	---	---		---			---	---	---	---		---	---	---	---		---	---	---		---		---	---	---
1,2-Dibromo-3-chloropropan	<	0.87	0	---	---		---	---	---		---			---	---	---	---		---	---	---	---		---	---	---		---		---	---	---
1,2-Dibromoethane	<	0.56	0	---	---		---	---	---		---			---	---	---	---		---	---	---	---		---	---	---		---		---	---	---
1,2-Dichlorobenzene	<	0.83	0	---	---		---	---	---		---			---	---	---	---		---	---	---	---		---	---	---		---		---	---	---
1,2-Dichloroethane	<	0.36	50.0	55.6	111		50.0	56.6	113		1.8			71	132	20	---		---	---	---	---		---	---	---		---		---	---	---
1,2-Dichloropropane	<	0.46	50.0	53.5	107		50.0	54	108		1.1			73	125	20	---		---	---	---	---		---	---	---		---		---	---	---
1,3,5-Trimethylbenzene	<	0.83	0	---	---		---	---	---		---			---	---	---	---		---	---	---	---		---	---	---		---		---	---	---
1,3-Dichlorobenzene	<	0.87	0	---	---		---	---	---		---			---	---	---	---		---	---	---	---		---	---	---		---		---	---	---
1,3-Dichloropropane	<	0.61	0	---	---		---	---	---		---			---	---	---	---		---	---	---	---		---	---	---		---		---	---	---
1,4-Dichlorobenzene	<	0.95	0	---	---		---	---	---		---			---	---	---	---		---	---	---	---		---	---	---		---		---	---	---
2,2-Dichloropropane	<	0.62	0	---	---		---	---	---		---			---	---	---	---		---	---	---	---		---	---	---		---		---	---	---

Conc = ug/L unless otherwise noted
C = QC Code, see Qualifer Sheet
Parent Result is reported down to MDL in order to allow Validation of this worksheet
The %R and RPD results are calculated from raw data values with more significant figures than are reported on this form.

Report Date: 12/14/2006
QC Batch Number: 15779

Pace Analytical Services, Inc.

QC Summary

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436
Fax: 920-469-8827

Test Name		Method Blank Result Conc	LCS Spiked Conc	LCS Recovery Conc	%	C	LCSD Spiked Conc	LCSD Recovery Conc	%	C	LCS/ LCSD RPD	%	C	LCS/LCSD Control Limits LCL %	UCL %	RPD %	Parent Sample Number	Parent Result Conc	MS Spiked Conc	MS Recovery Conc	%	C	MSD Spiked Conc	MSD Recovery Conc	%	C	MS/ MSD RPD	%	C	MS/MSD Control Limits LCL %	UCL %	RPD %
2-Chlorotoluene	<	0.85	0	---	---		---	---	---		---			---	---	---	---	---	---	---	---		---	---	---		---			---	---	---
4-Chlorotoluene	<	0.74	0	---	---		---	---	---		---			---	---	---	---	---	---	---	---		---	---	---		---			---	---	---
Bromobenzene	<	0.82	0	---	---		---	---	---		---			---	---	---	---	---	---	---	---		---	---	---		---			---	---	---
Bromochloromethane	<	0.97	0	---	---		---	---	---		---			---	---	---	---	---	---	---	---		---	---	---		---			---	---	---
Bromodichloromethane	<	0.56	50.0	55.1	110		50.0	55	110		0.1			75	125	20	---	---	---	---	---		---	---	---		---			---	---	---
Bromoform	<	0.94	50.0	48.4	97		50.0	49.2	98		1.6			75	125	20	---	---	---	---	---		---	---	---		---			---	---	---
Bromomethane	<	0.91	50.0	55.1	110		50.0	58.4	117		5.7			66	125	20	---	---	---	---	---		---	---	---		---			---	---	---
Carbon Tetrachloride	<	0.49	50.0	56.6	113		50.0	57.9	116		2.3			75	125	20	---	---	---	---	---		---	---	---		---			---	---	---
Chlorobenzene	<	0.41	50.0	53.1	106		50.0	53.5	107		0.8			75	125	20	---	---	---	---	---		---	---	---		---			---	---	---
Chlorodibromomethane	<	0.81	50.0	52.8	106		50.0	53.1	106		0.5			75	125	20	---	---	---	---	---		---	---	---		---			---	---	---
Chloroethane	<	0.97	50.0	56.5	113		50.0	55.4	111		2.0			72	126	20	---	---	---	---	---		---	---	---		---			---	---	---
Chloroform	<	0.37	50.0	56.2	112		50.0	57.1	114		1.5			75	125	20	---	---	---	---	---		---	---	---		---			---	---	---
Chloromethane	<	0.24	50.0	45.6	91		50.0	44.8	90		1.8			46	143	20	---	---	---	---	---		---	---	---		---			---	---	---
cis-1,2-Dichloroethene	<	0.83	50.0	55	110		50.0	55.7	111		1.2			75	125	20	---	---	---	---	---		---	---	---		---			---	---	---
cis-1,3-Dichloropropene	<	0.19	50.0	50.9	102		50.0	49.4	99		3.0			75	125	20	---	---	---	---	---		---	---	---		---			---	---	---
Dibromomethane	<	0.6	0	---	---		---	---	---		---			---	---	---	---	---	---	---	---		---	---	---		---			---	---	---
Dichlorodifluoromethane	<	0.99	0	---	---		---	---	---		---			---	---	---	---	---	---	---	---		---	---	---		---			---	---	---
Diisopropyl Ether	<	0.76	0	---	---		---	---	---		---			---	---	---	---	---	---	---	---		---	---	---		---			---	---	---
Fluorotrichloromethane	<	0.79	0	---	---		---	---	---		---			---	---	---	---	---	---	---	---		---	---	---		---			---	---	---
Hexachlorobutadiene	<	0.67	0	---	---		---	---	---		---			---	---	---	---	---	---	---	---		---	---	---		---			---	---	---
Isopropylbenzene	<	0.59	0	---	---		---	---	---		---			---	---	---	---	---	---	---	---		---	---	---		---			---	---	---
Methylene Chloride	<	0.43	50.0	58.4	117		50.0	56.2	112		3.9			75	125	20	---	---	---	---	---		---	---	---		---			---	---	---
Methyl-tert-butyl-ether	<	0.61	0	---	---		---	---	---		---			---	---	---	---	---	---	---	---		---	---	---		---			---	---	---
Naphthalene	<	0.74	0	---	---		---	---	---		---			---	---	---	---	---	---	---	---		---	---	---		---			---	---	---
n-Butylbenzene	<	0.93	0	---	---		---	---	---		---			---	---	---	---	---	---	---	---		---	---	---		---			---	---	---
n-Propylbenzene	<	0.81	0	---	---		---	---	---		---			---	---	---	---	---	---	---	---		---	---	---		---			---	---	---
p-Isopropyltoluene	<	0.67	0	---	---		---	---	---		---			---	---	---	---	---	---	---	---		---	---	---		---			---	---	---
s-Butylbenzene	<	0.89	0	---	---		---	---	---		---			---	---	---	---	---	---	---	---		---	---	---		---			---	---	---
Styrene	<	0.86	50.0	57.9	116		50.0	58.2	116		0.7			75	125	20	---	---	---	---	---		---	---	---		---			---	---	---
t-Butylbenzene	<	0.97	0	---	---		---	---	---		---			---	---	---	---	---	---	---	---		---	---	---		---			---	---	---
Tetrachloroethene	<	0.45	50.0	52.2	104		50.0	52.2	104		0.1			75	130	20	---	---	---	---	---		---	---	---		---			---	---	---
trans-1,2-Dichloroethene	<	0.89	50.0	56.5	113		50.0	58.2	116		3.0			75	125	20	---	---	---	---	---		---	---	---		---			---	---	---

Conc = ug/L unless otherwise noted

C = QC Code, see Qualifer Sheet

Parent Result is reported down to MDL in order to allow Validation of this worksheet

The %R and RPD results are calculated from raw data values with more significant figures than are reported on this form.

Report Date: 12/14/2006

QC Batch Number: 15779

Pace Analytical Services, Inc.

QC Summary

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436
Fax: 920-469-8827

Test Name		Method Blank Result Conc	LCS Spiked Conc	LCS Recovery Conc	%	C	LCSD Spiked Conc	LCSD Recovery Conc	%	C	LCS/ LCSD RPD %	C	LCS/LCSD Control Limits LCL %	UCL %	RPD %	Parent Sample Number		Parent Result Conc	MS Spiked Conc	MS Recovery Conc	%	C	MSD Spiked Conc	MSD Recovery Conc	%	C	MS/ MSD RPD %	C	MS/MSD Control Limits LCL %	UCL %	RPD %
trans-1,3-Dichloropropene	<	0.19	50.0	51.7	103		50.0	51.8	104		0.2		75	125	20	—		—	—	---	—		---	---	—		---		---	---	---
Trichloroethene	<	0.48	50.0	54.7	109		50.0	55.2	110		0.8		75	125	20	—		—	—	---	—		---	—	—		---		---	---	---
Vinyl Chloride	<	0.18	50.0	51.9	104		50.0	51.7	103		0.4		65	130	20	—		—	—	---	—		---	—	—		---		---	---	---
Benzene	<	0.41	50.0	56.8	114		50.0	57.8	116		1.7		75	125	20	877974-002		0.671	50.0	57.6	114		50.0	57.1	113		0.8		70	130	30
Ethylbenzene	<	0.54	50.0	56.3	113		50.0	56.5	113		0.3		75	125	20	877974-002	<	0.54	50.0	56.4	113		50.0	56.6	113		0.4		70	136	30
Toluene	<	0.67	50.0	55.6	111		50.0	55.7	111		0.2		75	125	20	877974-002	<	0.67	50.0	55.2	110		50.0	55.2	110		0.1		70	130	30
Xylene, m + p	<	1.8	100.0	115.7	116		100.0	115.7	116		0.1		75	125	20	877974-002		0.000	100.0	115.9	116		100.0	115.1	115		0.7		70	137	30
Xylene, o	<	0.83	50.0	56.7	113		50.0	56.4	113		0.4		75	125	20	877974-002		0.00	50.0	56.4	113		50.0	56.1	112		0.5		70	130	30
4-Bromofluorobenzene		100%	---	—	105		—	—	106		—		64	132	---	877974-002		99%	—	—	105		—	---	106		—		64	132	—
Toluene-d8		106%	---	—	108		---	—	108		—		73	127	---	877974-002		106%	—	—	108		—	---	108		—		73	127	—
Dibromofluoromethane		108%	—	---	103		—	---	103		—		68	122	—	877974-002		106%	---	—	103		—	---	104		—		68	122	—

Conc = ug/L unless otherwise noted

C = QC Code, see Qualifer Sheet

Parent Result is reported down to MDL in order to allow Validation of this worksheet

The %R and RPD results are calculated from raw data values with more significant figures than are reported on this form.

Report Date: 12/14/2006

QC Batch Number: 15779

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436
Fax: 920-469-8827

QC Summary

Batch: 877999
Lab Section: METALS
QC Batch Number: 15889
Prep Method: SW846 3010A
Analytical Method: SW846 6010B

QC Type	Client Sample ID	Lab Sample ID
MB	MBTMTG1984-89	MBTMTG1984-89
LCS	LCSTMTG1984-89	LCSTMTG1984-89
MS	878082-003MS	878082-003MS
MS	878082-001MS	878082-001MS
MS	878049-001MS	878049-001MS
MS	M-5MS	877999-006MS
MSD	878082-001MSD	878082-001MSD

Client Sample ID	Lab Sample ID	MB ID
M-1	877999-001	MB
M-5	877999-006	MB

Client Sample ID	Lab Sample ID	MB ID
M-4	877999-005	MB

Test Name	Method Blank Result		Conc	LCS Spiked Conc	LCS Recovery Conc	%	C	LCSD Spiked Conc	LCSD Recovery Conc	%	C	LCS/LCSD RPD %	C	LCS/LCSD Control Limits LCL %	UCL %	RPD %	Parent Sample Number		Parent Result Conc	MS Spiked Conc	MS Recovery Conc	%	C	MSD Spiked Conc	MSD Recovery Conc	%	C	MS/MSD RPD %	C	MS/MSD Control Limits LCL %	UCL %	RPD %
Arsenic - TCLP	<	0.0076	0.50	0.5	100.5			---	---	---		---		80	120	20	877999-006		0.47	0.50	0.61	29.5	N	---	---	---		---		75	125	20
Barium - TCLP	<	0.001	0.50	0.5	99.7			---	---	---		---		80	120	20	877999-006		0.11	0.50	0.52	81.6		---	---	---		---		75	125	20
Cadmium - TCLP	<	0.00074	0.50	0.49	99.0			---	---	---		---		80	120	20	877999-006	<	0.0037	0.50	0.47	94.6		---	---	---		---		75	125	20
Chromium - TCLP	<	0.0013	0.50	0.5	100.3			---	---	---		---		80	120	20	877999-006	<	0.0066	0.50	0.49	97.3		---	---	---		---		75	125	20
Lead - TCLP	<	0.0034	0.50	0.5	99.1			---	---	---		---		80	120	20	877999-006	<	0.017	0.50	0.48	95.9		---	---	---		---		75	125	20
Selenium - TCLP	<	0.0083	0.50	0.52	103.5			---	---	---		---		80	120	20	877999-006	<	0.042	0.50	0.53	105.2		---	---	---		---		75	125	20
Silver - TCLP	<	0.0026	0.25	0.25	98.4			---	---	---		---		80	120	20	877999-006	<	0.013	0.25	0.25	100.6		---	---	---		---		75	125	20
Arsenic - TCLP	<	0.0076	0.50	0.5	100.5			---	---	---		---		80	120	20	878049-001	<	0.038	2.5	1.8	73.3	N	---	---	---		---		75	125	20
Barium - TCLP	<	0.001	0.50	0.5	99.7			---	---	---		---		80	120	20	878049-001		3.8	2.5	5.2	53.1	N	---	---	---		---		75	125	20
Cadmium - TCLP	<	0.00074	0.50	0.49	99.0			---	---	---		---		80	120	20	878049-001		0.011	2.5	1.7	69.5	N	---	---	---		---		75	125	20
Chromium - TCLP	<	0.0013	0.50	0.5	100.3			---	---	---		---		80	120	20	878049-001		0.019	2.5	1.8	71.1	N	---	---	---		---		75	125	20
Lead - TCLP	<	0.0034	0.50	0.5	99.1			---	---	---		---		80	120	20	878049-001	<	0.017	2.5	1.7	69.8	N	---	---	---		---		75	125	20
Selenium - TCLP	<	0.0083	0.50	0.52	103.5			---	---	---		---		80	120	20	878049-001	<	0.042	2.5	1.8	73.7	N	---	---	---		---		75	125	20
Silver - TCLP	<	0.0026	0.25	0.25	98.4			---	---	---		---		80	120	20	878049-001	<	0.013	1.2	0.87	69.6	N	---	---	---		---		75	125	20
Arsenic - TCLP	<	0.0076	0.50	0.5	100.5			---	---	---		---		80	120	20	878082-001	<	0.0076	0.50	0.55	109.0		0.50	0.56	112.6		3.3		75	125	20
Barium - TCLP	<	0.001	0.50	0.5	99.7			---	---	---		---		80	120	20	878082-001		1.3	0.50	1.8	99.4		0.50	1.8	100.3		0.2		75	125	20
Cadmium - TCLP	<	0.00074	0.50	0.49	99.0			---	---	---		---		80	120	20	878082-001		0.0016	0.50	0.5	99.5		0.50	0.49	98.4		1.1		75	125	20
Chromium - TCLP	<	0.0013	0.50	0.5	100.3			---	---	---		---		80	120	20	878082-001	<	0.0013	0.50	0.51	101.3		0.50	0.5	100.4		1.0		75	125	20
Lead - TCLP	<	0.0034	0.50	0.5	99.1			---	---	---		---		80	120	20	878082-001		0.0055	0.50	0.5	99.7		0.50	0.49	97.8		1.9		75	125	20
Selenium - TCLP	<	0.0083	0.50	0.52	103.5			---	---	---		---		80	120	20	878082-001	<	0.0083	0.50	0.57	114.8		0.50	0.56	112.6		2.0		75	125	20
Silver - TCLP	<	0.0026	0.25	0.25	98.4			---	---	---		---		80	120	20	878082-001	<	0.0026	0.25	0.27	107.8		0.25	0.27	108.1		0.3		75	125	20

Conc = mg/L unless otherwise noted

C = QC Code, see Qualifer Sheet

Parent Result is reported down to MDL in order to allow Validation of this worksheet

The %R and RPD results are calculated from raw data values with more significant figures than are reported on this form.

Report Date: 12/14/2006

QC Batch Number: 15889

Pace Analytical Services, Inc.

QC Summary

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436
Fax: 920-469-8827

Test Name	Method Blank Result		LCS Spiked Conc	LCS Recovery			LCSD Spiked Conc	LCSD Recovery			LCS/LCSD RPD		LCS/LCSD Control Limits			Parent Sample Number	Parent Result		MS Spiked Conc	MS Recovery			MSD Spiked Conc	MSD Recovery			MS/MSD RPD		MS/MSD Control Limits		
		Conc		Conc	%	C		Conc	%	C	%	C	LCL %	UCL %	RPD %			Conc		Conc	%	C		Conc	%	C		%	C	LCL %	UCL %	RPD %
Arsenic - TCLP	<	0.0076	0.50	0.5	100.5		---	---	---		---		80	120	20	878082-003	<	0.0076	0.50	0.56	111.2		---	---	---		---		75	125	20
Barium - TCLP	<	0.001	0.50	0.5	99.7		---	---	---		---		80	120	20	878082-003		2.0	0.50	2.5	92.2	+	---	---	---		---		75	125	20
Cadmium - TCLP	<	0.00074	0.50	0.49	99.0		---	---	---		---		80	120	20	878082-003	<	0.00074	0.50	0.51	101.4		---	---	---		---		75	125	20
Chromium - TCLP	<	0.0013	0.50	0.5	100.3		---	---	---		---		80	120	20	878082-003	<	0.0013	0.50	0.52	104.5		---	---	---		---		75	125	20
Lead - TCLP	<	0.0034	0.50	0.5	99.1		---	---	---		---		80	120	20	878082-003		0.028	0.50	0.52	99.1		---	---	---		---		75	125	20
Selenium - TCLP	<	0.0083	0.50	0.52	103.5		---	---	---		---		80	120	20	878082-003	<	0.0083	0.50	0.56	111.5		---	---	---		---		75	125	20
Silver - TCLP	<	0.0026	0.25	0.25	98.4		---	---	---		---		80	120	20	878082-003	<	0.0026	0.25	0.27	107.0		---	---	---		---		75	125	20

Conc = mg/L unless otherwise noted

C = QC Code, see Qualifer Sheet

Parent Result is reported down to MDL in order to allow Validation of this worksheet

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Report Date: 12/14/2006

QC Batch Number: 15889

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436
Fax: 920-469-8827

QC Summary

Batch: 877999
Lab Section: PCB-K
QC Batch Number: 15923
Prep Method: SW846 3541
Analytical Method: SW846 8082

QC Type	Client Sample ID	Lab Sample ID
MB	SVG2044-019PCBMB	SVG2044-019PCBMB
LCS	SVG2044-019PCBLCS	SVG2044-019PCBLCS
LCSD	SVG2044-019PCBLCSD	SVG2044-019PCBLCSD
MS	877984-001MS	877984-001MS
MSD	877984-001MSD	877984-001MSD

Client Sample ID	Lab Sample ID	MB ID	Client Sample ID	Lab Sample ID	MB ID
M-6	877999-007	MB			

Test Name	Method Blank Result	Conc	LCS Spiked Conc	LCS Recovery Conc	%	C	LCSD Spiked Conc	LCSD Recovery Conc	%	C	LCS/LCSD RPD	%	C	LCS/LCSD Control Limits LCL %	UCL %	RPD %	Parent Sample Number	Parent Result	Conc	MS Spiked Conc	MS Recovery Conc	%	C	MSD Spiked Conc	MSD Recovery Conc	%	C	MS/MSD RPD	%	C	MS/MSD Control Limits LCL %	UCL %	RPD %
Aroclor 1016	<	27	0	---	---		---	---	---		---			---	---	---	877984-001	<	28	---	---	---		---	---	---		---			---	---	---
Aroclor 1221	<	27	0	---	---		---	---	---		---			---	---	---	877984-001	<	28	---	---	---		---	---	---		---			---	---	---
Aroclor 1232	<	27	0	---	---		---	---	---		---			---	---	---	877984-001	<	28	---	---	---		---	---	---		---			---	---	---
Aroclor 1242	<	27	500.0	530.5	106		500.0	529.5	106		0.2			61	115	30	877984-001	<	28	500.0	540.3	108		500.0	548.2	110		1.5			65	135	30
Aroclor 1248	<	27	0	---	---		---	---	---		---			---	---	---	877984-001	<	28	---	---	---		---	---	---		---			---	---	---
Aroclor 1254	<	27	0	---	---		---	---	---		---			---	---	---	877984-001	<	28	---	---	---		---	---	---		---			---	---	---
Aroclor 1260	<	27	0	---	---		---	---	---		---			---	---	---	877984-001	<	28	---	---	---		---	---	---		---			---	---	---
Total PCBs	<	27	---	---	---		---	---	---		---			---	---	---	877984-001	<	28	---	---	---		---	---	---		---			---	---	---
Tetrachloro-m-xylene		75%	---	---	91		---	---	96		---			50	137	---	877984-001		87%	---	---	87		---	---	88		---			50	137	---
Decachlorobiphenyl		66%	---	---	78		---	---	84		---			56	130	---	877984-001		78%	---	---	77		---	---	80		---			56	130	---

Conc = ug/Kg unless otherwise noted
C = QC Code, see Qualifer Sheet
Parent Result is reported down to MDL in order to allow Validation of this worksheet
The %R and RPD results are calculated from raw data values with more significant figures than are reported on this form.

Report Date: 12/14/2006
QC Batch Number: 15923

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436
Fax: 920-469-8827

QC Summary

Batch: 877999
Lab Section: METALS
QC Batch Number: 15925
Prep Method: SW846 7471A
Analytical Method: SW846 7471A

QC Type	Client Sample ID	Lab Sample ID
MB	MBSMTG1986-49	MBSMTG1986-49
LCS	LCSSMTG1986-49	LCSSMTG1986-49
MS	877923-001MS	877923-001MS
MSD	877923-001MSD	877923-001MSD

Client Sample ID	Lab Sample ID	MB ID
M-1	877999-001	MB
M-5	877999-006	MB

Client Sample ID	Lab Sample ID	MB ID
M-4	877999-005	MB

Test Name		Method Blank Result Conc	LCS Spiked Conc	LCS Recovery Conc	%	C	LCSD Spiked Conc	LCSD Recovery Conc	%	C	LCS/LCSD RPD %	C	LCS/LCSD Control Limits LCL %	UCL %	RPD %	Parent Sample Number		Parent Result Conc	MS Spiked Conc	MS Recovery Conc	%	C	MSD Spiked Conc	MSD Recovery Conc	%	C	MS/MSD RPD %	C	MS/MSD Control Limits LCL %	UCL %	RPD %
Mercury	<	0.0015	0.25	0.25	101.9		---	---	---		---		85	115	20	877923-001		0.033	0.28	0.31	101.2		0.28	0.31	100.2		0.9		85	115	20

Conc = mg/Kg unless otherwise noted
C = QC Code, see Qualifer Sheet
Parent Result is reported down to MDL in order to allow Validation of this worksheet
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Report Date: 12/14/2006
QC Batch Number: 15925

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436
Fax: 920-469-8827

QC Summary

Batch: 877999
Lab Section: METALS
QC Batch Number: 15928
Prep Method: SW846 7470A
Analytical Method: SW846 7470A

QC Type	Client Sample ID	Lab Sample ID
MB	MBTMTG1985-43	MBTMTG1985-43
LCS	LCSTMTG1985-43	LCSTMTG1985-43
MS	M-5MS	877999-006MS
MSD	M-5MSD	877999-006MSD

Client Sample ID	Lab Sample ID	MB ID	Client Sample ID	Lab Sample ID	MB ID
M-5	877999-006	MB			

Test Name	Method Blank Result	Conc	LCS Spiked Conc	LCS Recovery Conc	%	C	LCSD Spiked Conc	LCSD Recovery Conc	%	C	LCS/LCSD RPD	%	C	LCS/LCSD Control Limits LCL %	UCL %	RPD %	Parent Sample Number		Parent Result Conc	MS Spiked Conc	MS Recovery Conc	%	C	MSD Spiked Conc	MSD Recovery Conc	%	C	MS/MSD RPD	%	C	MS/MSD Control Limits LCL %	UCL %	RPD %
Mercury - TCLP	<	7.2e-005	0.0050	0.0055	110.6		---	---	---		---			85	115	20	877999-006		5.2E-4	0.0050	0.006	109.0		0.0050	0.0059	107.2		1.6			85	115	20

Conc = mg/L unless otherwise noted
C = QC Code, see Qualifer Sheet
Parent Result is reported down to MDL in order to allow Validation of this worksheet
The %R and RPD results are calculated from raw data values with more significant figures than are reported on this form.

Report Date: 12/14/2006
QC Batch Number: 15928

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436
Fax: 920-469-8827

QC Summary

Batch: 877999
Lab Section: METALS
QC Batch Number: 15929
Prep Method: SW846 7470A
Analytical Method: SW846 7470A

QC Type	Client Sample ID	Lab Sample ID
MB	MBTMTG1985-42	MBTMTG1985-42
LCS	LCSTMTG1985-42	LCSTMTG1985-42
MS	877872-001MS	877872-001MS
MSD	877872-001MSD	877872-001MSD

Client Sample ID	Lab Sample ID	MB ID
M-1	877999-001	MB

Client Sample ID	Lab Sample ID	MB ID
M-4	877999-005	MB

Test Name	Method Blank Result Conc		LCS Spiked Conc	LCS Recovery Conc	LCS Recovery %	LCS Recovery C	LCSD Spiked Conc	LCSD Recovery Conc	LCSD Recovery %	LCSD Recovery C	LCS/LCSD RPD %	LCS/LCSD RPD C	LCS/LCSD Control Limits LCL %	LCS/LCSD Control Limits UCL %	LCS/LCSD Control Limits RPD %	Parent Sample Number	Parent Result		MS Spiked Conc	MS Recovery Conc	MS Recovery %	MS Recovery C	MSD Spiked Conc	MSD Recovery Conc	MSD Recovery %	MSD Recovery C	MS/MSD RPD %	MS/MSD RPD C	MS/MSD Control Limits LCL %	MS/MSD Control Limits UCL %	MS/MSD Control Limits RPD %
Mercury - TCLP	<	7.2e-005	0.0050	0.0056	112.8		—	—	—		—		85	115	20	877872-001	<	7.2e-005	0.0050	0.0054	108.9		0.0050	0.0053	105.5		3.2		85	115	20

Conc = mg/L unless otherwise noted
C = QC Code, see Qualifer Sheet
Parent Result is reported down to MDL in order to allow Validation of this worksheet
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Report Date: 12/14/2006
QC Batch Number: 15929

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436
Fax: 920-469-8827

QC Summary

Batch: 877999
Lab Section: METALS
QC Batch Number: 15983
Prep Method: SW846 3050B
Analytical Method: SW846 6020

QC Type	Client Sample ID	Lab Sample ID
MB	MBSMTG1875-15	MBSMTG1875-15
LCS	LCSSMTG1875-15	LCSSMTG1875-15
MS	M-1MS	877999-001MS
MSD	M-1MSD	877999-001MSD

Client Sample ID	Lab Sample ID	MB ID
M-1	877999-001	MB
M-5	877999-006	MB

Client Sample ID	Lab Sample ID	MB ID
M-4	877999-005	MB

Test Name	Method Blank Result	Conc	LCS Spiked Conc	LCS Recovery Conc	%	C	LCSD Spiked Conc	LCSD Recovery Conc	%	C	LCS/LCSD RPD %	C	LCS/LCSD Control Limits LCL %	UCL %	RPD %	Parent Sample Number	Parent Result Conc	MS Spiked Conc	MS Recovery Conc	%	C	MSD Spiked Conc	MSD Recovery Conc	%	C	MS/MSD RPD %	C	MS/MSD Control Limits LCL %	UCL %	RPD %
Aluminum	J	2	500.00	524.2	104.8		---	---	---		---		75	125	10	877999-001	1454.0	625.78	1941.2	77.8		625.78	1864.2	65.6	N	4.0		75	125	20
Arsenic	<	0.036	10.00	10.9	109.1		---	---	---		---		75	125	13	877999-001	140.1	12.52	154.9	118.5	+	12.52	149.3	74.0	+	3.7		75	125	20
Barium	<	0.015	10.0	10.4	103.8		---	---	---		---		75	125	13	877999-001	5.53	12.5	17.3	94.4		12.5	16.8	89.9		3.4		75	125	20
Beryllium	<	0.017	10	11.4	113.8		---	---	---		---		75	125	13	877999-001	0.022	13	9	71.8	N	13	9.7	77.3		7.5		75	125	20
Boron	<	0.4	10.0	11.4	113.8		---	---	---		---		75	125	13	877999-001	3.11	12.5	10.6	59.7	N	12.5	12	70.8	N	12.4		75	125	20
Cadmium	<	0.023	10.0	10.8	107.8		---	---	---		---		75	125	13	877999-001	3.25	12.5	14.6	91.0		12.5	13.8	84.0		6.2		75	125	20
Chromium	<	0.041	10.00	11.2	112.3		---	---	---		---		75	125	13	877999-001	165.6	12.52	211.2	364.5	+	12.52	187.5	175.0	+	11.9		75	125	20
Cobalt	<	0.0088	10.00	10.9	108.5		---	---	---		---		75	125	13	877999-001	311.5	12.52	342	243.3	+	12.52	325.1	108.3	+	5.1		75	125	20
Copper	J	0.045	10.000	11	110.1		---	---	---		---		75	125	13	877999-001	1054.4	12.516	1148	747.5	+	12.516	974	-642.5	+	16.4		75	125	20
Iron	J	4.2	500	539.2	107.8		---	---	---		---		75	125	13	877999-001	370000	630	360000	-1050.0	+	630	320000	-8250.0	+	13.3		75	125	20
Lead	J	0.012	10.00	11.4	113.7		---	---	---		---		75	125	13	877999-001	728.4	12.52	702.4	-207.5	+	12.52	720.9	-60.0	+	2.6		75	125	20
Magnesium	J	2.3	500.00	522.2	104.4		---	---	---		---		75	125	13	877999-001	2217.8	625.78	2655.8	70.0	N	625.78	2619.5	64.2	N	1.4		75	125	20
Manganese	<	0.23	10.0	10.8	108.2		---	---	---		---		75	125	13	877999-001	52.9	12.5	69.2	130.8	+	12.5	67.8	119.0	+	2.1		75	125	20
Molybdenum	J	0.26	10.00	11.1	111.4		---	---	---		---		75	125	13	877999-001	234.0	12.52	248.6	116.5	+	12.52	268	271.5	+	7.5		75	125	20
Nickel	J	0.048	10.00	11	109.7		---	---	---		---		75	125	13	877999-001	519.1	12.52	560.4	330.0	+	12.52	536.3	137.5	+	4.4		75	125	20
Selenium	<	0.17	10.0	11.4	113.6		---	---	---		---		75	125	13	877999-001	9.11	12.5	22.8	109.0		12.5	22	103.0		3.4		75	125	20
Thallium	<	0.015	10	11.1	111.1		---	---	---		---		75	125	13	877999-001	0.088	13	9.2	72.5	N	13	9	71.0	N	2.1		75	125	20
Vanadium	<	0.022	10.0	10.7	107.5		---	---	---		---		75	125	13	877999-001	1.00	12.5	12.6	92.6		12.5	11.9	87.3		5.4		75	125	20
Zinc	J	2.2	10.00	11.4	114.4		---	---	---		---		75	125	13	877999-001	168.5	12.52	178	75.5	+	12.52	172.8	34.0	+	3.0		75	125	20

Conc = mg/Kg unless otherwise noted
C = QC Code, see Qualifer Sheet
Parent Result is reported down to MDL in order to allow Validation of this worksheet
The %R and RPD results are calculated from raw data values with more significant figures than are reported on this form.

Report Date: 12/14/2006
QC Batch Number: 15983

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436
Fax: 920-469-8827

QC Summary

Batch: 877999
Lab Section: METALS
QC Batch Number: 15984
Prep Method: 3050B sec7.5
Analytical Method: SW846 6020

QC Type	Client Sample ID	Lab Sample ID
MB	MBSMTG1757-9	MBSMTG1757-9
LCS	LCSSMTG1757-9	LCSSMTG1757-9
MS	M-1MS	877999-001MS
MSD	M-1MSD	877999-001MSD

Client Sample ID	Lab Sample ID	MB ID
M-1	877999-001	MB
M-5	877999-006	MB

Client Sample ID	Lab Sample ID	MB ID
M-4	877999-005	MB

Test Name	Method Blank Result	Conc	LCS Spiked Conc	LCS Recovery Conc	%	C	LCSD Spiked Conc	LCSD Recovery Conc	%	C	LCS/LCSD RPD %	C	LCS/LCSD Control Limits LCL %	UCL %	RPD %	Parent Sample Number	Parent Result	Conc	MS Spiked Conc	MS Recovery Conc	%	C	MSD Spiked Conc	MSD Recovery Conc	%	C	MS/MSD RPD %	C	MS/MSD Control Limits LCL %	UCL %	RPD %
Antimony	<	0.056	20.00	19.6	98.1		—	—	—		—		75	125	20	877999-001		594.4	25.03	599.3	19.5	+	25.03	574.3	-80.5	+	4.3		75	125	20
Silver	<	0.026	5.000	10.5	209.7	&	—	—	—		—		75	125	20	877999-001		182.1	6.257	204.2	354.0	+	6.257	200.2	290.0	+	2.0		75	125	20

Conc = mg/Kg unless otherwise noted
C = QC Code, see Qualifer Sheet
Parent Result is reported down to MDL in order to allow Validation of this worksheet
The %R and RPD results are calculated from raw data values with more significant figures than are reported on this form.

Report Date: 12/14/2006
QC Batch Number: 15984

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436
Fax: 920-469-8827

QC Summary

Batch: 877999
Lab Section: WETCHEM
QC Batch Number: 16093
Prep Method: SW846 9012A
Analytical Method: SW846 9012A

QC Type	Client Sample ID	Lab Sample ID
MB	WCG2073-030MB	WCG2073-030MB
LCS	WCG2073-030MBLCS	WCG2073-030MBLCS
MS	878199-006MS	878199-006MS
MSD	878199-006MSD	878199-006MSD

Client Sample ID	Lab Sample ID	MB ID
M-4	877999-005	MB

Client Sample ID	Lab Sample ID	MB ID
M-5	877999-006	MB

Test Name	Method Blank Result Conc		LCS Spiked Conc	LCS Recovery Conc	LCS Recovery %	LCS Recovery C	LCSD Spiked Conc	LCSD Recovery Conc	LCSD Recovery %	LCSD Recovery C	LCS/LCSD RPD %	LCS/LCSD RPD C	LCS/LCSD Control Limits LCL %	LCS/LCSD Control Limits UCL %	LCS/LCSD Control Limits RPD %	Parent Sample Number	Parent Result		MS Spiked Conc	MS Recovery Conc	MS Recovery %	MS Recovery C	MSD Spiked Conc	MSD Recovery Conc	MSD Recovery %	MSD Recovery C	MS/MSD RPD %	MS/MSD RPD C	MS/MSD Control Limits LCL %	MS/MSD Control Limits UCL %	MS/MSD Control Limits RPD %
Cyanide, Total	<	0.31	3.0	3	98.7		---	---	---		---		81	119	20	878199-006	<	0.71	6.9	4.3	63.1	N	6.9	4.5	66.3	N	4.9		70	122	20

Conc = mg/kg unless otherwise noted
C = QC Code, see Qualifer Sheet
Parent Result is reported down to MDL in order to allow Validation of this worksheet
The %R and RPD results are calculated from raw data values with more significant figures than are reported on this form.

Report Date: 12/14/2006
QC Batch Number: 16093

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436
Fax: 920-469-8827

QC Summary

Batch: 877999
Lab Section: PCB-K
QC Batch Number: 16099
Prep Method: SW846 3580A
Analytical Method: SW846 8082

QC Type	Client Sample ID	Lab Sample ID
MB	SVG2088-001PCBMB	SVG2088-001PCBMB
LCS	SVG2088-001PCBLCS	SVG2088-001PCBLCS
LCSD	SVG2088-001PCBLCSD	SVG2088-001PCBLCSD

Client Sample ID	Lab Sample ID	MB ID
M-2-WEST	877999-002	MB

Client Sample ID	Lab Sample ID	MB ID
M-2-EAST	877999-003	MB

Test Name	Method Blank Result	Conc	LCS Spiked Conc	LCS Recovery Conc	%	C	LCSD Spiked Conc	LCSD Recovery Conc	%	C	LCS/LCSD RPD	%	C	LCS/LCSD Control Limits LCL %	UCL %	RPD %	Parent Sample Number	Parent Result Conc	MS Spiked Conc	MS Recovery Conc	%	C	MSD Spiked Conc	MSD Recovery Conc	%	C	MS/MSD RPD	%	C	MS/MSD Control Limits LCL %	UCL %	RPD %
Aroclor 1016	<	0.08	—	—	—		—	—	—		—			—	—	—	—	—	—	—	—		—	—	—		—			—	—	—
Aroclor 1221	<	0.08	—	—	—		—	—	—		—			—	—	—	—	—	—	—	—		—	—	—		—			—	—	—
Aroclor 1232	<	0.08	—	—	—		—	—	—		—			—	—	—	—	—	—	—	—		—	—	—		—			—	—	—
Aroclor 1242	<	0.08	—	—	—		—	—	—		—			—	—	—	—	—	—	—	—		—	—	—		—			—	—	—
Aroclor 1248	<	0.08	—	—	—		—	—	—		—			—	—	—	—	—	—	—	—		—	—	—		—			—	—	—
Aroclor 1254	<	0.08	—	—	—		—	—	—		—			—	—	—	—	—	—	—	—		—	—	—		—			—	—	—
Aroclor 1260	<	0.08	5.0	4.6	92		5.0	4.7	94		1.7			50	150	20	—	—	—	—	—		—	—	—		—			—	—	—
Total PCBs	<	0.08	—	—	—		—	—	—		—			—	—	—	—	—	—	—	—		—	—	—		—			—	—	—
Tetrachloro-m-xylene		85%	—	—	88		—	—	90		—			50	150	—	—	—	—	—	—		—	—	—		—			—	—	—
Decachlorobiphenyl		79%	—	—	81		—	—	85		—			50	150	—	—	—	—	—	—		—	—	—		—			—	—	—

Conc = ug/wip unless otherwise noted
C = QC Code, see Qualifer Sheet
Parent Result is reported down to MDL in order to allow Validation of this worksheet
The %R and RPD results are calculated from raw data values with more significant figures than are reported on this form.

Report Date: 12/14/2006
QC Batch Number: 16099

Sample Condition Upon Receipt

Pace Analytical

Client Name: Foth + Van Dyke Project # 877999

Courier: ☐ Fed Ex ☐ UPS ☐ USPS ☑ Client ☐ Commercial ☐ Pace Other _____

Optional
Proj. Due Date:
Proj. Name:

Tracking #: _____

Custody Seal on Cooler/Box Present: ☐ yes ☑ no Seals intact: ☐ yes ☑ no

Packing Material: ☐ Bubble Wrap ☑ Bubble Bags ☐ None ☐ Other _____

Thermometer Used: DFA Type of Ice: (Wet) Blue None ☑ Samples on ice, cooling process has begun

Cooler Temperature: ROI Biological Tissue is Frozen: Yes No

Date and Initials of person examining contents: 11/2/06 KSL 11/2/06

Temp should be above freezing to 6°C

		Comments:
Chain of Custody Present:	☑Yes ☐No ☐N/A	1.
Chain of Custody Filled Out:	☑Yes ☐No ☐N/A	2.
Chain of Custody Relinquished:	☑Yes ☐No ☐N/A	3.
Sampler Name & Signature on COC:	☑Yes ☐No ☐N/A	4.
Samples Arrived within Hold Time:	☑Yes ☐No ☐N/A	5.
Short Hold Time Analysis (<72hr):	☐Yes ☑No ☐N/A	6.
Rush Turn Around Time Requested:	☐Yes ☑No ☐N/A	7.
Sufficient Volume:	☑Yes ☐No ☐N/A	8.
Correct Containers Used:	☑Yes ☐No ☐N/A	9.
-Pace Containers Used:	☑Yes ☐No ☐N/A	
Containers Intact:	☑Yes ☐No ☐N/A	10.
Filtered volume received for Dissolved tests	☐Yes ☐No ☑N/A	11.
Sample Labels match COC:	☑Yes ☐No ☐N/A	12.
-Includes date/time/ID/Analysis Matrix: S/W		
All containers needing preservation have been checked.	☐Yes ☐No ☑N/A	13.
All containers needing preservation are found to be in compliance with EPA recommendation.	☐Yes ☐No ☑N/A	
exceptions: VOA, coliform, TOC, O&G, WI-DRO (water)	☐Yes ☐No	Initial when completed / Lot # of added preservative
Samples checked for dechlorination:	☐Yes ☐No ☑N/A	14.
Headspace in VOA Vials (>6mm):	☐Yes ☑No ☐N/A	15.
Trip Blank Present:	☐Yes ☑No ☐N/A	16.
Trip Blank Custody Seals Present	☐Yes ☐No ☑N/A	
Pace Trip Blank Lot # (if purchased): _____		

Client Notification/ Resolution: Field Data Required? Y / N

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: _____

Project Manager Review: [signature] for TN **Date:** 12/18/06

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers)

Pace Analytical®
www.pacelabs.com

MN: 612-607-1700 WI: 920-469-2436

877999

COC No. 013855

CHAIN OF CUSTODY

*Preservation Codes
A=None B=HCL C=H2SO4 D=HNO3 E=DI Water F=Methanol G=NaOH
H=Sodium Bisulfate Solution I=Sodium Thiosulfate J=Other

Company Name:	Foth and Van Dyke
Branch/Location:	Green Bay
Project Contact:	
Phone:	920-497-2500
Project Number:	06W003
Project Name:	KEMC-Humboldt Mill
Project State:	MI
Sampled By (Print):	Jeff Lynott
Sampled By (Sign):	
PO #:	Regulatory Program:

Quote #:	
Mail To Contact:	Janis Kesy
Mail To Company:	Foth and Van Dyke
Mail To Address:	2737 S. Ridge Rd Green Bay, WI 54307
Invoice To Contact:	
Invoice To Company:	
Invoice To Address:	
Invoice To Phone:	

Data Package Options (billable)
☐ EPA Level III
☐ EPA Level IV

MS/MSD
☐ On your sample (billable)
☐ NOT needed on your sample

Matrix Codes

A = Air	W = Water
B = Biota	DW = Drinking Water
C = Charcoal	GW = Ground Water
O = Oil	SW = Surface Water
S = Soil	WW = Waste Water
Sl = Sludge	WP = Wipe

PACE LAB #	CLIENT FIELD ID	COLLECTION DATE	COLLECTION TIME	MATRIX	FILTERED? (YES/NO)	PRESERVATION (CODE)*	Analyses Requested: TCLP RCRA metals	Total metals	PCB	VOC	cyanide	CLIENT COMMENTS	LAB COMMENTS (Lab Use Only)	Profile #
					Y/N	Pick Letter	A	A	A	B	A			
001	M-1	10/31/06	14:00	SL			X	X					2-4oz AMBER	
002	M-2 West	10/31/06	19:30	WP					X				1-4oz AMBER	
003	M-2-East	10/31/06	15:00	WP					X				1-4oz AMBER	
004	M-3	10/31/06	19:45	WW						X			3-40mL B	
005	M-4	10/31/06	13:00	SL			X	X			X		2-4oz AMBER	
006	M-5	10/31/06	13:30	SL			X	X			X	Run Total metals 1st cyanide 2nd, TCLP last	1-4oz AMBER	
007	M-6	10/31/06	13:45	SL					X				1-4oz AMBER	

Rush Turnaround Time Requested - Prelims
(Rush TAT subject to approval/surcharge)
Date Needed:

Transmit Prelim Rush Results by (complete what you want):

Email #1:	
Email #2:	
Telephone:	
Fax:	

Samples on HOLD are subject to special pricing and release of liability

Relinquished By:	Date/Time:	Received By:	Date/Time:
Jeffrey S Lynott	11/2/06 8:00	[illegible]	11-2-06 1800

PACE Project No.
877999

Receipt Temp = 1.0 °C

Sample Receipt pH
OK / Adjusted

Cooler Custody Seal
Present / Not Present
Intact / Not Intact

Version 6.0 06/14/06

ORIGINAL

(Please Print Clearly)

Company Name:	Foth and Van Dyke
Branch/Location:	Green Bay
Project Contact:	
Phone:	920-497-2500
Project Number:	06W003
Project Name:	KEMC - Humboldt Mill
Project State:	MI
Sampled By (Print):	Jeff Lynott
Sampled By (Sign):	[signature]
PO #:	
Regulatory Program:	

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MN: 612-607-1700 WI: 920-469-2436

COC No. 013855

CHAIN OF CUSTODY

*Preservation Codes
A=None B=HCL C=H2SO4 D=HNO3 E=DI Water F=Methanol G=NaOH
H=Sodium Bisulfate Solution I=Sodium Thiosulfate J=Other

Quote #:	
Mail To Contact:	Janis Kosy
Mail To Company:	Foth and Van Dyke
Mail To Address:	2737 S. Ridge Rd Green Bay, WI 54307
Invoice To Contact:	
Invoice To Company:	
Invoice To Address:	
Invoice To Phone:	

FILTERED? (YES/NO)
PRESERVATION (CODE)*

Data Package Options (billable)
- ☐ EPA Level III
- ☐ EPA Level IV

MS/MSD
- ☐ On your sample (billable)
- ☐ NOT needed on your sample

Matrix Codes
A = Air, B = Biota, C = Charcoal, O = Oil, S = Soil, Sl = Sludge, W = Water, DW = Drinking Water, GW = Ground Water, SW = Surface Water, WW = Waste Water, WP = Wipe

PACE LAB #	CLIENT FIELD ID	COLLECTION DATE	COLLECTION TIME	MATRIX	Analyses Requested: TCLP RCRA metals	Total metals	PCB	VOC	Cyanide				CLIENT COMMENTS	LAB COMMENTS (Lab Use Only)	Profile #
	Y/N														
	Pick Letter				A	A	O	B	A						
	M-1	10/31/06	14:00	SL	X	X									
	M-2 West	10/31/06	14:30	WP			X								
	M-2-East	10/31/06	15:00	WP			X								
	M-3	10/31/06	14:45	WW				X							
	M-4	10/31/06	13:00	SL	X	X			X						
	M-5	10/31/06	13:30	SL	X	X			X				Run Total metals 1st cyanide 2nd, TCLP last		
	M-6	10/31/06	13:45	SL			X								

Rush Turnaround Time Requested - Prelims
(Rush TAT subject to approval/surcharge)
Date Needed:

Transmit Prelim Rush Results by (complete what you want):

Email #1:	
Email #2:	
Telephone:	
Fax:	

Samples on HOLD are subject to special pricing and release of liability

Relinquished By:	Date/Time:	Received By:	Date/Time:
[signature]	11/2/06 8:00	[signature]	11-2-06 0800

PACE Project No.

Receipt Temp = 8.0 °C

Sample Receipt pH OK / Adjusted

Cooler Custody Seal
Present / Not Present
Intact / Not Intact

Version 6.0 06/14/06

C019a(27Jun2006)

Batch No. 872691
Buried Pyrite Sample Data

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, Inc.
1241 Bellevue Street, Suite 9
Green Bay, WI 54302
Phone: 920.469.2436
Fax: 920.469.8827

June 6, 2006

Janis Kesy
Foth & Van Dyke
2737 South Ridge Road
Green Bay, WI 54304

Dear Ms. Kesy:

Enclosed is a report for the analysis of environmental samples and associated QC samples for the KEMC project (06W003). The samples were assigned to batch number 872691 for laboratory tracking purposes.

A table of the results has also been sent to you via e-mail.

If you have any questions regarding this data please call me at (608) 232-3300 ext. 302.

Sincerely,

Tod Noltemeyer
Project Manager

MASTER FILE COPY

Scope 06W003 Classification 10,500

Copy To JSK, CED1, SVP1

Pace Analytical®
1241 Bellevue Street, Suite 9
Green Bay, WI 54302
920-469-2436, Fax: 920-469-8827

Analytical Report Number: 872691

Client: FOTH & VAN DYKE

Lab Contact: Tod Noltemeyer

Project Name: KEMC - HUMBOLDT MILL

Project Number: 06W003

Lab Sample Number	Field ID	Matrix	Collection Date
872691-001	HA-1	SOIL	06/06/06 14:10
872691-002	HA-2	SOIL	06/06/06 14:40
872691-003	HA-3	SOIL	06/06/06 15:00

I certify that the data contained in this Final Report has been generated and reviewed in accordance with approved methods and Laboratory Standard Operating Procedure. Exceptions, if any, are discussed in the accompanying sample comments. Release of this final report is authorized by Laboratory management, as is verified by the following signature. This report shall not be reproduced, except in full, without the written consent of Pace Analytical Services, Inc. The sample results relate only to the analytes of interest tested.

Approval Signature

6/15/06
Date

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436

Analytical Report Number: 872691

Client : FOTH & VAN DYKE
Project Name : KEMC - HUMBOLDT MILL
Project Number : 06W003
Field ID : HA-1

Matrix Type : SOIL
Collection Date : 06/06/06
Report Date : 06/15/06
Lab Sample Number : 872691-001

INORGANICS

Test		Result	EQL	Dilution	Units	Code	Anl Date	Prep Method	Anl Method
Leach Date		DONE		1			06/08/06	SW846 1312	
Leach Date - Conventionals		DONE		1			06/07/06	SW846 1311	
Arsenic		320	23	10	mg/Kg		06/08/06	SW846 3050B	SW846 6010B
Arsenic - SPLP		200	20	1	ug/L		06/13/06	SW846 3010A	SW846 6010B
Arsenic - TCLP	<	1.0	1.0	1	mg/L		06/09/06	SW846 3010A	SW846 6010B
Barium		6.1	0.58	1	mg/Kg		06/08/06	SW846 3050B	SW846 6010B
Barium - SPLP		290	5.0	1	ug/L	A	06/13/06	SW846 3010A	SW846 6010B
Barium - TCLP	<	1.0	1.0	1	mg/L		06/09/06	SW846 3010A	SW846 6010B
Cadmium	<	5.8	5.8	10	mg/Kg		06/08/06	SW846 3050B	SW846 6010B
Cadmium - SPLP		15	5.0	1	ug/L		06/13/06	SW846 3010A	SW846 6010B
Cadmium - TCLP	<	0.25	0.25	1	mg/L		06/09/06	SW846 3010A	SW846 6010B
Chromium		250	0.58	1	mg/Kg		06/08/06	SW846 3050B	SW846 6010B
Chromium - SPLP		1700	5.0	1	ug/L		06/13/06	SW846 3010A	SW846 6010B
Chromium - TCLP	<	0.25	0.25	1	mg/L		06/09/06	SW846 3010A	SW846 6010B
Copper		310	1.2	1	mg/Kg		06/08/06	SW846 3050B	SW846 6010B
Copper - SPLP		11000	10	1	ug/L		06/13/06	SW846 3010A	SW846 6010B
Copper - TCLP		1.3	0.25	1	mg/L		06/09/06	SW846 3010A	SW846 6010B
Lead		350	12	10	mg/Kg		06/08/06	SW846 3050B	SW846 6010B
Lead - SPLP		37	10	1	ug/L		06/13/06	SW846 3010A	SW846 6010B
Lead - TCLP	<	1.0	1.0	1	mg/L		06/09/06	SW846 3010A	SW846 6010B
Mercury		0.061	0.012	1	mg/Kg		06/12/06	SW846 7471A	SW846 7471A
Mercury - SPLP	<	0.20	0.20	1	ug/L		06/13/06	SW846 7470A	SW846 7470A
Mercury - TCLP	<	0.080	0.080	1	mg/L		06/09/06	SW846 7470A	SW846 7470A
Nickel		300	1.2	1	mg/Kg		06/08/06	SW846 3050B	SW846 6010B
Nickel - SPLP		2600	10	1	ug/L		06/13/06	SW846 3010A	SW846 6010B
Nickel - TCLP		1.7	0.25	1	mg/L		06/09/06	SW846 3010A	SW846 6010B
Selenium	<	23	23	10	mg/Kg		06/08/06	SW846 3050B	SW846 6010B
Selenium - SPLP	<	20	20	1	ug/L		06/13/06	SW846 3010A	SW846 6010B
Selenium - TCLP	<	1.0	1.0	1	mg/L		06/09/06	SW846 3010A	SW846 6010B
Silver		18	1.2	1	mg/Kg		06/08/06	SW846 3050B	SW846 6010B
Silver - SPLP	<	10	10	1	ug/L		06/13/06	SW846 3010A	SW846 6010B
Silver - TCLP	<	0.25	0.25	1	mg/L		06/09/06	SW846 3010A	SW846 6010B
Percent Solids		86.0	---	1	%		06/08/06	SM M2540G	SM M2540G

All soil results are reported on a dry weight basis unless otherwise noted.

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436

Analytical Report Number: 872691

Client : FOTH & VAN DYKE
Project Name : KEMC - HUMBOLDT MILL
Project Number : 06W003
Field ID : HA-2

Matrix Type : SOIL
Collection Date : 06/06/06
Report Date : 06/15/06
Lab Sample Number : 872691-002

INORGANICS

Test		Result	EQL	Dilution	Units	Code	Anl Date	Prep Method	Anl Method
Leach Date		DONE		1			06/08/06	SW846 1312	
Leach Date - Conventionals		DONE		1			06/07/06	SW846 1311	
Arsenic		60	2.1	1	mg/Kg		06/08/06	SW846 3050B	SW846 6010B
Arsenic - SPLP	<	20	20	1	ug/L		06/13/06	SW846 3010A	SW846 6010B
Arsenic - TCLP	<	1.0	1.0	1	mg/L		06/09/06	SW846 3010A	SW846 6010B
Barium		24	0.54	1	mg/Kg		06/08/06	SW846 3050B	SW846 6010B
Barium - SPLP		300	5.0	1	ug/L	A	06/13/06	SW846 3010A	SW846 6010B
Barium - TCLP	<	1.0	1.0	1	mg/L		06/09/06	SW846 3010A	SW846 6010B
Cadmium	<	0.54	0.54	1	mg/Kg		06/08/06	SW846 3050B	SW846 6010B
Cadmium - SPLP	<	5.0	5.0	1	ug/L		06/13/06	SW846 3010A	SW846 6010B
Cadmium - TCLP	<	0.25	0.25	1	mg/L		06/09/06	SW846 3010A	SW846 6010B
Chromium		64	0.54	1	mg/Kg		06/08/06	SW846 3050B	SW846 6010B
Chromium - SPLP		32	5.0	1	ug/L	A	06/13/06	SW846 3010A	SW846 6010B
Chromium - TCLP	<	0.25	0.25	1	mg/L		06/09/06	SW846 3010A	SW846 6010B
Copper		63	1.1	1	mg/Kg		06/08/06	SW846 3050B	SW846 6010B
Copper - SPLP		240	10	1	ug/L		06/13/06	SW846 3010A	SW846 6010B
Copper - TCLP	<	0.25	0.25	1	mg/L		06/09/06	SW846 3010A	SW846 6010B
Lead		64	1.1	1	mg/Kg		06/08/06	SW846 3050B	SW846 6010B
Lead - SPLP	<	10	10	1	ug/L		06/13/06	SW846 3010A	SW846 6010B
Lead - TCLP	<	1.0	1.0	1	mg/L		06/09/06	SW846 3010A	SW846 6010B
Mercury		0.022	0.011	1	mg/Kg		06/12/06	SW846 7471A	SW846 7471A
Mercury - SPLP	<	0.20	0.20	1	ug/L		06/13/06	SW846 7470A	SW846 7470A
Mercury - TCLP	<	0.080	0.080	1	mg/L		06/09/06	SW846 7470A	SW846 7470A
Nickel		34	1.1	1	mg/Kg		06/08/06	SW846 3050B	SW846 6010B
Nickel - SPLP		58	10	1	ug/L	A	06/13/06	SW846 3010A	SW846 6010B
Nickel - TCLP	<	0.25	0.25	1	mg/L		06/09/06	SW846 3010A	SW846 6010B
Selenium	<	2.1	2.1	1	mg/Kg		06/08/06	SW846 3050B	SW846 6010B
Selenium - SPLP	<	20	20	1	ug/L		06/13/06	SW846 3010A	SW846 6010B
Selenium - TCLP	<	1.0	1.0	1	mg/L		06/09/06	SW846 3010A	SW846 6010B
Silver		3.4	1.1	1	mg/Kg		06/08/06	SW846 3050B	SW846 6010B
Silver - SPLP	<	10	10	1	ug/L		06/13/06	SW846 3010A	SW846 6010B
Silver - TCLP	<	0.25	0.25	1	mg/L		06/09/06	SW846 3010A	SW846 6010B
Percent Solids		93.2	---	1	%		06/08/06	SM M2540G	SM M2540G

All soil results are reported on a dry weight basis unless otherwise noted.

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436

Analytical Report Number: 872691

Client : FOTH & VAN DYKE
Project Name : KEMC - HUMBOLDT MILL
Project Number : 06W003
Field ID : HA-3

Matrix Type : SOIL
Collection Date : 06/06/06
Report Date : 06/15/06
Lab Sample Number : 872691-003

INORGANICS

Test		Result	EQL	Dilution	Units	Code	Anl Date	Prep Method	Anl Method
Leach Date		DONE		1			06/08/06	SW846 1312	
Leach Date - Conventionals		DONE		1			06/07/06	SW846 1311	
Arsenic		32	2.1	1	mg/Kg		06/08/06	SW846 3050B	SW846 6010B
Arsenic - SPLP	<	20	20	1	ug/L		06/13/06	SW846 3010A	SW846 6010B
Arsenic - TCLP	<	1.0	1.0	1	mg/L		06/09/06	SW846 3010A	SW846 6010B
Barium		18	0.52	1	mg/Kg		06/08/06	SW846 3050B	SW846 6010B
Barium - SPLP		390	5.0	1	ug/L	A	06/13/06	SW846 3010A	SW846 6010B
Barium - TCLP	<	1.0	1.0	1	mg/L		06/09/06	SW846 3010A	SW846 6010B
Cadmium	<	0.52	0.52	1	mg/Kg		06/08/06	SW846 3050B	SW846 6010B
Cadmium - SPLP	<	5.0	5.0	1	ug/L		06/13/06	SW846 3010A	SW846 6010B
Cadmium - TCLP	<	0.25	0.25	1	mg/L		06/09/06	SW846 3010A	SW846 6010B
Chromium		54	0.52	1	mg/Kg		06/08/06	SW846 3050B	SW846 6010B
Chromium - SPLP	<	5.0	5.0	1	ug/L	A	06/13/06	SW846 3010A	SW846 6010B
Chromium - TCLP	<	0.25	0.25	1	mg/L		06/09/06	SW846 3010A	SW846 6010B
Copper		27	1.0	1	mg/Kg		06/08/06	SW846 3050B	SW846 6010B
Copper - SPLP		46	10	1	ug/L	A	06/13/06	SW846 3010A	SW846 6010B
Copper - TCLP	<	0.25	0.25	1	mg/L		06/09/06	SW846 3010A	SW846 6010B
Lead		10	1.0	1	mg/Kg		06/08/06	SW846 3050B	SW846 6010B
Lead - SPLP	<	10	10	1	ug/L		06/13/06	SW846 3010A	SW846 6010B
Lead - TCLP	<	1.0	1.0	1	mg/L		06/09/06	SW846 3010A	SW846 6010B
Mercury		0.016	0.010	1	mg/Kg		06/12/06	SW846 7471A	SW846 7471A
Mercury - SPLP	<	0.20	0.20	1	ug/L		06/13/06	SW846 7470A	SW846 7470A
Mercury - TCLP	<	0.080	0.080	1	mg/L		06/09/06	SW846 7470A	SW846 7470A
Nickel		27	1.0	1	mg/Kg		06/08/06	SW846 3050B	SW846 6010B
Nickel - SPLP		29	10	1	ug/L	A	06/13/06	SW846 3010A	SW846 6010B
Nickel - TCLP	<	0.25	0.25	1	mg/L		06/09/06	SW846 3010A	SW846 6010B
Selenium	<	2.1	2.1	1	mg/Kg		06/08/06	SW846 3050B	SW846 6010B
Selenium - SPLP	<	20	20	1	ug/L		06/13/06	SW846 3010A	SW846 6010B
Selenium - TCLP	<	1.0	1.0	1	mg/L		06/09/06	SW846 3010A	SW846 6010B
Silver	<	1.0	1.0	1	mg/Kg		06/08/06	SW846 3050B	SW846 6010B
Silver - SPLP	<	10	10	1	ug/L		06/13/06	SW846 3010A	SW846 6010B
Silver - TCLP	<	0.25	0.25	1	mg/L		06/09/06	SW846 3010A	SW846 6010B
Percent Solids		95.6	---	1	%		06/08/06	SM M2540G	SM M2540G

All soil results are reported on a dry weight basis unless otherwise noted.

Pace Analytical
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Green Bay, WI 54302
920-469-2436
Fax: 920-469-8827

Lab Number	TestGroupID	Field ID	Comment
872691-	M-BA-SP	All Samples	A - This parameter was detected at 300 ug/L in the SPLP Extraction Blank. This concentration can be attributed to background from the filter paper used in the SPLP filtering process. Sample results around this level may be due to procedure background.
872691-	M-CR-SP	All Samples	A - This parameter was detected at 11 ug/L in the SPLP Extraction Blank. This concentration can be attributed to background from the filter paper used in the SPLP filtering process. Sample results around this level may be due to procedure background.
872691-	M-CU-SP	All Samples	A - This parameter was detected at 4.4 ug/L in the SPLP Extraction Blank. This concentration can be attributed to background from the filter paper used in the SPLP filtering process. Sample results around this level may be due to procedure background.
872691-	M-NI-SP	All Samples	A - This parameter was detected at 3.8 ug/L in the SPLP Extraction Blank. This concentration can be attributed to background from the filter paper used in the SPLP filtering process. Sample results around this level may be due to procedure background.

Qualifier Codes

Flag	Applies To	Explanation
A	Inorganic	Analyte is detected in the method blank. Method blank criteria is evaluated to the laboratory method detection limit. Additionally, method blank acceptance may be based on project specific criteria or determined from analyte concentrations in the sample and are evaluated on a sample by sample basis.
B	Inorganic	The analyte has been detected between the method detection limit and the reporting limit.
B	Organic	Analyte is present in the method blank. Method blank criteria is evaluated to the laboratory method detection limit. Additionally, method blank acceptance may be based on project specific criteria or determined from analyte concentrations in the sample and are evaluated on a sample by sample basis.
C	All	Elevated detection limit.
D	All	Analyte value from diluted analysis or surrogate result not applicable due to sample dilution.
E	Inorganic	Estimated concentration due to matrix interferences. During the metals analysis the serial dilution failed to meet the established control limits of 0-10%. The sample concentration is greater than 50 times the IDL for analysis done on the ICP or 100 times the IDL for analysis done on the ICP-MS. The result was flagged with the E qualifier to indicate that a physical interference was observed.
E	Organic	Analyte concentration exceeds calibration range.
F	Inorganic	Due to potential interferences for this analysis by Inductively Coupled Plasma techniques (SW-846 Method 6010), this analyte has been confirmed by and reported from an alternate method.
F	Organic	Surrogate results outside control criteria.
G	All	The result is estimated because the concentration is less than the lowest calibration standard concentration utilized in the initial calibration. The method detection limit is less than the reporting limit specified for this project.
H	All	Preservation, extraction or analysis performed past holding time.
HF	Inorganic	This test is considered a field parameter, and the recommended holding time is 15 minutes from collection. The analysis was performed in the laboratory beyond the recommended holding time.
J	All	Concentration detected equal to or greater than the method detection limit but less than the reporting limit.
K	Inorganic	Sample received unpreserved. Sample was either preserved at the time of receipt or at the time of sample preparation.
K	Organic	Detection limit may be elevated due to the presence of an unrequested analyte.
L	All	Elevated detection limit due to low sample volume.
M	Organic	Sample pH was greater than 2
N	All	Spiked sample recovery not within control limits.
O	Organic	Sample received overweight.
P	Organic	The relative percent difference between the two columns for detected concentrations was greater than 40%.
Q	All	The analyte has been detected between the limit of detection (LOD) and limit of quantitation (LOQ). The results are qualified due to the uncertainty of analyte concentrations within this range.
S	Organic	The relative percent difference between quantitation and confirmation columns exceeds internal quality control criteria. Because the result is unconfirmed, it has been reported as a non-detect with an elevated detection limit.
U	All	The analyte was not detected at or above the reporting limit.
V	All	Sample received with headspace.
W	All	A second aliquot of sample was analyzed from a container with headspace.
X	All	See Sample Narrative.
Z	Organics	This compound was separated in the check standard but it did not meet the resolution criteria as set forth in SW846.
&	All	Laboratory Control Spike recovery not within control limits.
*	All	Precision not within control limits.
+	Inorganic	The sample result is greater than four times the spike level: therefore, the percent recovery is not evaluated.
<	All	The analyte was not detected at or above the reporting limit.
1	Inorganic	Dissolved analyte or filtered analyte greater than total analyte; analyses passed QC based on precision criteria.
2	Inorganic	Dissolved analyte or filtered analyte greater than total analyte; analyses failed QC based on precision criteria.
3	Inorganic	BOD result is estimated due to the BOD blank exceeding the allowable oxygen depletion.
4	Inorganic	BOD duplicate precision not within control limits. Due to the 48 hour holding time for this test, it is not practical to reanalyze and try to correct the deficiency.
5	Inorganic	BOD result is estimated due to insufficient oxygen depletion. Due to the 48 hour holding time for this test, it is not practical to reanalyze and try to correct the deficiency.
6	Inorganic	BOD laboratory control sample not within control limits. Due to the 48 hour holding time for this test, it is not practical to reanalyze and try to correct the deficiency.
7	Inorganic	BOD result is estimated due to complete oxygen depletion. Due to the 48 hour holding time for this test, it is not practical to reanalyze and try to correct the deficiency.

Pace Analytical
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Analysis Summary by Laboratory

1241 Bellevue Street
Green Bay, WI 54302

Test Group Name	872691-001	872691-002	872691-003
ARSENIC	B	B	B
ARSENIC - SPLP	B	B	B
ARSENIC - TCLP	B	B	B
BARIUM	B	B	B
BARIUM - SPLP	B	B	B
BARIUM - TCLP	B	B	B
CADMIUM	B	B	B
CADMIUM - SPLP	B	B	B
CADMIUM - TCLP	B	B	B
CHROMIUM	B	B	B
CHROMIUM - SPLP	B	B	B
CHROMIUM - TCLP	B	B	B
COPPER	B	B	B
COPPER - SPLP	B	B	B
COPPER - TCLP	B	B	B
LEAD	B	B	B
LEAD - SPLP	B	B	B
LEAD - TCLP	B	B	B
MERCURY	B	B	B
MERCURY - SPLP	B	B	B
MERCURY - TCLP	B	B	B
NICKEL	B	B	B
NICKEL - SPLP	B	B	B
NICKEL - TCLP	B	B	B
PERCENT SOLIDS	B	B	B
SELENIUM	B	B	B
SELENIUM - SPLP	B	B	B
SELENIUM - TCLP	B	B	B
SILVER	B	B	B
SILVER - SPLP	B	B	B
SILVER - TCLP	B	B	B

Code	Facility	Address	MI Certification
B	Green Bay Lab (Bellevue St)	1241 Bellevue Street, Suite 9 Green Bay, WI 54302	Not Certified

Sample Condition Upon Receipt

Pace Analytical

Client Name: FOTH Project # 872691

Courier: ☐ Fed Ex ☐ UPS ☐ USPS ☐ Client ☐ Commercial ☒ Pace Other_____

Custody Seal on Cooler/Box Present: ☒ yes ☐ no Seals intact: ☒ yes ☐ no

Optional
Proj. Due Date:
Proj. Name:

Packing Material: ☐ Bubble Wrap ☒ Bubble Bags ☐ None ☐ Other_____

Thermometer Used NA Type of Ice: (Wet) Blue None ☒ Samples on ice, cooling process has begun

Cooler Temperature R01 Biological Tissue is Frozen: Yes No

Temp should be above freezing to 6°C Comments:

Date and Initials of person examining contents: CS 6/7/06 ALY 6-7-06

Chain of Custody Present:	☒Yes ☐No ☐N/A	1.
Chain of Custody Filled Out:	☒Yes ☐No ☐N/A	2.
Chain of Custody Relinquished:	☒Yes ☐No ☐N/A	3.
Sampler Name & Signature on COC:	☒Yes ☐No ☐N/A	4.
Samples Arrived within Hold Time:	☒Yes ☐No ☐N/A	5.
Short Hold Time Analysis (<72hr):	☐Yes ☒No ☐N/A	6.
Rush Turn Around Time Requested:	☐Yes ☒No ☐N/A	7.
Sufficient Volume:	☒Yes ☐No ☐N/A	8.
Correct Containers Used:	☒Yes ☐No ☐N/A	9.
-Pace Containers Used:	☒Yes ☐No ☐N/A	
Containers Intact:	☒Yes ☐No ☐N/A	10.
Filtered volume received for Dissolved tests	☐Yes ☐No ☒N/A	11.
Sample Labels match COC:	☒Yes ☐No ☐N/A	12.
-Includes date/time/ID/Analysis Matrix: S		
All containers needing preservation have been checked.	☐Yes ☐No ☒N/A	13.
All containers needing preservation are found to be in compliance with EPA recommendation.	☐Yes ☐No ☒N/A	
exceptions: VOA, coliform, TOC, O&G, WI-DRO (water)	☐Yes ☐No	Initial when completed
Samples checked for dechlorination:	☐Yes ☐No ☒N/A	14.
Headspace in VOA Vials (>6mm):	☐Yes ☐No ☒N/A	15.
Trip Blank Present:	☐Yes ☒No ☐N/A	16.
Trip Blank Custody Seals Present	☐Yes ☐No ☒N/A	
Pace Trip Blank Lot # (if purchased):		

Client Notification/ Resolution: Field Data Required? Y / N

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: _____

Project Manager Review: KL for TN **Date:** 6/8/06

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers)

Pace Analytical®

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page: of 915926

Section A Required Client Information:

Company	Foth + Van Dyke
Address	2737 S. Ridge Rd
	Green Bay, WI 54307
Email To:	jkesy@foth.com
Phone	920-497-2500
Fax	920-497-8516
Requested Due Date/TAT:	6/14/06

Section B Required Project Information:

Report To:	Janis Kesy
Copy To:	
Purchase Order No.:	
Project Name:	KFMC - Humboldt Mill
Project Number:	06u003

Section C Invoice Information:

Attention:	Janis Kesy
Company Name:	Foth + Van Dyke
Address:	2737 S. Ridge Rd
Pace Quote Reference:	
Pace Project Manager:	
Pace Profile #:	

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☐ Other_____

SITE LOCATION ☐GA ☐IL ☐IN ☒MI ☐MN ☐NC ☐OH ☐SC ☐WI ☐OTHER _____

Section D Required Client Information

SAMPLE ID

One Character per box. (A-Z, 0-9 / .-) Samples IDs MUST BE UNIQUE

Valid Matrix Codes: MATRIX / CODE — DRINKING WATER DW; WATER WT; WASTE WATER WW; PRODUCT P; SOIL/SOLID SL; OIL OL; WIPE WP; AIR AR; OTHER OT; TISSUE TS

Filtered (Y/N)

Requested Analysis: RRRA metals total; Ni, Cu - total; TCLP metals - RCRA; SPLP metals - RCRA; TCLP - Ni, Cu; SPLP - Ni, Cu

Pace Project Number: 872691

ITEM #	SAMPLE ID	MATRIX CODE	SAMPLE TYPE G=GRAB C=COMP	COLLECTED COMPOSITE START DATE	COMPOSITE START TIME	COMPOSITE END/GRAB DATE	COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	RRRA metals total	Ni, Cu - total	TCLP metals - RCRA	SPLP metals - RCRA	TCLP - Ni, Cu	SPLP - Ni, Cu	Residual Chlorine (Y/N)	Lab I.D
1	HA-1 001	SL				6/6/06	1410		4	x								x	x	x	x	x	x		4-8 Oz Ambers
2	HA-2 002	SL				6/6/06	1440		4	x								x	x	x	x	x	x		
3	HA-3 003	SL				6/6/06	1500		4	x								x	x	x	x	x	x		
4																									
5																									
6																									
7																									
8																									
9																									
10																									
11																									
12																									

Additional Comments:

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
Janis A Kesy - Foth	6/7/06	0845	Glenn Vorwaldt	6/7/06	13:10
Glenn Vorwaldt	6/7/06	13:30	C. Schufelberg	6/7	1330

SAMPLE CONDITION

Temp in °C	Received on Ice	Custody Sealed Cooler	Samples Intact
	Y/N	Y/N	Y/N
R01	Y/N	Y/N	Y/N
	Y/N	Y/N	Y/N
	Y/N	Y/N	Y/N

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Janis Kesy

SIGNATURE of SAMPLER: Janis A Kesy

DATE Signed (MM / DD / YY): 6/7/06

SEE REVERSE SIDE FOR INSTRUCTIONS

ALLQ020rev.3,31Mar05

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436
Fax: 920-469-8827

QC Summary

Batch: 872691
Lab Section: METALS
QC Batch Number: 11853
Prep Method: SW846 3050B
Analytical Method: SW846 6010B

QC Type	Client Sample ID	Lab Sample ID
MB	MBSMTG1912-40	MBSMTG1912-40
LCS	LCSSMTG1912-40	LCSSMTG1912-40
MS	872697-001MS	872697-001MS
MSD	872697-001MSD	872697-001MSD

Client Sample ID	Lab Sample ID	MB ID
HA-1	872691-001	MB
HA-3	872691-003	MB

Client Sample ID	Lab Sample ID	MB ID
HA-2	872691-002	MB

Test Name	Method Blank Result	Conc	LCS Spiked Conc	LCS Recovery Conc	%	C	LCSD Spiked Conc	LCSD Recovery Conc	%	C	LCS/LCSD RPD %	C	LCS/LCSD Control Limits LCL %	UCL %	RPD %	Parent Sample Number	Parent Result	Conc	MS Spiked Conc	MS Recovery Conc	%	C	MSD Spiked Conc	MSD Recovery Conc	%	C	MS/MSD RPD %	C	MS/MSD Control Limits LCL %	UCL %	RPD %
Arsenic	<	2	50.0	49.5	99.0		—	—	—		—		80	120	20	872697-001		2.51	52.0	48.3	88.0		52.0	56	102.7		14.7		75	125	20
Barium	<	0.5	50.0	45.4	90.8		—	—	—		—		80	120	20	872697-001		24.0	52.0	64.8	78.4		52.0	66.3	81.2		2.2		75	125	20
Cadmium	<	0.5	50.0	47.3	94.7		—	—	—		—		80	120	20	872697-001		0.0837	52.0	45.3	86.8		52.0	46.6	89.3		2.9		75	125	20
Chromium	<	0.5	50.0	52.8	105.6		—	—	—		—		80	120	20	872697-001		12.7	52.0	60	90.7		52.0	66.9	104.1		11.0		75	125	20
Copper	<	1	50.0	47.3	94.6		—	—	—		—		80	120	20	872697-001		9.28	52.0	50.5	79.2		52.0	58.6	94.8		14.9		75	125	20
Lead	<	1	50.0	50.3	100.7		—	—	—		—		80	120	20	872697-001		7.71	52.0	54.8	90.5		52.0	62	104.4		12.4		75	125	20
Nickel	<	1	50.0	49.3	98.6		—	—	—		—		80	120	20	872697-001		7.79	52.0	50.8	82.7		52.0	58.2	97.0		13.6		75	125	20
Selenium	<	2	50.0	48.5	97.1		—	—	—		—		80	120	20	872697-001	<	0.84	52.0	48.4	93.0		52.0	49.8	95.6		2.8		75	125	20
Silver	<	1	25.0	23.6	94.5		—	—	—		—		80	120	20	872697-001	<	0.25	26.0	23.4	90.0		26.0	24.6	94.5		4.9		75	125	20

Conc = mg/Kg unless otherwise noted
C = QC Code, see Qualifer Sheet
Parent Result is reported down to MDL in order to allow Validation of this worksheet
The %R and RPD results are calculated from raw data values with more significant figures than are reported on this form.

Report Date: 10/10/2006
QC Batch Number: 11853

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436
Fax: 920-469-8827

QC Summary

Batch: 872691
Lab Section: METALS
QC Batch Number: 11866
Prep Method: SW846 3010A
Analytical Method: SW846 6010B

QC Type	Client Sample ID	Lab Sample ID
MB	MBTMTG1911-36	MBTMTG1911-36
LCS	LCSTMTG1911-36	LCSTMTG1911-36
MS	HA-1MS	872691-001MS
MS	872678-001MS	872678-001MS
MSD	HA-1MSD	872691-001MSD

Client Sample ID	Lab Sample ID	MB ID
HA-1	872691-001	MB
HA-3	872691-003	MB

Client Sample ID	Lab Sample ID	MB ID
HA-2	872691-002	MB

Test Name	Method Blank Result	Conc	LCS Spiked Conc	LCS Recovery Conc	%	C	LCSD Spiked Conc	LCSD Recovery Conc	%	C	LCS/LCSD RPD	%	C	LCS/LCSD Control Limits LCL %	UCL %	RPD %	Parent Sample Number	Parent Result	Conc	MS Spiked Conc	MS Recovery Conc	%	C	MSD Spiked Conc	MSD Recovery Conc	%	C	MS/MSD RPD	%	C	MS/MSD Control Limits LCL %	UCL %	RPD %
Arsenic - TCLP	<	0.2	0.50	0.48	96.1		—	—	—		—			80	120	20	872678-001	<	0.038	2.5	2.4	97.0		—	—	—		—			75	125	20
Barium - TCLP	<	0.2	0.50	0.5	100		—	—	—		—			80	120	20	872678-001		1.7	2.5	4	94.2		—	—	—		—			75	125	20
Cadmium - TCLP	<	0.05	0.50	0.49	98.9		—	—	—		—			80	120	20	872678-001		0.083	2.5	2.4	92.9		—	—	—		—			75	125	20
Chromium - TCLP	<	0.05	0.50	0.48	95.8		—	—	—		—			80	120	20	872678-001		0.058	2.5	2.3	89.0		—	—	—		—			75	125	20
Lead - TCLP	<	0.2	0.50	0.49	97.9		—	—	—		—			80	120	20	872678-001		0.044	2.5	2.3	91.3		—	—	—		—			75	125	20
Selenium - TCLP	<	0.2	0.50	0.48	96.3		—	—	—		—			80	120	20	872678-001	<	0.042	2.5	2.4	97.8		—	—	—		—			75	125	20
Silver - TCLP	<	0.05	0.25	0.24	96.5		—	—	—		—			80	120	20	872678-001	<	0.013	1.2	1.2	99.2		—	—	—		—			75	125	20
Arsenic - TCLP	<	0.2	0.50	0.48	96.1		—	—	—		—			80	120	20	872691-001	<	0.038	2.5	2.5	98.7		2.5	2.4	94.1		4.8			75	125	20
Barium - TCLP	<	0.2	0.50	0.5	100		—	—	—		—			80	120	20	872691-001		0.36	2.5	2.8	99.7		2.5	2.8	96.1		3.2			75	125	20
Cadmium - TCLP	<	0.05	0.50	0.49	98.9		—	—	—		—			80	120	20	872691-001		0.0097	2.5	2.5	97.9		2.5	2.3	93.4		4.6			75	125	20
Chromium - TCLP	<	0.05	0.50	0.48	95.8		—	—	—		—			80	120	20	872691-001		0.15	2.5	2.5	93.3		2.5	2.4	90.0		3.4			75	125	20
Copper - TCLP	<	0.05	0.50	0.49	98.9		—	—	—		—			80	120	20	872691-001		1.3	2.5	3.7	96.0		2.5	3.7	97.5		0.3			75	125	20
Lead - TCLP	<	0.2	0.50	0.49	97.9		—	—	—		—			80	120	20	872691-001	<	0.017	2.5	2.4	96.3		2.5	2.3	92.3		4.3			75	125	20
Nickel - TCLP	<	0.05	0.50	0.49	97.9		—	—	—		—			80	120	20	872691-001		1.7	2.5	4	92.0		2.5	4.1	92.6		0.4			75	125	20
Selenium - TCLP	<	0.2	0.50	0.48	96.3		—	—	—		—			80	120	20	872691-001	<	0.042	2.5	2.5	99.2		2.5	2.4	95.1		4.2			75	125	20
Silver - TCLP	<	0.05	0.25	0.24	96.5		—	—	—		—			80	120	20	872691-001	<	0.013	1.2	1.2	99.0		1.2	1.2	94.7		4.4			75	125	20

Conc = mg/L unless otherwise noted
C = QC Code, see Qualifer Sheet
Parent Result is reported down to MDL in order to allow Validation of this worksheet
The %R and RPD results are calculated from raw data values with more significant figures than are reported on this form.

Report Date: 10/10/2006
QC Batch Number: 11866

Pace Analytical Services, Inc.

QC Summary

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436
Fax: 920-469-8827

Batch: 872691
Lab Section: METALS
QC Batch Number: 11896
Prep Method: SW846 7470A
Analytical Method: SW846 7470A

QC Type	Client Sample ID	Lab Sample ID
MB	MBWMTG1845-65	MBWMTG1845-65
MB	MBTMTG1845-65	MBTMTG1845-65
LCS	LCSWMTG1845-65	LCSWMTG1845-65
LCS	LCSTMTG1845-65	LCSTMTG1845-65
MS	872696-033MS	872696-033MS
MS	HA-1MS	872691-001MS
MS	872678-001MS	872678-001MS
MSD	872696-033MSD	872696-033MSD
MSD	HA-1MSD	872691-001MSD
MSD	872678-001MSD	872678-001MSD

Client Sample ID	Lab Sample ID	MB ID
HA-1	872691-001	MB
HA-3	872691-003	MB

Client Sample ID	Lab Sample ID	MB ID
HA-2	872691-002	MB

Test Name	Method Blank Result	Conc	LCS Spiked Conc	LCS Recovery Conc	%	C	LCSD Spiked Conc	LCSD Recovery Conc	%	C	LCS/LCSD RPD	%	C	LCS/LCSD Control Limits LCL %	UCL %	RPD %	Parent Sample Number		Parent Result Conc	MS Spiked Conc	MS Recovery Conc	%	C	MSD Spiked Conc	MSD Recovery Conc	%	C	MS/MSD RPD	%	C	MS/MSD Control Limits LCL %	UCL %	RPD %
Mercury - TCLP	<	0.2	5.0	4.8	95.5		—	—	—		—			85	115	20	872678-001	<	0.029	2.0	1.9	95.9		2.0	1.9	95.6		0.3			85	115	20
Mercury - TCLP	<	0.2	5.0	4.8	95.5		—	—	—		—			85	115	20	872691-001	<	0.029	2.0	1.9	94.6		2.0	1.9	95.3		0.7			85	115	20

Conc = ug/L unless otherwise noted
C = QC Code, see Qualifer Sheet
Parent Result is reported down to MDL in order to allow Validation of this worksheet
The %R and RPD results are calculated from raw data values with more significant figures than are reported on this form.

Report Date: 10/10/2006
QC Batch Number: 11896

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436
Fax: 920-469-8827

QC Summary

Batch: 872691
Lab Section: METALS
QC Batch Number: 11947
Prep Method: SW846 7471A
Analytical Method: SW846 7471A

QC Type	Client Sample ID	Lab Sample ID
MB	MBSMTG1847-58	MBSMTG1847-58
LCS	LCSSMTG1847-58	LCSSMTG1847-58
MS	872762-001MS	872762-001MS
MSD	872762-001MSD	872762-001MSD

Client Sample ID	Lab Sample ID	MB ID
HA-1	872691-001	MB
HA-3	872691-003	MB

Client Sample ID	Lab Sample ID	MB ID
HA-2	872691-002	MB

Test Name	Method Blank Result	Conc	LCS Spiked Conc	LCS Recovery Conc	%	C	LCSD Spiked Conc	LCSD Recovery Conc	%	C	LCS/LCSD RPD	%	C	LCS/LCSD Control Limits LCL %	UCL %	RPD %	Parent Sample Number	Parent Result Conc	MS Spiked Conc	MS Recovery Conc	%	C	MSD Spiked Conc	MSD Recovery Conc	%	C	MS/MSD RPD	%	C	MS/MSD Control Limits LCL %	UCL %	RPD %
Mercury	<	0.01	0.25	0.26	102.9		—	—	—		—			85	115	20	872762-001	0.022	0.29	0.31	101.6		0.29	0.32	103.8		1.9			85	115	20

Conc = mg/Kg unless otherwise noted
C = QC Code, see Qualifer Sheet
Parent Result is reported down to MDL in order to allow Validation of this worksheet
The %R and RPD results are calculated from raw data values with more significant figures than are reported on this form.

Report Date: 10/10/2006
QC Batch Number: 11947

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436
Fax: 920-469-8827

QC Summary

Batch: 872691
Lab Section: METALS
QC Batch Number: 11974
Prep Method: SW846 3010A
Analytical Method: SW846 6010B

QC Type	Client Sample ID	Lab Sample ID
MB	MBTMTG1911-40	MBTMTG1911-40
MB	MBSPMTG1911-40	MBSPMTG1911-40
LCS	LCSTMTG1911-40	LCSTMTG1911-40
LCS	LCSSPMTG1911-40	LCSSPMTG1911-40
MS	872846-001MS	872846-001MS
MS	HA-1MS	872691-001MS
MSD	872846-001MSD	872846-001MSD
MSD	HA-1MSD	872691-001MSD

Client Sample ID	Lab Sample ID	MB ID
HA-1	872691-001	MB
HA-3	872691-003	MB

Client Sample ID	Lab Sample ID	MB ID
HA-2	872691-002	MB

Test Name	Method Blank Result	Conc	LCS Spiked Conc	LCS Recovery Conc	%	C	LCSD Spiked Conc	LCSD Recovery Conc	%	C	LCS/LCSD RPD %	C	LCS/LCSD Control Limits LCL %	UCL %	RPD %	Parent Sample Number		Parent Result Conc	MS Spiked Conc	MS Recovery Conc	%	C	MSD Spiked Conc	MSD Recovery Conc	%	C	MS/MSD RPD %	C	MS/MSD Control Limits LCL %	UCL %	RPD %
Arsenic - SPLP	<	20	500.0	502.7	100.5		---	---	---		---		80	120	20	872691-001		197.6	500.0	695.1	99.5		500.0	667.9	94.1		4.0		75	125	20
Barium - SPLP	<	5	500.0	493.5	98.7		---	---	---		---		80	120	20	872691-001		285.4	500.0	777.3	98.4		500.0	751.9	93.3		3.3		75	125	20
Cadmium - SPLP	<	5	500.0	498.2	99.6		---	---	---		---		80	120	20	872691-001		15.28	500.0	479.1	92.8		500.0	468.6	90.7		2.2		75	125	20
Chromium - SPLP	<	5	500.00	526.3	105.3		---	---	---		---		80	120	20	872691-001		1720.7	500.00	2212.4	98.3		500.00	2127.8	81.4		3.9		75	125	20
Copper - SPLP	<	10	500.000	495.6	99.1		---	---	---		---		80	120	20	872691-001		11183.3	500.000	11834.6	130.3	+	500.000	11329	29.1	+	4.4		75	125	20
Lead - SPLP	<	10	500.0	504.5	100.9		---	---	---		---		80	120	20	872691-001		36.76	500.0	508.5	94.3		500.0	495.2	91.7		2.6		75	125	20
Nickel - SPLP	<	10	500.00	500.4	100.1		---	---	---		---		80	120	20	872691-001		2608.8	500.00	3083.2	94.9	+	500.00	2970.8	72.4	+	3.7		75	125	20
Selenium - SPLP	<	20	500.0	514	102.8		---	---	---		---		80	120	20	872691-001	<	8.3	500.0	506.5	101.3		500.0	498.2	99.6		1.7		75	125	20
Silver - SPLP	<	10	250.0	245	98.0		---	---	---		---		80	120	20	872691-001	<	2.6	250.0	243.7	97.5		250.0	237.8	95.1		2.5		75	125	20

Conc = ug/L unless otherwise noted
C = QC Code, see Qualifer Sheet
Parent Result is reported down to MDL in order to allow Validation of this worksheet
The %R and RPD results are calculated from raw data values with more significant figures than are reported on this form.

Report Date: 10/10/2006
QC Batch Number: 11974

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436
Fax: 920-469-8827

QC Summary

Batch: 872691
Lab Section: METALS
QC Batch Number: 11982
Prep Method: SW846 7470A
Analytical Method: SW846 7470A

QC Type	Client Sample ID	Lab Sample ID
MB	MBWMTG1845-66	MBWMTG1845-66
MB	MBSPMTG1845-66	MBSPMTG1845-66
LCS	LCSWMTG1845-66	LCSWMTG1845-66
LCS	LCSSPMTG1845-66	LCSSPMTG1845-66
MS	872782-002MS	872782-002MS
MS	HA-1MS	872691-001MS
MSD	872782-002MSD	872782-002MSD
MSD	HA-1MSD	872691-001MSD

Client Sample ID	Lab Sample ID	MB ID
HA-1	872691-001	MB
HA-3	872691-003	MB

Client Sample ID	Lab Sample ID	MB ID
HA-2	872691-002	MB

Test Name	Method Blank Result Conc	LCS Spiked Conc	LCS Recovery Conc	LCS Recovery %	LCS C	LCSD Spiked Conc	LCSD Recovery Conc	LCSD Recovery %	LCSD C	LCS/LCSD RPD %	LCS/LCSD RPD C	LCS/LCSD Control Limits LCL %	LCS/LCSD Control Limits UCL %	LCS/LCSD Control Limits RPD %	Parent Sample Number	Parent Result Conc	MS Spiked Conc	MS Recovery Conc	MS Recovery %	MS C	MSD Spiked Conc	MSD Recovery Conc	MSD Recovery %	MSD C	MS/MSD RPD %	MS/MSD RPD C	MS/MSD Control Limits LCL %	MS/MSD Control Limits UCL %	MS/MSD Control Limits RPD %
Mercury - SPLP	< 0.2	5.0	5.3	105.5		---	---	---		---		85	115	20	872691-001	< 0.072	5.0	4.9	97.5		5.0	4.9	97.3		0.2		85	115	20

Conc = ug/L unless otherwise noted
C = QC Code, see Qualifer Sheet
Parent Result is reported down to MDL in order to allow Validation of this worksheet
The %R and RPD results are calculated from raw data values with more significant figures than are reported on this form.

Report Date: 10/10/2006
QC Batch Number: 11982

B-3

Technical Memorandum: Impact of Increased Drainage Through Wetland EE

Client: Kennecott Minerals Company
Project: Humboldt Mill Project
Prepared by: Michael D. Liebman, P.E.
Checked by: Steve Donohue

Scope ID.: 06W003

Date: 12/4/07
Date: 12/4/07

Scope

HTDF Discharge Evaluation from Tailings Placement and Runoff for design rainfall events

Conditions/Assumptions

The proposed placement of tailings into the Humboldt Tailings Disposal Facility (HTDF) and the associated treatment of the HTDF discharge will result in some increase of flow from the HTDF into downstream wetlands and stream corridors. Although the total volume of increased discharge waters should have little impact on the wetland or stream systems, it is important to understand the change in the peak flows passing through this system before discharging to the Middle Branch Escanaba River about one mile below the HTDF discharge. This is especially important as this stream system passes by a residential area near the confluence with the river.

Flow hydrology for the HTDF and tributary lands was developed to determine flow estimates for a range of rainfall events. These runoff flows for the 2, 10, and 100-year storm events were used in hydraulics calculations to determine the potential change in stream depths near the residential properties.

Analysis Methodology

The *Haestad Methods* "PONDPACK" hydrologic program was used to calculate various design storm peak flows (using NRCS TR-55 methodology) generated by the drainage basin tributary to the Middle Branch Escanaba River. The drainage basin includes the HTDF and its tributary lands. Pond storage was included in the hydrologic calculation for both the existing condition and for the proposed condition which includes the additional outlet flow associated with the water treatment discharge.

For the hydrology calculations, the soils and land uses within the drainage basin were estimated. The soils are comprised of sandy loams, sands, outcrop, and other smaller soils which generally fall into the "B" or "C" hydrologic soil classification. The landscape is predominately wooded with some wetlands. This combination led to the use of a Runoff Curve Number (hydrologic parameter used in TR-55) of 60 for this evaluation. This, and other information was input into the program to model the characteristics of the drainage basin. The 2, 10, and 100-year rainfall event flows were then developed.

To the existing condition flows, an additional 264 gpm (0.6 cfs) was added to account for the additional HTDF discharge rate to model the proposed condition (from 246 gpm to 510 gpm). The existing and proposed condition flows were then run through the *Haestad Methods* "FLOWMASTER" hydraulics program to determine the flow depths associated with these flows in the area of the residences. A trapezoidal channel of 3' bottom width and 2 ½ to 1 side-slopes was estimated as the stream geometry in the area of the residences (along with a channel slope of 0.7% and a Mannings channel roughness of 0.045). Although quite conservative (because the additional proposed condition flows will dissipate somewhat before reaching the residential area) the differences in stream flow depths can be compared between the existing and proposed conditions.

Results

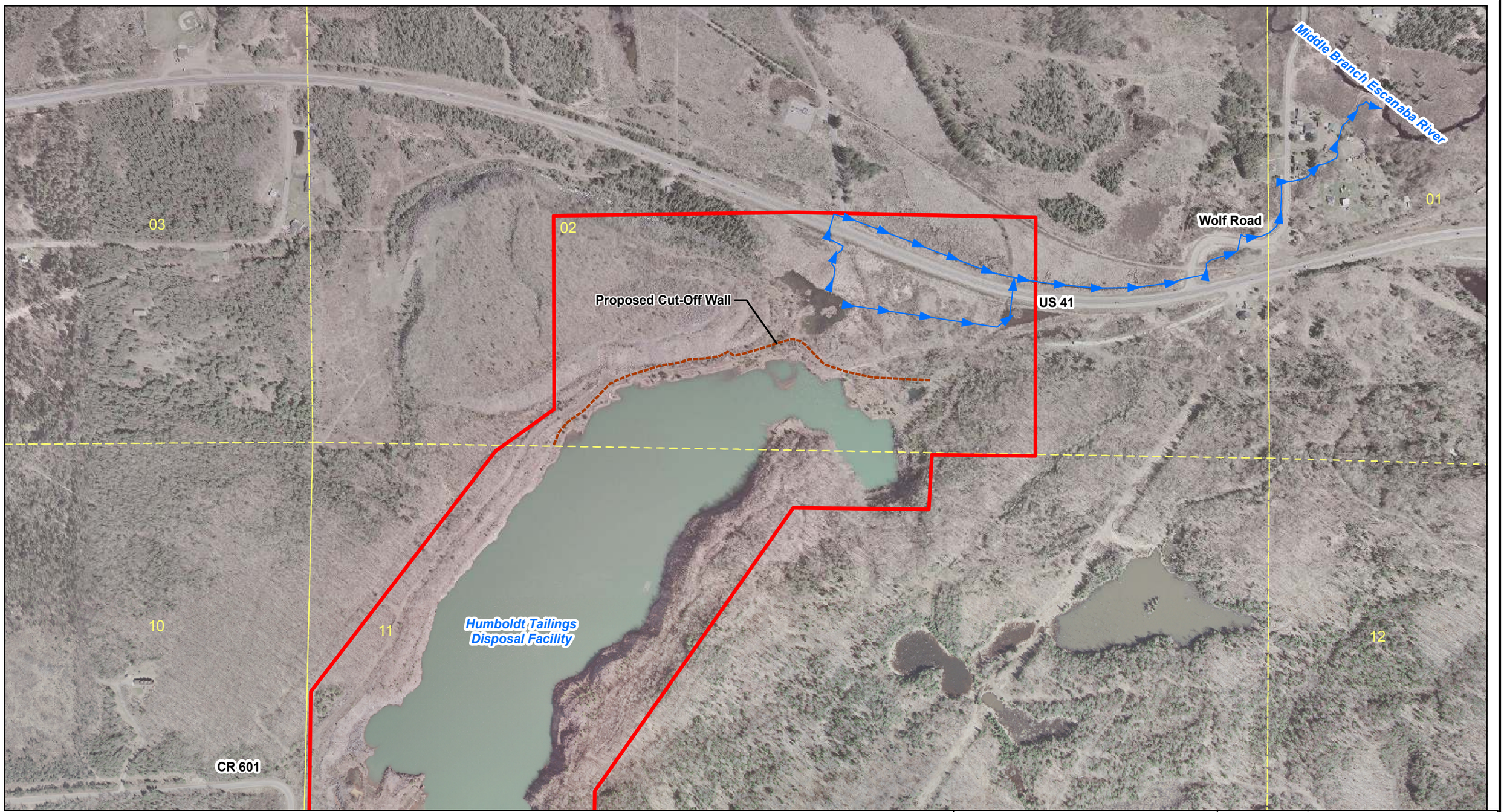
The results of the proposed HTDF discharge increase is summarized in the following tables,

	2-year		10-year		100-year	
	Flow	Depth	Flow	Depth	Flow	Depth
Existing Condition	13 cfs	1.06’	47 cfs	1.96’	168 cfs	3.45’
Proposed Condition	13.6 cfs	1.09’	47.6 cfs	1.98’	168.6 cfs	3.46’

As shown, the increases due to this flow modification are negligible.

Conclusions/Recommendation

As discussed, the addition of the water treatment flow at the HTDF will increase peak flows downstream by 0.6 cfs. This additional flow will increase the depth of water in the channel near the residences by as much as 0.03 feet for a 2-year event, 0.02 feet for the 10-year event, and no increase for the 100-year event. The channel bank is estimated to be over two feet high, so the more frequent events which show the small depth of flow increase (2-year event) should have no effect on the residences as the water will remain in the channel. For larger, less frequent storms (10-year to 100-year event), the depth of flow increase is so small as to be considered insignificant.



NOTES

1. Orthophotography supplied by Aero-Metric Engineering, Sheboygan, Wisconsin. Date of photography: April 27, 2006.
2. Horizontal datum based on NAD 83/94. Horizontal coordinates based on UTM Zone 16.
3. Site Location - Project Site within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.

LEGEND

- PLSS Sections
- KEMC Project Location
- Approximate Surface Water Flow through Wetland EE
- Proposed Cut-Off Wall

N

Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	AKM	DATE: OCT. '08
APPROVED BY:	SVD1	DATE: OCT. '08
APPROVED BY:		DATE:

Kennecott Eagle Minerals

FIGURE 1
HUMBOLDT MILL PROJECT
FLOW OF WETLAND EE

Scale: 0 250 500 Feet

Date: OCTOBER, 2008

Prepared by: BJW1

Project No: 06W003

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B-4

Technical Memorandum: Well Inventory and Wellhead Protection Survey

Memorandum

December 4, 2007

TO: Andrea Martin

CC: Master File 06W003-6001

FR: Jeff Lynott

RE: Humboldt Mill Project Water Well Survey

Water well surveys using state databases have been performed as part of the baseline studies for the Humboldt Mill Project. The following databases were searched for this survey:

1. Michigan Department of Environmental Quality (MDEQ) Scanned Well Logs 1965-1999 http://www.deq.state.mi.us/well-logs/
2. MDEQ Wellogic database http://www.deq.state.mi.us/wellogic/main.html, which links to the MDEQ Water Well Viewer database http://wellviewer.rsgis.msu.edu/viewer.htm
3. Marquette County Health Department Records

The search area encompasses all of Sections 1, 2, 3, 10, 11, 12, 13, 14, 15, in Township 47N, Range 29W, in Marquette County. The search area is shown on Figure 1.

Seventy-one water well records were found within the search area (Figure 1). No well records were identified within Section 12. Although no record was found for a well supplying water to the Humboldt Mill, the current owner indicated a water supply well did exist for the facility, but was no longer in operation. The well is in the SW1/4 of the SW ¼ of the SE ¼ of Section 11. No well records were found for the residence on the south side of Highway 41 near the intersection with Wolf Lake Road (A) and for the residence north of County Road 601, approximately 1,200 feet west of the intersection with Highway 95 (B).

All of the wells with known or approximate locations are listed in Table 1. The locations of fifty-two of the wells in the search area have been identified by MDEQ and are displayed on the MDEQ Water Well Viewer website. The remaining wells were graphically located by Foth, based on the approximate location described on the well records received from the databases listed above. None of the locations shown on Figure 1 have been checked in the field. In some cases, well locations on the logs do not appear to match residential locations on the topographic map. The logs for all wells identified in the search area are attached to this memo.

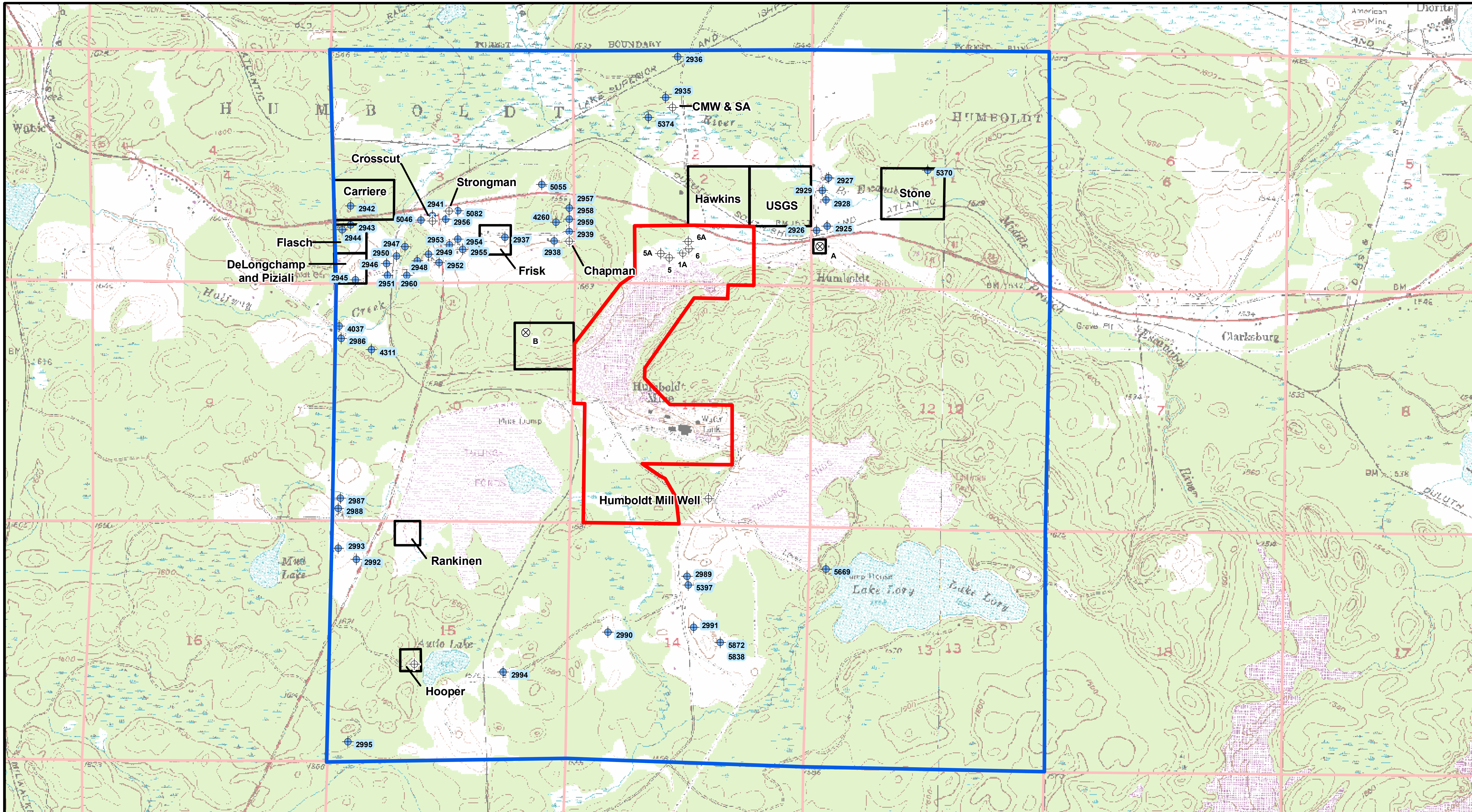
Table 1
Well Survey Results

Well ID	Section	Source	Installation Date	Aquifer
52000002928	1	MDEQWL	NL	QAL
52000002925	1	MDEQWL	6/12/89	QAL
52000002926	1	MDEQWL	NL	QAL
52000002927	1	MDEQWL	6/5/79	QAL
52000002929	1	MDEQWL	6/7/74	--
52000005370	1	MDEQWL	8/21/04	PCW
Olive E Stone	1	HISTORIC	6/7/74	QAL
USGS GW Branch	2	HISTORIC	10/63	QAL
Callahan Mining-6A	2	HISTORIC	7/10/90	QAL
Callahan Mining-5A	2	HISTORIC	7/10/90	QAL
Callahan Mining-5	2	HISTORIC	7/10/90	QAL
Callahan Mining-1A	2	HISTORIC	7/10/90	QAL
Callahan Mining-6	2	HISTORIC	7/10/90	QAL
52000005374	2	MDEQWL	9/29/04	QAL
52000002936	2	MDEQWL	NL	QAL
Central Marquette Water & Sewer	2	HISTORIC	11/14/73	PCW
Donald Hawkins	2	HISTORIC	1969	QAL
52000002935	2	MDEQWL	NL	PCW
52000002937	3	MDEQWL	2/27/87	PCW
52000002939	3	MDEQWL	12/12/81	PCW
52000002944	3	MDEQWL	1/4/78	QAL
52000002953	3	MDEQWL	10/4/90	PCW
52000002954	3	MDEQWL	10/27/76	PCW
52000002956	3	MDEQWL	7/6/83	PCW
52000002960	3	MDEQWL	8/26/88	PCW
52000004260	3	MDEQWL	8/7/01	PCW
52000005055	3	MDEQWL	11/11/55	NL
52000002959	3	MDEQWL	NL	PCW
52000002943	3	MDEQWL	10/28/74	QAL
52000002946	3	MDEQWL	12/4/74	QAL
52000002951	3	MDEQWL	11/11/87	PCW
52000002955	3	MDEQWL	3/8/67	PCW
52000002958	3	MDEQWL	8/28/81	PCW
52000002952	3	MDEQWL	4/14/67	QAL
52000002947	3	MDEQWL	6/14/88	PCW
52000002938	3	MDEQWL	2/6/87	PCW
52000002948	3	MDEQWL	2/10/87	PCW
52000002949	3	MDEQWL	11/84	PCW
52000002950	3	MDEQWL	3/23/77	PCW
52000002941	3	MDEQWL	9/19/90	QAL
52000005082	3	MDEQWL	12/5/73	PCW
Crosscuts Café & Inn	3	HISTORIC	9/19/90	QAL
52000002942	3	MDEQWL	3/7/74	QAL
52000002945	3	MDEQWL	11/91	QAL

Well ID	Section	Source	Installation Date	Aquifer
52000005046	3	MDEQWL	12/9/99	
Robert Flasch	3	HISTORIC	9/89	QAL
Steve Frisk	3	HISTORIC	4/28/77	PCW
Glen Chapman	3	HISTORIC	12/12/81	PCW
Donald Strongman	3	HISTORIC	NL	PCW
Guido Piziali	3	HISTORIC	4/4/77	PCW
Deneson J Carriere	3	HISTORIC	3/15/68	QAL
52000002957	3	MDEQWL	8/13/68	QAL
James DeLongchamp	3	HISTORIC	1/4/78	QAL
52000002987	10	MDEQWL	10/3/78	PCW
52000002988	10	MDEQWL	2/77	PCW
52000004037	10	MDEQWL	9/29/00	PCW
52000004311	10	MDEQWL	7/10/01	PCW
52000002986	10	MDEQWL	11/82	QAL
Humboldt Mill	11	No record*	?	PCW
52000005669	13	MDEQWL	8/11/05	PCW
52000002989	14	MDEQWL	9/17/91	PCW
52000005397	14	MDEQWL	10/20/04	PCW
52000005872	14	MDEQWL	10/6/06	QAL
52000005838	14	MDEQWL	6/19/06	QAL
52000002990	14	MDEQWL	NL	QAL
52000002991	14	MDEQWL	NL	PCW
52000002993	15	MDEQWL	3/2/79	QAL
52000002994	15	MDEQWL	8/1/88	PCW
Rankinen Michael	15	HISTORIC	9/93	PCW
52000002995	15	MDEQWL	6/20/90	PCW
52000002992	15	MDEQWL	3/23/73	PCW
Roger Hooper	15	HISTORIC	10/24/95	PCW

Notes:

All wells are located in Humboldt Township T 47N R 29W
NL – not listed
MDEQWL – Marquette Department of Environmental Quality Wellogic database
HISTORIC –MDEQ Scanned Well Log database
QAL – Quaternary alluvium
PCW – Consolidated formation (bedrock)
* Information on this well received from current mill owner



NOTES

1. USGS georeferenced Digital Raster Graphics (DRG) are from Michigan Center of Geographic Information (http://www.michigan.gov/cgi/)
2. Horizontal datum based on NAD 83/96. Horizontal coordinates based on Michigan State Plane North.
3. Humboldt Mill Project located within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.
4. Water Well Database Search from Michigan DEQ and MSU Water Well Viewer Website.

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LEGEND

- KEMC Project Location
- Approximate limits of waterwell database search
- Approximate Well Location by MDEQ and ID (All well IDs are prefixed by 5200000)
- Well Area or Location not located by MDEQ
- Occupied Residence, no well log available

N

Foth
Foth Infrastructure & Environment, LLC

Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	JSL	DATE: OCT. '07
APPROVED BY:	AKM	DATE: OCT. '07
APPROVED BY:		DATE:

Kennecott
Eagle Minerals

FIGURE 1

HUMBOLDT MILL PROJECT
WATER WELL DATABASE SEARCH AREA

Scale: 0 750 1,500 Feet	Date: OCTOBER 2007
Prepared by: BJW1	Project No: 06W003

Section 1

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000002925 **Import ID:** 52472901001

Tax No: 0620100800	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
NW¼ SW¼ SW¼	1	47N 29W		

Well ID: 52000002925

Elevation: 1550 ft

Latitude: 46.4962036422

Longitude: -87.8853260815

Distance and Direction from Road Intersection: 1/8 MILE OFF US41 ON WOLFE LK. RD.

Well Owner: David & Catherine Kososki

Well Address:	Owner Address:
654 CO RD FX CHAMPION MI 49814	654 CO RD FX CHAMPION MI 49814

Drilling Method: Rotary

Well Depth: 43.00 ft. **Well Use:** Household

Well Type: New **Date Completed:** 6/12/1989

Casing Type: Steel - black
Casing Joint: Welded
Diameter: 6.00 in. to 42.60 ft. depth

Bore Diameter 1:
Bore Diameter 2:
Bore Diameter 3:
Height: 1.50 ft. above grade
Casing Fitting: Drive shoe

Static Water Level: 5.00 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:
40.00 ft. after 0.50 hrs. pumping at 1.00 GPM

Abandoned Well Plugged: Yes
Reason for not plugging Well:

Abandoned well ID:

Screen Installed: Yes **Well Intake:**
Filter Packed: No
Screen Diameter: 6.00 in. **Length:** 4.00 ft.
Screen Material Type:
Slot: 8.00 in. Set Between 39.00 ft. and 43.00 ft.
Blank: 0.00 ft. Above
Fittings:
Neoprene packer

Well Grouted: No **Grouting Method:**
No. of Bags: **Additives:**
Grouting Materials:

Well Head Completion: Pitless adapter

Nearest source of possible contamination:

Type	Distance	Direction
Septic tank	60.00 ft.	Northwest

Drilling Machine Operator Name: KLIEMAN PUMP & WELL DRILLING
Employment: Unknown

Pump Installed: Yes **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: A.Y. McDonald **Pump Type:** Submersible
Model Number: **Pump Capacity:** 0.00 GPM
Length of Drop Pipe: 32.00 ft. **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Formation Description	Thickness	Depth to Bottom
Sand Coarse	20.00	20.00
Gravel	15.00	35.00
Sand Fine	8.00	43.00

Geology Remarks: 1. [COARSE SAND] [20] [20] 2. [GRAVEL] [35] [15] 3. [FINE CLEAN SAND] [43] [8]

Contractor Type: Unknown
Registration Number: 575
Business Name:
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks:

OTHER REMARKS

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:54

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Well ID: 52000002926 — Failure to comply is a misdemeanor. — Import ID: 52472901002

Tax No: 06201001800	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
NW¼ SW¼ SW¼	1	47N 29W		

Well ID: 52000002926

Elevation: 1550 ft

Latitude: 46.4960220234

Longitude: -87.88612158

Distance and Direction from Road Intersection:

Well Owner: Donald Hawkins

Well Address:	Owner Address:
RT 1 BOX 115 CHAMPION MI 49814	RT 1 BOX 115 CHAMPION MI 49814

Drilling Method: Cable Tool

Well Depth: 33.00 ft. — **Well Use:** Household

Well Type: Replacement — **Date Completed:**

Casing Type: Unknown
Casing Joint: Threaded & coupled
Diameter: 7.00 in. to 33.00 ft. depth

Bore Diameter 1:
Bore Diameter 2:
Bore Diameter 3:
Height: 1.00 ft. above grade
Casing Fitting: Drive shoe

Static Water Level: 6.00 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:
30.00 ft. after 12.00 hrs. pumping at 5.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Screen Installed: No — **Well Intake:** Unknown
Filter Packed:
Screen Diameter: — **Length:**
Screen Material Type:
Slot:
Blank:
Fittings:

Well Grouted: Yes — **Grouting Method:** Unknown
No. of Bags: — **Additives:** None
Grouting Materials:
Unknown — From 0.00 ft. to 0.00 ft.

Well Head Completion: 12 inches above grade, Other

Nearest source of possible contamination:

Type	Distance	Direction
Septic tank	50.00 ft.	East

Drilling Machine Operator Name: LENTZ WELL DRILLING

Employment: Unknown

Pump Installed: No — **Pump Installation only:** No
Pump Installation date: — **HP:**
Manufacturer: — **Pump Type:**
Model Number: — **Pump Capacity:**
Length of Drop Pipe: — **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : — **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Formation Description	Thickness	Depth to Bottom
Topsoil	2.00	2.00
Sand	29.00	31.00
Gravel	2.00	33.00

Geology Remarks: 1. [TOPSOIL] [2] [2] 2. [SAND] [31] [29] 3. [GRAVEL] [33] [2]

Contractor Type: Unknown
Registration Number: 800
Business Name:
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor — **Date**

General Remarks:

OTHER REMARKS **Well Head Completion:** 12 inch Above Grade

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:54

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000002927 **Import ID:** 52472901003

Tax No: 0620101710	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
NW¼ NW¼ SW¼	1	47N 29W		

Well ID: 52000002927

Elevation: 1550 ft

Latitude: 46.4991469798

Longitude: -87.8851236327

Distance and Direction from Road Intersection: PARCEL SUBLOT 1

Well Owner: Chester Simmons

Well Address:
CHAMPION MI 49814

Owner Address:
2072 CO RD FX
CHAMPION MI 49814

Drilling Method: Cable Tool
Well Depth: 40.00 ft. **Well Use:** Household
Well Type: Replacement **Date Completed:** 6/5/1979
Casing Type: Unknown
Casing Joint: Welded
Diameter: 4.00 in. to 36.00 ft. depth

Bore Diameter 1:
Bore Diameter 2:
Bore Diameter 3:
Height: 1.50 ft. above grade
Casing Fitting: Drive shoe

Pump Installed: Yes **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: Webtrol **Pump Type:** Submersible
Model Number: **Pump Capacity:** 0.00 GPM
Length of Drop Pipe: 0.00 ft. **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Static Water Level: 12.00 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:
12.00 ft. after 2.00 hrs. pumping at 15.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Formation Description	Thickness	Depth to Bottom
Topsoil	1.00	1.00
Gravel Coarse	9.00	10.00
Sand	30.00	40.00

Screen Installed: Yes **Well Intake:**
Filter Packed: No
Screen Diameter: 4.00 in. **Length:** 4.00 ft.
Screen Material Type:
Slot: 10.00 in. Set Between 36.00 ft. and 40.00 ft.
Blank: 0.00 ft. Above
Fittings:
Neoprene packer

Well Grouted: No **Grouting Method:**
No. of Bags: **Additives:**
Grouting Materials:

Well Head Completion: Pitless adapter

Geology Remarks: 1. [TOPSOIL] [1] [1] 2. [COARSE GRAVEL] [10] [9] 3. [SAND] [40] [30]

Nearest source of possible contamination:

Type	Distance	Direction
None		

Contractor Type: Unknown
Registration Number: 1675
Business Name:
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Drilling Machine Operator Name: MACDONALD WELL DRILLING

Employment: Unknown

Signature of Registered Contractor **Date**

General Remarks:

OTHER REMARKS

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:54

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Well ID: 52000002928 — Failure to comply is a misdemeanor. — Import ID: 52472901004

Tax No: 0620101750	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
SW¼ NW¼ SW¼	1	47N 29W		

Well ID: 52000002928

Elevation: 1550 ft

Latitude: 46.4978650793

Longitude: -87.8856548963

Distance and Direction from Road Intersection: LOG HOUSE

Well Owner: Ronald Norkoli

Well Address:	Owner Address:
1/4 RT WOLF LK RD HUMBOLDT MI 49814	RT 1 BOX 120 CHAMPION MI 49814

Drilling Method: Driven Hand

Well Depth: 25.00 ft. — **Well Use:** Household

Well Type: Replacement — **Date Completed:**

Casing Type: Steel - black
Casing Joint: Welded
Diameter: 4.00 in. to 12.00 ft. depth

Bore Diameter 1:
Bore Diameter 2:
Bore Diameter 3:
Height: 1.00 ft. above grade
Casing Fitting: Drive shoe

Pump Installed: Yes — **Pump Installation only:** No
Pump Installation date: — **HP:**
Manufacturer: A.Y. McDonald — **Pump Type:** Jet
Model Number: — **Pump Capacity:**
Length of Drop Pipe: 20.00 ft. — **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : — **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Static Water Level: 8.00 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Formation Description	Thickness	Depth to Bottom
No Lithology Information	25.00	25.00

Screen Installed: Yes — **Well Intake:**
Filter Packed: No
Screen Diameter: 1.25 in. — **Length:** 3.00 ft.
Screen Material Type:
Slot: 0.00 in. Set Between 22.00 ft. and 25.00 ft.
Blank: 0.00 ft. Above
Fittings:
None

Well Grouted: Yes — **Grouting Method:** Unknown
No. of Bags: — **Additives:** None
Grouting Materials:
Unknown — From 0.00 ft. to 0.00 ft.

Well Head Completion: Unknown

Geology Remarks: 1. [NO LITHOLOGY INFORMATION] [25] [25]

Nearest source of possible contamination:

Type	Distance	Direction
Septic tank	300.00 ft.	East

Contractor Type: Unknown
Registration Number:
Business Name:
Business Address:

Drilling Machine Operator Name:

Employment: Unknown

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor — **Date**

General Remarks:

OTHER REMARKS

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:54

GEOLOGICAL SURVEY SAMPLE No. [ ]

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

1 LOCATION OF WELL

County	Twp.	Fraction	Section No.	Town	Range
MARQUETTE	HUMBOLDT	NW¼ SW¼ ¼	1	T47N N/S.	29W E/W.

Distance And Direction from Road Intersections

OWNER No.

Street address & City of Well Location HUMBOLDT

3 OWNER OF WELL: OLIVE E. STONE

Address RTE #1, Box 120-A CHAMPION, MICH.

4 WELL DEPTH: (completed) 20 ft. Date of Completion ft. 6-7-74

5 ☐ Cable tool ☐ Rotary ☒ Driven ☐ Dug ☐ Hollow rod ☐ Jetted ☐ Bored ☐ ___

6 USE: ☒ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Air Conditioning ☐ Commercial ☐ Test Well ☐ ___

7 CASING: Threaded ☒ Welded ☐

4 in. Diam. to 9 ft. Depth

1¼ in. to 16 ft. Depth

Height: Above/Below surface 4 ft.

Weight ___ lbs/ft.

Drive Shoe? Yes ☒ No ☐

8 SCREEN:

Type: POINT Dia.: 1¼"

Slot/Gauze 80 Length 4'

Set between 15 ft. and 20 ft.

Fittings: COPPER ABOVE CASING

9 STATIC WATER LEVEL

12 ft. below land surface

10 PUMPING LEVEL below land surface

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

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

11 WATER QUALITY in Parts Per Million:

Iron (Fe) ___ Chlorides (Cl) ___

Hardness ___

12 WELL HEAD COMPLETION: ☐ In Approved Pit ☐ Pitless Adapter ☐ 12" Above Grade

13 GROUTING:

Well Grouted? ☐ Yes ☐ No

Depth: From ___ ft. to ___ ft.

14 SANITARY:

Nearest Source of possible contamination

75 feet E Direction DISPOSAL Type

Well disinfected upon completion ☐ Yes ☐ No

15 PUMP:

Manufacturer's Name McDONALD

Model Number 140801240B HP ½

Length of Drop Pipe ___ ft. capacity ___ G.P.M.

Type: ☐ Submersible ☐ SHALLOW WELL ☐ Jet ☐ Reciprocating

2 FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
DRIVEN POINT	20'	20'
BED ROCK AT 20'		

16 Remarks elevation, source of data, etc.

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

REGISTERED BUSINESS NAME ___ REGISTRATION NO. ___

Address ___

Signed ___ Date ___

AUTHORIZED REPRESENTATIVE

100M 6-66

JAN 27 1975 GEOLOGICAL SURVEY COPY

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000002929 **Import ID:** 52472901005

Tax No: 0620101700	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
NW¼ NW¼ SW¼	1	47N 29W		

Well ID: 52000002929

Elevation: 1535 ft

Latitude: 46.4984592196

Longitude: -87.8858547553

Distance and Direction from Road Intersection: FX 1360 WOLF LK RD

Well Owner: Tom Heikkila

Well Address:	Owner Address:
1360 WOLF LD RD HUMBOLDT MI 49814	1360 CO RD FX CHAMPION MI 49814

Drilling Method: Driven Hand
Well Depth: 20.00 ft. **Well Use:** Household
Well Type: Replacement **Date Completed:** 6/7/1974
Casing Type: Unknown
Casing Joint: Threaded & coupled
Diameter: 4.00 in. to 9.00 ft. depth

Bore Diameter 1:
Bore Diameter 2:
Bore Diameter 3:
Height: 4.00 ft. above grade
Casing Fitting: Drive shoe

Static Water Level: 12.00 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Screen Installed: Yes **Well Intake:**
Filter Packed: No
Screen Diameter: 1.25 in. **Length:** 4.00 ft.
Screen Material Type:
Slot: 7.00 in. Set Between 16.00 ft. and 20.00 ft.
Blank: 0.00 ft. Above
Fittings:
Other

Well Grouted: Yes **Grouting Method:** Unknown
No. of Bags: **Additives:** None
Grouting Materials:
Unknown From 0.00 ft. to 0.00 ft.

Well Head Completion: Unknown

Nearest source of possible contamination:

Type	Distance	Direction
Septic tank	75.00 ft.	East

Drilling Machine Operator Name:

Employment: Unknown

Pump Installed: Yes **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: A.Y. McDonald **Pump Type:** Other
Model Number: **Pump Capacity:**
Length of Drop Pipe: 0.00 ft. **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Formation Description	Thickness	Depth to Bottom
No Lithology Information	20.00	20.00

Geology Remarks: 1. [NO LITHOLOGY INFORMATION GIVEN] [20] [20]

Contractor Type: Unknown
Registration Number:
Business Name:
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks:
OTHER REMARKS **Screen Fittings:** Type Unknown **Pump Type:** Type Unknown

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:54

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000005370

Tax No: 00520620101730	Permit No: 20040909	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
NE¼ NE¼ SW¼	1	47N 29W		

Well ID: 52000005370

Elevation:

Latitude: 46.499846

Longitude: -87.876841

Distance and Direction from Road Intersection: 0.5 MILE NORTH OF HWY 0.5 MILE WEST OFF LAKE ROAD

Well Owner: Joel Lindholm

Well Address:

Owner Address:
300 WILLOW
ISHPEMING MI 49849

Drilling Method: Rotary
Well Depth: 85.00 ft. **Well Use:** Household
Well Type: New **Date Completed:** 8/21/2004
Casing Type: Steel - unknown
Casing Joint: Welded
Diameter: 6.00 in. to 34.00 ft. depth

Bore Diameter 1: 6.00 in. to 34.00 ft. depth
Bore Diameter 2:
Bore Diameter 3:
Height: 1.00 ft. above grade
Casing Fitting: Drive shoe

Static Water Level: 24.00 ft. Below Grade(Not Flowing)
Yield Test Method: Air
Measurement Taken During Pump Test:
50.00 ft. after 1.00 hrs. pumping at 8.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Screen Installed: No **Well Intake:** Bedrock Well
Filter Packed:
Screen Diameter: **Length:**
Screen Material Type:
Slot:
Blank:
Fittings:

Well Grouted: Yes **Grouting Method:** Unknown
No. of Bags: 2 **Additives:** None
Grouting Materials:
Bentonite slurry

Well Head Completion: 12 inches above grade

Nearest source of possible contamination:

Type	Distance	Direction
Septic tank	75.00 ft.	North

Drilling Machine Operator Name: LARRY LENTZ

Employment: Employee

Pump Installed: No **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: **Pump Type:**
Model Number: **Pump Capacity:**
Length of Drop Pipe: **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Formation Description	Thickness	Depth to Bottom
Sand	12.00	12.00
Sand & Clay	6.00	18.00
Sand & Gravel	16.00	34.00
Slate	51.00	85.00

Geology Remarks:

Contractor Type: Water well drilling contractor
Registration Number: 1635
Business Name: LARRYS WELL AND PUMP SERVICE
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks:
OTHER REMARKS

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

12/28/2004 09:23

Section 2

Cons.7401 8/63

Page of

Sample No. W-2083

MICHIGAN DEPARTMENT OF CONSERVATION
GEOLOGICAL SURVEY DIVISION

WATER WELL RECORD

Permit No.

Owner No.

County: Marquette | Twp.: Humboldt | ¼ NE ¼ SE ¼ Sec. 2 | Town: 47N N/S. | Range: 29W E/W.

Distance from Roads, Section Lines, etc.

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Sand, brown, fine to coarse and gravel, fine to coarse, silty with clay	2	2
Sand, light brown, fine to coarse and gravel, fine to coarse, silty with clay	15	17
Sand, tan, fine to coarse, transparent to opaque, rounded to subrounded, gravel fine to coarse, slightly silty	5	22
Sand, tan, fine to coarse, and gravel, as above, quantity of gravel reduced	5	27
Sand, tan and gravel, sample as above, with loss of gravel, coarse	25	52
Sand, tan, very fine to med. with coarse and with a little gravel, fine, silty	10	62
Sand, tan, sample as above with increased quantity of fines and silt	5	67
Sand, tan, very fine to fine with med. to coarse and with gravel, fine to med., very silty with clay	5	72
Sand, tan, sample as above, loss of gravel, med.	5	77
Sand, tan, sample as above with returning show of gravel, med.	5	82
Sand, tan, very fine to fine and silt with clay	5	87
Sand, brown, very fine to med., silty with clay and gravel, med. to coarse	1	88

Owner: USGS, Ground Water Branch

Address: 205 State Office Bldg., Escanaba

Driller and Address: USGS, Denver, Colo. (Wm.MacLeod)

Well Depth: drilled 88 ft. Date of Completion: Oct. 1963

☐ Cable tool ☐ Rotary ☐ Dug ☐ R.C.
☐ Driven ☐ Jetted ☒ Bored

Use: ☐ Domestic ☐ Public Supply ☐ Industry
☐ Irrigation ☐ Air Conditioning ☐ Dewatering
☐ Test Well ☐ observation

Casing: Diam. 1¼ in. to 19 ft. Depth
___ in. to ___ ft. Depth

Height: Above/Below surface 4.0 ft.
Type-Weight

Screen:
Type: drive point Dia: 1¼"
Slot/Gauze 60 slot Length 30"
Set between ___ ft. and ___ ft.
Accessories:

Water level:
9 ft. above/~~below~~ top of cap
___ ft. above/below ___
Meas. by T.N. Date Nov. 1963

Drawdown:
___ ft. after ___ hrs. pumping ___ g.p.m.
___ ft. after ___ hrs. pumping ___ g.p.m.
Meas. by Date

Flow: g.p.w./g.p.h. Temp: °F

Water Quality in Parts Per Million:
Iron (Fe) .14 Chlorides (Cl) 0
Hardness 22

Elevation: 1531.32 ft. above M.S.L.

Source of data: Samples & T.C.Newport

Record by: J.H.Kent Date: 2/14/6[illegible]

Remarks: Marquette Iron Range Study.

GEOLOGICAL SURVEY NO. [ ]

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

WATER WELL AND PUMP RECORD

PERMIT NUMBER [ ][ ][ ][ ][ ][ ][ ][ ]

1 LOCATION OF WELL

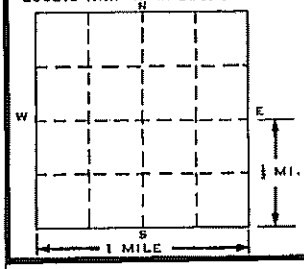
County	Township Name	Fraction	Section Number	Town Number	Range Number
MARQUETTE	HUMBOLDT	SE ¼ SE ¼ SW ¼	2	47 N/S	29 E/W

Distance And Direction From Road Intersection

At the north end of the Humboldt Pit

Street Address & City of Well Location

Locate with "X" in Section Below



Sketch Map:

Well # 6A

3 OWNER OF WELL:

Callahan Mining Company

Address Rt #1 Box 300

Champion, MI 49814

Address Same As Well Location? ☐ Yes ☒ No

4 WELL DEPTH: 26 FT. | Date Completed MO. 07 DAY 10 YEAR 90 | ☒ New Well ☐ Replacement Well

5 ☐ Cable tool ☒ Rotary ☐ Driven ☐ Dug ☐ Hollow rod ☐ Auger ☐ Jetted ☐ _____

6 USE: ☐ Domestic ☐ Type I Public ☐ Type III Public ☐ Irrigation ☐ Type IIa Public ☐ Heat pump ☐ Test Well ☐ Type IIb Public ☒ Monitor

7 CASING: Diameter ☒ Steel ☐ Threaded ☐ Plastic ☒ Welded

6 in. to 22 ft. depth

_____ in. to _____ ft. depth

Grouted Drill Hole Diameter

_____ in. to _____ ft. depth

_____ in. to _____ ft. depth

Height: Above/Below Surface 1.5 ft.

Weight 18.97 lbs./ft.

Drive Shoe ☒ Yes ☐ No

2 FORMATION DESCRIPTION

FORMATION DESCRIPTION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Black Muck	10'	10'
Sand - Clayey	5'	15'
Sand	11'	26'

USE A 2ND SHEET IF NEEDED

8 SCREEN: ☐ Not Installed

Type Johnson Stainless Diameter 6"

Slot/Gauze .012 Length 4'

Set between 22 ft. and 26 ft.

FITTINGS: ☒ K-Packer ☐ Lead Packer ☐ Bremer Check

☐ Blank above screen _____ ft. Other _____

9 STATIC WATER LEVEL:

_____ ft. below land surface ☐ Flow

10 PUMPING LEVEL: below land surface

26 ft. after 1 hrs. pumping at 15 G.P.M.

_____ ft. after _____ hrs. pumping at _____ G.P.M

11 WELL HEAD COMPLETION: ☐ Pitless adapter ☒ 12" above grade ☐ Basement offset ☐ Approved pit

12 WELL GROUTED? ☒ No ☐ Yes From _____ to _____ ft.

☐ Neat cement ☐ Bentonite ☐ Other _____

No. of bags of cement _____ Additives _____

13 Nearest source of possible contamination

Type _____ Distance _____ ft. Direction _____

Well disinfected upon completion? ☐ Yes ☐ No

Was old well plugged? ☐ Yes ☐ No

14 PUMP: ☒ Not Installed ☐ Pump Installation Only

Manufacturer's name _____

Model number _____ HP _____ Volts _____

Length of Drop Pipe _____ ft. capacity _____ G.P.M.

TYPE: ☐ Submersible ☐ Jet _____

PRESSURE TANK:

Manufacturer's name _____

Model number _____ Capacity _____ Gallons

RECEIVED
Mich. Dept. of Public Health
NOV 8 1990
BUREAU OF ENVIRONMENTAL AND OCCUPATIONAL HEALTH-SWQS

15. Remarks, elevation, source of data, etc.

Paul Ziemnick

16. WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Siirtola Well Drilling 1677

REGISTERED BUSINESS NAME REGISTRATION NO.

Address Rte 1, Box 386C, Hancock, Mi. 49930

Signed _____ Date July 20, 1990

AUTHORIZED REPRESENTATIVE

17. Rig Operator's Name:

D67d 2/89

Authority: Act 368 PA 1978
Completion: Required
Penalty: Conviction of a violation of any provision is a misdemeanor.

GEOLOGICAL SURVEY COPY

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

WATER WELL AND PUMP RECORD

, GEOLOGICAL SURVEY NO. [ ]

PERMIT NUMBER [ ][ ][ ][ ][ ][ ][ ][ ]

1 LOCATION OF WELL

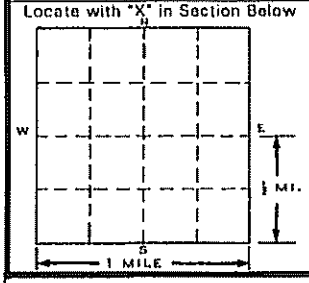
County	Township Name	Fraction	Section Number	Town Number	Range Number
MARQUETTE	HUMBOLDT	SE ¼ SE ¼ SW ¼	8	47 N/S	29 E/W

Distance And Direction From Road Intersection

At the north end of the Humboldt Pit

Street Address & City of Well Location

Locate with "X" in Section Below — Sketch Map:



Well # 5A

3 OWNER OF WELL:

Callahan Mining Company

Address Rt#1 Box 300

Champion, MI 49814

Address Same As Well Location? ☐ Yes ☒ No

4 WELL DEPTH: 29 FT. — Date Completed MO. 07 DAY 10 YEAR 90 — ☒ New Well ☐ Replacement Well

5 ☐ Cable tool ☒ Rotary ☐ Driven ☐ Dug ☐ Hollow rod ☐ Auger ☐ Jetted ☐ _____

6 USE: ☐ Domestic ☐ Type I Public ☐ Type III Public ☐ Irrigation ☐ Type IIa Public ☐ Heat pump ☐ Test Well ☐ Type IIb Public ☒ Monitor

7 CASING: Diameter ☒ Steel ☐ Threaded ☐ Plastic ☒ Welded

6 in. to 25 ft. depth

_____ In. to _____ ft. depth

Grouted Drill Hole Diameter

_____ in. to _____ ft. depth

_____ in. to _____ ft. depth

Height: Above/Below Surface 1.5 ft.

Weight 18.97 lbs./ft.

Drive Shoe ☒ Yes ☐ No

2 FORMATION DESCRIPTION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Sand, Dark Brown	16'	16'
Sand, Clean	13'	29'

USE A 2ND SHEET IF NEEDED

8 SCREEN: ☐ Not Installed

Type Johnson Stainless Diameter 6"

Slot/Gauze .012 Length 4'

Set between 25 ft. and 29 ft.

FITTINGS: ☒ K-Packer ☐ Lead Packer ☐ Bremer Check

☐ Blank above screen _____ ft. Other _____

9 STATIC WATER LEVEL:

4.5 ft. below land surface ☐ Flow

10 PUMPING LEVEL: below land surface

29 ft. after 1 hrs. pumping at 50 G.P.M.

_____ ft. after _____ hrs. pumping at _____ G.P.M.

11 WELL HEAD COMPLETION: ☐ Pitless adapter ☒ 12" above grade ☐ Basement offset ☐ Approved pit

12 WELL GROUTED? ☒ No ☐ Yes From _____ to _____ ft.

☐ Neat cement ☐ Bentonite ☐ Other _____

No. of bags of cement _____ Additives _____

13 Nearest source of possible contamination

Type _____ Distance _____ ft. Direction _____

Well disinfected upon completion? ☐ Yes ☐ No

Was old well plugged? ☐ Yes ☐ No

14 PUMP: ☒ Not Installed ☐ Pump Installation Only

Manufacturer's name _____

Model number _____ HP _____ Volts _____

Length of Drop Pipe _____ ft. capacity _____ G.P.M.

TYPE: ☐ Submersible ☐ Jet _____

PRESSURE TANK:

Manufacturer's name _____

Model number _____ Capacity _____ Gallons

RECEIVED
Mich. Dept. of Public Health
NOV 6 1990
BUREAU OF ENVIRONMENTAL AND OCCUPATIONAL HEALTH-SWQS

15. Remarks, elevation, source of data, etc.

16. WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Siirtola Well Drilling 1677

REGISTERED BUSINESS NAME REGISTRATION NO.

Address Rte 1, Box 386C, Hancock, Mi. 49930

Signed _____ Date July 20, 1990

AUTHORIZED REPRESENTATIVE

17. Rig Operator's Name:

Paul Ziemnick

D67d 2/89

Authority: Act 368 PA 1978
Completion: Required
Penalty: Conviction of a violation of any provision is a misdemeanor.

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY NO. [ ]

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

WATER WELL AND PUMP RECORD

PERMIT NUMBER [ ][ ][ ][ ][ ][ ][ ][ ][ ]

1 LOCATION OF WELL

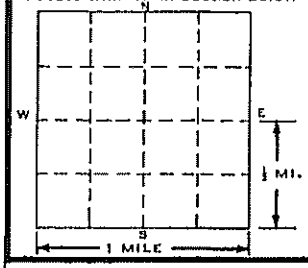
County	Township Name	Fraction	Section Number	Town Number	Range Number
MARQUESTE	HUMBOLDT	se ¼ SE ¼ SE ¼	2	47 N/S	29 E/W

Distance And Direction From Road Intersection

North end of the Humboldt Pit

Street Address & City of Well Location

Locate with "X" in Section Below



Sketch Map:

Well # 5

3 OWNER OF WELL:

Callahan Mining Company

Address Rt #1 Box 300

Champion, MI 49814

Address Same As Well Location? ☐ Yes ☒ No

4 WELL DEPTH: 69 FT. Date Completed MO. 07 DAY 10 YEAR 90 ☒ New Well ☐ Replacement Well

5 ☐ Cable tool ☒ Rotary ☐ Driven ☐ Dug ☐ Hollow rod ☐ Auger ☐ Jetted ☐ _____

6 USE: ☐ Domestic ☐ Type I Public ☐ Type III Public ☐ Irrigation ☐ Type IIa Public ☐ Heat pump ☐ Test Well ☐ Type IIb Public ☒ Monitor

7 CASING: Diameter ☒ Steel ☐ Threaded ☐ Plastic ☒ Welded

6 in. to 65 ft. depth

_____ in. to _____ ft. depth

Grouted Drill Hole Diameter

_____ in. to _____ ft. depth

_____ in. to _____ ft. depth

Height: Above/Below Surface 1.5 ft.

Weight 18.97 lbs./ft.

Drive Shoe ☒ Yes ☐ No

2 FORMATION DESCRIPTION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Large Rocks	4'	4'
Sand, Clayey	10'	14'
Sand, Clean	16',	30'
Sand, Clayey	12'	42'
Sand & Gravel, Clayey	6'	48'
Sand, Clayey	5'	53'
Sand & Gravel Clayey	16'	69'

8 SCREEN: ☐ Not Installed

Type Johnson Stainless Diameter 6"

Slot/Gauze .015 Length 4'

Set between 65 ft. and 69 ft.

FITTINGS: ☒ K-Packer ☐ Lead Packer ☐ Bremer Check

☐ Blank above screen _____ ft. Other _____

9 STATIC WATER LEVEL:

4.5 ft. below land surface ☐ Flow

10 PUMPING LEVEL: below land surface

69 ft. after 1 hrs. pumping at 5 G.P.M.

_____ ft. after _____ hrs. pumping at _____ G.P.M.

11 WELL HEAD COMPLETION: ☐ Pitless adapter ☒ 12" above grade ☐ Basement offset ☐ Approved pit

12 WELL GROUTED? ☒ No ☐ Yes From _____ to _____ ft.

☐ Neat cement ☐ Bentonite ☐ Other _____

No. of bags of cement _____ Additives _____

13 Nearest source of possible contamination

Type _____ Distance _____ ft. Direction _____

Well disinfected upon completion? ☐ Yes ☐ No

Was old well plugged? ☐ Yes ☐ No

14 PUMP: ☒ Not Installed ☐ Pump Installation Only

Manufacturer's name _____

Model number _____ HP _____ Volts _____

Length of Drop Pipe _____ ft. capacity _____ G.P.M.

TYPE: ☐ Submersible ☐ Jet _____

PRESSURE TANK:

Manufacturer's name _____

Model number _____ Capacity _____ Gallons

USE A 2ND SHEET IF NEEDED

RECEIVED
Mich. Dept. of Public Health
NOV 6 1990
BUREAU OF ENVIRONMENTAL AND OCCUPATIONAL HEALTH-GWQS

15. Remarks, elevation, source of data, etc.

17. Rig Operator's Name: Paul Kiemnick

WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Siirtola Well Drilling 1677

REGISTERED BUSINESS NAME REGISTRATION NO.

Address Rte 1, Bx 386C, Hancock, Mi. 49930

Signed _____ Date July 20, 1990

AUTHORIZED REPRESENTATIVE

D67d 2/89

Authority: Act 368 PA 1978
Completion: Required
Penalty: Conviction of a violation of any provision is a misdemeanor.

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY NO.

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

WATER WELL AND PUMP RECORD

PERMIT NUMBER

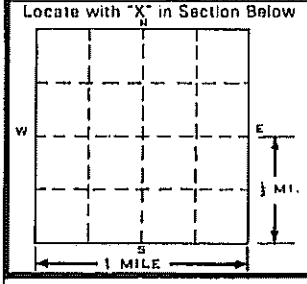
1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
MARQUETTE	HUMBOLDT	SE¼ SE ¼ SW ¼	2	47 N/S	29 E/W

Distance And Direction From Road Intersection: At the north end of the Humboldt Pit

Street Address & City of Well Location:

Locate with "X" in Section Below



Sketch Map: Well # 1A

3 OWNER OF WELL:

Address: Callahan Mining Company, Rt #1 Box 300, Champion, MI 49814

Address Same As Well Location? ☐ Yes ☒ No

4 WELL DEPTH: 29.5 FT. Date Completed MO. 07 DAY 10 YEAR 90 ☒ New Well ☐ Replacement Well

5 ☐ Cable tool ☒ Rotary ☐ Driven ☐ Dug ☐ Hollow rod ☐ Auger ☐ Jetted ☐ _____

6 USE: ☐ Domestic ☐ Type I Public ☐ Type III Public ☐ Irrigation ☐ Type IIa Public ☐ Heat pump ☐ Test Well ☐ Type IIb Public ☒ Monitor

7 CASING: Diameter ☒ Steel ☐ Threaded ☐ Plastic ☒ Welded

6 in. to 25.5 ft. depth

_____ in. to _____ ft. depth

Grouted Drill Hole Diameter

_____ in. to _____ ft. depth

_____ in. to _____ ft. depth

Height: Above/Below Surface 1.5 ft.

Weight 18.97 lbs./ft.

Drive Shoe ☒ Yes ☐ No

2 FORMATION DESCRIPTION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Gravel & Large Rocks, Clayey	10'	10'
Sand, Black	2'	12'
Sand, Clean	18'	30'

8 SCREEN: Johnson ☐ Not Installed

Type Stainless Diameter 6"

Slot/Gauze .012 Length 4'

Set between 25.5' ft. and 29.5 ft.

FITTINGS: ☒ K-Packer ☐ Lead Packer ☐ Bremer Check ☐ Blank above screen _____ ft. Other _____

9 STATIC WATER LEVEL: 5 ft. below land surface ☐ Flow

10 PUMPING LEVEL: below land surface

29 ft. after 1 hrs. pumping at 60 G.P.M.

_____ ft. after _____ hrs. pumping at _____ G.P.M.

11 WELL HEAD COMPLETION: ☐ Pitless adapter ☒ 12" above grade ☐ Basement offset ☐ Approved pit

12 WELL GROUTED? ☒ No ☐ Yes From _____ to _____ ft.

☐ Neat cement ☐ Bentonite ☐ Other _____

No. of bags of cement _____ Additives _____

13 Nearest source of possible contamination

Type _____ Distance _____ ft. Direction _____

Well disinfected upon completion? ☐ Yes ☐ No

Was old well plugged? ☐ Yes ☐ No

14 PUMP: ☒ Not Installed ☐ Pump Installation Only

Manufacturer's name _____

Model number _____ HP _____ Volts _____

Length of Drop Pipe _____ ft. capacity _____ G.P.M.

TYPE: ☐ Submersible ☐ Jet _____

PRESSURE TANK:

Manufacturer's name _____

Model number _____ Capacity _____ Gallons

USE A 2ND SHEET IF NEEDED

RECEIVED
Mich. Dept. of Public Health
NOV 8 1990
BUREAU OF ENVIRONMENTAL AND OCCUPATIONAL HEALTH-GWQS

15. Remarks, elevation, source of data, etc.

Paul Ziemnick

16. WATER WELL CONTRACTOR'S CERTIFICATION: This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Siirtola Well Drilling 1677
REGISTERED BUSINESS NAME REGISTRATION NO.

Address: Rte 1, Bx 386C, Hancock, Mi. 49930

Signed _____ Date July 20, 1990
AUTHORIZED REPRESENTATIVE

17. Rig Operator's Name: ↵

D67d 2/89

Authority: Act 368 PA 1978
Completion: Required
Penalty: Conviction of a violation of any provision is a misdemeanor.

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY NO.

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

WATER WELL AND PUMP RECORD

PERMIT NUMBER

1 LOCATION OF WELL

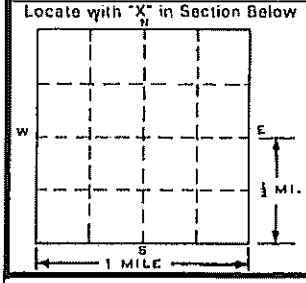
County	Township Name	Fraction	Section Number	Town Number	Range Number
MARQUETTE	HUMBOLDT	SE ¼ SE ¼ SW ¼	2	47 N/S	29 E/W

Distance And Direction From Road Intersection

At the north end of the Humboldt Pit

Street Address & City of Well Location

Locate with "X" in Section Below



Sketch Map:

Well # 6

3 OWNER OF WELL:

Callahan Mining Company

Address: Rt #1 Box 300, Champion, MI 49814

Address Same As Well Location? ☐ Yes ☒ No

4 WELL DEPTH: 69 FT. | Date Completed MO. 07 DAY 10 YEAR 90 | ☒ New Well ☐ Replacement Well

5 ☐ Cable tool ☒ Rotary ☐ Driven ☐ Dug ☐ Hollow rod ☐ Auger ☐ Jetted ☐ _____

6 USE: ☐ Domestic ☐ Type I Public ☐ Type III Public ☐ Irrigation ☐ Type IIa Public ☐ Heat pump ☐ Test Well ☐ Type IIb Public ☒ Monitor

7 CASING: Diameter ☒ Steel ☐ Threaded ☐ Plastic ☒ Welded

_____ in. to _____ ft. depth

_____ in. to _____ ft. depth

Grouted Drill Hole Diameter

_____ in. to _____ ft. depth

_____ in. to _____ ft. depth

Height: Above/Below Surface 1.5 ft.

Weight 18.97 lbs./ft.

Drive Shoe ☒ Yes ☐ No

8 SCREEN: ☐ Not Installed

Type Johnson Stainless Diameter 6"

Slot/Gauze .015 Length 4'

Set between 65 ft. and 69 ft

FITTINGS: ☒ K-Packer ☐ Lead Packer ☐ Bremer Check

☐ Blank above screen _____ ft. Other _____

9 STATIC WATER LEVEL:

2 ft. below land surface ☐ Flow

10 PUMPING LEVEL: below land surface

69 ft. after 1 hrs. pumping at 30 G.P.M.

_____ ft. after _____ hrs. pumping at _____ G.P.M.

11 WELL HEAD COMPLETION: ☐ Pitless adapter ☒ 12" above grade ☐ Basement offset ☐ Approved pit

12 WELL GROUTED? ☒ No ☐ Yes From _____ to _____ ft.

☐ Neat cement ☐ Bentonite ☐ Other _____

No. of bags of cement _____ Additives _____

13 Nearest source of possible contamination

Type _____ Distance _____ ft. Direction _____

Well disinfected upon completion? ☐ Yes ☐ No

Was old well plugged? ☐ Yes ☐ No

14 PUMP: ☒ Not Installed ☐ Pump Installation Only

Manufacturer's name _____

Model number _____ HP _____ Volts _____

Length of Drop Pipe _____ ft. capacity _____ G.P.M.

TYPE: ☐ Submersible ☐ Jet _____

PRESSURE TANK:

Manufacturer's name _____

Model number _____ Capacity _____ Gallons

2 FORMATION DESCRIPTION

FORMATION DESCRIPTION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Black Muck	7'	7'
Sand - Clayey	11'	18'
Sand - Clean	20'	38'
Sand - Clayey	8'	46'
Gravel	23'	69'
Bedrock		

USE A 2ND SHEET IF NEEDED

RECEIVED
Mich. Dept. of Public Health
NOV 8 1990
BUREAU OF ENVIRONMENTAL AND OCCUPATIONAL HEALTH-EWDS

15. Remarks, elevation, source of data, etc.

17. Rig Operator's Name: Paul Ziemnick

WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Siittola Well Drilling 1677
REGISTERED BUSINESS NAME REGISTRATION NO.

Address Rte 1, Box 386C, Hancock, Mi. 49930

Signed _____ Date July 20, 1990
AUTHORIZED REPRESENTATIVE

D67d 2/89

Authority: Act 368 PA 1978
Completion: Required
Penalty: Conviction of a violation of any provision is a misdemeanor.

GEOLOGICAL SURVEY COPY

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Well ID: 52000005374

Tax No: 520620200500	Permit No: 20041085	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
U¼ SW¼ NW¼	2	47N 29W		

Well ID: 52000005374

Elevation:

Latitude: 46.502563

Longitude: -87.900825

Distance and Direction from Road Intersection: 9802 US41 WEST CHAMPION

Well Owner: Ronald Meyer

Well Address:

Owner Address:
37038 CR 496
CHAMPION MI 49849

Drilling Method: Rotary
Well Depth: 350.00 ft. | **Well Use:** Household
Well Type: New | **Date Completed:** 9/29/2004
Casing Type: Steel - unknown
Casing Joint: Welded
Diameter: 6.00 in. to 25.00 ft. depth

Bore Diameter 1: 8.00 in. to 24.00 ft. depth
Bore Diameter 2: 5.50 in. to 350.00 ft. depth
Bore Diameter 3:
Height: 1.00 ft. above grade
Casing Fitting: Unknown

Static Water Level: 31.00 ft. Below Grade(Not Flowing)
Yield Test Method: Air
Measurement Taken During Pump Test:
300.00 ft. after 1.00 hrs. pumping at 5.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Screen Installed: No | **Well Intake:** Bedrock Well
Filter Packed:
Screen Diameter: | **Length:**
Screen Material Type:
Slot:
Blank:
Fittings:

Well Grouted: Yes | **Grouting Method:** Unknown
No. of Bags: 3 | **Additives:** None
Grouting Materials:
Neat cement From 4.00 ft. to 25.00 ft.

Well Head Completion: Pitless adapter

Nearest source of possible contamination:

Type	Distance	Direction
Septic tank	50.00 ft.	East

Drilling Machine Operator Name: JIM HAKOLA

Employment: Employee

Pump Installed: Yes | **Pump Installation only:** No
Pump Installation date: | **HP:** 0.75
Manufacturer: Other | **Pump Type:** Submersible
Model Number: 554P20 | **Pump Capacity:** 5.00 GPM
Length of Drop Pipe: 300.00 ft. | **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: Yes
Pressure Tank Type: Unknown
Manufacturer: Amtrol
Model Number : WF260 **Tank Capacity :** 225 Gallons
Pressure Relief Valve Installed : No

Formation Description	Thickness	Depth to Bottom
Sand	4.00	4.00
Unidentified Consolidated Fm	346.00	350.00

Geology Remarks:

Contractor Type: Water well drilling contractor
Registration Number: 206
Business Name: HAKOLA WELL AND PUMP SERVICE
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks:
OTHER REMARKS Pump Manufacturer: NATIONAL

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

12/28/2004 09:35

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Well ID: 52000002936 Failure to comply is a misdemeanor. Import ID: 52472902007

Tax No:	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
NE¼ NE¼ NW¼	2	47N 29W		

Well ID: 52000002936

Elevation: 1550 ft

Latitude: 46.5066082372

Longitude: -87.8987597715

Distance and Direction from Road Intersection:

Well Owner: Cent Mgt Water And Sewer Auth

Well Address: HUMBOLDT MI 49814

Owner Address: 100 E DIVISION ISHPEMING MI 49849

Drilling Method: Cable Tool

Well Depth: 150.00 ft. | Well Use: Test well

Well Type: Replacement | Date Completed:

Casing Type: Unknown
Casing Joint: Threaded & coupled
Diameter: 5.00 in. to 150.00 ft. depth

Bore Diameter 1:
Bore Diameter 2:
Bore Diameter 3:
Height: 2.00 ft. above grade
Casing Fitting: Drive shoe

Static Water Level: 7.00 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Screen Installed: No Well Intake: Unknown
Filter Packed:
Screen Diameter: Length:
Screen Material Type:
Slot:
Blank:
Fittings:

Well Grouted: No Grouting Method:
No. of Bags: Additives:
Grouting Materials:

Well Head Completion: 12 inches above grade, Other

Nearest source of possible contamination:
Type Distance Direction
None

Drilling Machine Operator Name: HAKALA WELL AND PUMP

Employment: Unknown

Pump Installed: No Pump Installation only: No
Pump Installation date: HP:
Manufacturer: Pump Type:
Model Number: Pump Capacity:
Length of Drop Pipe: Id of Well:
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : Tank Capacity : Gallons
Pressure Relief Valve Installed : No

Formation Description	Thickness	Depth to Bottom
Sand Fine	10.00	10.00
Sand Fine To Coarse	5.00	15.00
Gray Clay & Sand Fine	5.00	20.00
Sand & Gravel	10.00	30.00
Sand Coarse	5.00	35.00
Brown Sand & Gravel	10.00	45.00
Sand Fine	20.00	65.00
Gray Clay & Sand Fine	60.00	125.00
Gray Clay Sandy	15.00	140.00
Gray Clay	8.00	148.00
Gravel Coarse	2.00	150.00

Geology Remarks: 1. [FINE SAND] [10] [10] 2. [FINE TO COARSE SAND] [15] [5] 3. [GRAY CLAY AND FINE SAND] [20] [5] 4. [MIXED SAND AND GRAVEL] [30] [10] 5. [COARSE SAND] [35] [5] 6. [DK BR SAND AND GRAVEL*] [45] [10] 7. [FINE DK SAND] [65] [20] 8. [GRAY CLAY AND FINE SAND] [125] [60] 9. [GRAY SANDY CLAY] [140] [15] 10. [GRAY CLAY] [148] [8] 11. [COARSE DIRTY GRAVEL] [150] [2]

Contractor Type: Unknown
Registration Number: 206
Business Name:
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor Date

General Remarks: *SWAMPY SMELL TO WATER

OTHER REMARKS Well Head Completion: 12 inch Above Grade

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:54

GEOLOGICAL SURVEY SAMPLE No.

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

CE¼ NW¼

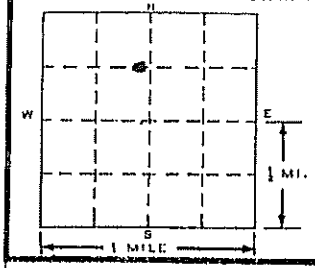
1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
Marquette	Humboldt	¼ ~~NE¼~~ ¼	2	47 N/S.	29 E/W.

Distance And Direction from Road Intersections

Street address & City of Wall Location

Locate with "X" in section below



Sketch Map:

3 OWNER OF WELL: Central Marquette Water & Sewer Authority

Address 100 E. Division St. Ishpeming Mi. 49849

4 WELL DEPTH: (completed) 95 ft. Date of Completion 11-14-73

5 ☒ Cable tool ☐ Rotary ☐ Driven ☐ Dug ☐ Hollow rod ☐ Jetted ☐ Bored ☐ ____

6 USE: ☐ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Air Conditioning ☐ Commercial ☐ Test Well ☒ EXPLORATORY

7 CASING: Threaded ☐ Welded ☒ Diam. 4 in. to 85 ft. Depth; ____ in. to ____ ft. Depth. Height: Above/Below Surface ____ ft. Weight ____ lbs./ft. Drive Shoe? Yes ☐ No ☐

2 FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Top Soil	1	1
Gravel & sand	29	30
Coarse sand	8	38
Clay & sand	12	50
Gravel	39	89
Slate soft fractured	5	94
Slate black	1	95

USE A 2ND SHEET IF NEEDED

8 SCREEN: Type: Johnson Dia.: 3½ Slot/Gauze 12 Length 10 ft. Set between ____ ft. and ____ ft. Fittings:

9 STATIC WATER LEVEL 9 ft. below land surface

10 PUMPING LEVEL below land surface 30 ft. after 2 hrs. pumping 9 g.p.m. ____ ft. after ____ hrs. pumping ____ g.p.m.

11 WATER QUALITY in Parts Per Million: Iron (Fe) TEST Chlorides (Cl) ____ Hardness ____ Other ____

12 WELL HEAD COMPLETION: ☐ In Approved Pit ☐ Pitless Adapter ☒ 12" Above Grade

13 Well Grouted? ☐ Yes ☒ No ☐ Neat Cement ☐ Bentonite ☐ ____ Depth: From ____ ft. to ____ ft.

14 Nearest Source of possible contamination NOT APPLICABLE Type

Well disinfected upon completion ☐ Yes ☐ No

15 PUMP: ☒ Not Installed Manufacturer's Name ____ Model Number ____ HP ____ Volts ____ Length of Drop Pipe ____ ft. capacity ____ G.P.M. Type: ☐ Submersible ☐ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

ABC Well Drilling — REGISTERED BUSINESS NAME — 0953 — REGISTRATION NO.

Address P.O.Box 229 Manistique Mi.

Signed William F. Cole — AUTHORIZED REPRESENTATIVE — Date 12-1-78

D67d 100M (Rev. 12-68)

APR 1 0 1979

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No. [ ]

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

1 LOCATION OF WELL

County	Twp.	Fraction	Section No.	Town	Range
Marquette	Humbolt	¼ NW ¼ SE ¼	2	47 N/S	29 E/W

Distance And Direction from Road Intersections

OWNER No. _____

Street address & City of Well Location: Same as owner

3 OWNER OF WELL: Donald Hawkins

Address: Humbolt

4 WELL DEPTH: (completed) 33 ft. Date of Completion

5 [X] Cable tool [ ] Rotary [ ] Driven [ ] Dug [ ] Hollow rod [ ] Jetted [ ] Bored [ ] ____

6 USE: [X] Domestic [ ] Public Supply [ ] Industry [ ] Irrigation [ ] Air Conditioning [ ] Commercial [ ] Test Well [ ] ____

7 CASING: Diam. 7 in. to 33 ft. Depth; Threaded [X] Welded [ ]; ____ in. to ____ ft. Depth

Height: Above/Below surface 1 ft. Weight ____ lbs/ft. Drive Shoe? Yes [X] No [ ]

8 SCREEN: Type: None Dia.: ____

Slot/Gauze ____ Length ____

Set between ____ ft. and ____ ft.

Fittings:

9 STATIC WATER LEVEL 6 ft. below land surface

10 PUMPING LEVEL below land surface 30 ft. after 12 hrs. pumping 5 g.p.m.

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

11 WATER QUALITY in Parts Per Million:

Iron (Fe) ____ Chlorides (Cl) ____

Hardness ____

12 WELL HEAD COMPLETION: [ ] In Approved Pit [ ] Pitless Adapter [X] 12" Above Grade

13 GROUTING:

Well Grouted? [ ] Yes [ ] No

Material: [ ] Neat Cement [ ] ____

Depth: From ____ ft. to ____ ft.

14 SANITARY:

Nearest Source of possible contamination

50 feet E Direction Septic Type

Well disinfected upon completion [X] Yes [ ] No

15 PUMP:

Manufacturer's Name ____

Model Number ____ HP ____

Length of Drop Pipe ____ ft. capacity ____ G.P.M.

Type: [ ] Submersible [ ] ____ [ ] Jet [ ] Reciprocating

2

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Topsoil	2	2
Sand	2	31
Gravel	31	33

16 Remarks, elevation, source of data, etc.

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Lentz Well Drilling — REGISTERED BUSINESS NAME

0800 — REGISTRATION NO.

Address B15A Michigamme Mich

Signed Larry Lentz — AUTHORIZED REPRESENTATIVE

Date ____

0670 100M 6-66

MAY 19 1969 GEOLOGICAL SURVEY COPY

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000002935 **Import ID:** 52472902006

Tax No:	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
SE¼ NE¼ NW¼	2	47N 29W		

Well ID: 52000002935

Elevation: 1540 ft

Latitude: 46.5038842806

Longitude: -87.8990295724

Distance and Direction from Road Intersection:

Well Owner: Cent Mqt Water And Sewer Auth

Well Address:

MI

Owner Address:
100 E DIVISION
ISHPEMING MI 49849

Drilling Method: Cable Tool
Well Depth: 126.00 ft. **Well Use:** Test well
Well Type: Replacement **Date Completed:** 9/19/1979
Casing Type: Unknown
Casing Joint: Unknown
Diameter: 5.00 in. to 0.00 ft. depth

Bore Diameter 1:
Bore Diameter 2:
Bore Diameter 3:
Height: 0.00 ft. above grade
Casing Fitting: None

Pump Installed: No **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: **Pump Type:**
Model Number: **Pump Capacity:**
Length of Drop Pipe: **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Static Water Level: 999.99 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Screen Installed: No **Well Intake:** Unknown
Filter Packed:
Screen Diameter: **Length:**
Screen Material Type:
Slot:
Blank:
Fittings:

Well Grouted: Yes **Grouting Method:** Unknown
No. of Bags: **Additives:** None
Grouting Materials:
Unknown From 0.00 ft. to 0.00 ft.

Well Head Completion: Unknown

Nearest source of possible contamination:
Type **Distance** **Direction**
None

Drilling Machine Operator Name: HAKALA WELL AND PUMP

Employment: Unknown

Formation Description	Thickness	Depth to Bottom
Sand	2.00	2.00
Sand & Gravel Coarse	8.00	10.00
Sand Coarse	10.00	20.00
Sand Fine To Medium	10.00	30.00
Brown Sand Fine	10.00	40.00
Sand & Gravel	7.00	47.00
Sand Medium To Coarse	5.00	52.00
Sand Fine Wet/Moist	6.00	58.00
Gray Sand & Clay Fine	7.00	65.00
Sand Fine To Coarse	5.00	70.00
Hardpan	20.00	90.00
Gravel	2.00	92.00
Hardpan W/Clay W/Gravel	18.00	110.00
Slate W/Shale Weathered	16.00	126.00

(Continued on Page 2)

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:54

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Well ID: 52000002935 — Failure to comply is a misdemeanor. — Import ID: 52472902006

Tax No:	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
SE¼ NE¼ NW¼	2	47N 29W		

Well ID: 52000002935

Elevation: 1540 ft

Latitude: 46.5038842806

Longitude: -87.8990295724

Distance and Direction from Road Intersection:

Well Owner: Cent Mqt Water And Sewer Auth

Well Address:

MI

Owner Address:
100 E DIVISION
ISHPEMING MI 49849

(Continued from Page 1)

Formation Description	Thickness	Depth to Bottom

(Continued from Page 1)

Geology Remarks: 1. [SAND] [2] [2] 2. [COARSE SAND AND GRAVEL] [10] [8] 3. [COARSE SAND] [20] [10] 4. [FINE MED SAND] [30] [10] 5. [FINE SAND, DK BROWN] [40] [10] 6. [MIXED SAND AND GRAVEL] [47] [7] 7. [MED COARSE SAND(SWAMPY WATER)] [52] [5] 8. [FINE MUDDY SAND] [58] [6] 9. [FINE GRAY SAND AND CLAY] [65] [7] 10. [FINE TO COARSE SAND] [70] [5] 11. [HARDPAN WITH ROCKS] [90] [20] 12. [LARGE GRAVEL] [92] [2] 13. [HARDPAN (PACKED GRAVEL AND CLAY)] [110] [18] 14. [WEATHERED SLATE OR SHALE ROCK] [126] [16]

Contractor Type: Unknown
Registration Number: 206
Business Name:
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks:

OTHER REMARKS

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:54

Section 3

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000002937 **Import ID:** 52472903001

Tax No: 0620305500	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
NE¼ SW¼ SE¼	3	47N 29W		

Well ID: 52000002937

Elevation: 1590 ft

Latitude: 46.4955813752

Longitude: -87.913646336

Distance and Direction from Road Intersection: .25 MI E OF FA

Well Owner: Julia Koski

Well Address:	Owner Address:
1529 CO RD FA CHAMPION MI 49814	1529 CO RD FA CHAMPION MI 49814

Drilling Method: Rotary

Well Depth: 142.00 ft. **Well Use:** Household

Well Type: Replacement **Date Completed:** 2/27/1987

Casing Type: Steel - black
Casing Joint: Welded
Diameter: 6.00 in. to 27.50 ft. depth

Bore Diameter 1:
Bore Diameter 2:
Bore Diameter 3:
Height: 1.50 ft. above grade
Casing Fitting: Drive shoe

Pump Installed: Yes **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: A.Y. McDonald **Pump Type:** Unknown
Model Number: **Pump Capacity:**
Length of Drop Pipe: 137.00 ft. **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Static Water Level: 10.00 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:
135.00 ft. after 2.00 hrs. pumping at 2.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Formation Description	Thickness	Depth to Bottom
Sand W/Boulders	15.00	15.00
Hardpan W/Boulders	11.00	26.00
Red Unidentified Consolidated Fm Soft	39.00	65.00
Black Granite	45.00	110.00
Black & White Granite	32.00	142.00

Screen Installed: No **Well Intake:** Unknown
Filter Packed:
Screen Diameter: **Length:**
Screen Material Type:
Slot:
Blank:
Fittings:

Well Grouted: No **Grouting Method:**
No. of Bags: **Additives:**
Grouting Materials:

Well Head Completion: Pitless adapter

Geology Remarks: 1. [SAND AND BOULDERS] [15] [15] 2. [BOULDERS,HARDPAN] [26] [11] 3. [SOFT REDDISH ROCK] [65] [39] 4. [BLACK GRANITE] [110] [45] 5. [BLACK AND WHITE GRANITE] [142] [32]

Nearest source of possible contamination:

Type	Distance	Direction
Other	100.00 ft.	East

Contractor Type: Unknown
Registration Number: 575
Business Name:
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Drilling Machine Operator Name: KLEIMAN PUMP AND WELL DRILLING
Employment: Unknown

Signature of Registered Contractor **Date**

General Remarks:

OTHER REMARKS **Source Type 1:** Type Unknown

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:54

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000002939 **Import ID:** 52472903003

Tax No: 0620306400	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
NE¼ SE¼ SE¼	3	47N 29W		

Well ID: 52000002939

Elevation: 1590 ft

Latitude: 46.4960673759

Longitude: -87.9076312899

Distance and Direction from Road Intersection: .5 MI E THEN .125 MI S OF INTERSECTION OF US41 AND M95

Well Owner: James Lindholm

Well Address:	Owner Address:
769 CO RD FA CHAMPION MI 49814	769 CO RD FA CHAMPION MI 49814

Drilling Method: Rotary

Well Depth: 61.00 ft. **Well Use:** Household

Well Type: Replacement **Date Completed:** 12/12/1981

Casing Type: Unknown
Casing Joint: Welded
Diameter: 6.00 in. to 28.00 ft. depth

Bore Diameter 1:
Bore Diameter 2:
Bore Diameter 3:
Height: 1.00 ft. above grade
Casing Fitting: Drive shoe

Static Water Level: 6.00 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:
25.00 ft. after 0.00 hrs. pumping at 12.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Screen Installed: No **Well Intake:** Unknown
Filter Packed:
Screen Diameter: **Length:**
Screen Material Type:
Slot:
Blank:
Fittings:

Well Grouted: No **Grouting Method:**
No. of Bags: **Additives:**
Grouting Materials:

Well Head Completion: Pitless adapter

Nearest source of possible contamination:

Type	Distance	Direction
Septic tank	75.00 ft.	Northwest

Drilling Machine Operator Name: SUNTALA WELL DRILLING

Employment: Unknown

Pump Installed: Yes **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: F.E. Myers **Pump Type:** Submersible
Model Number: **Pump Capacity:** 0.00 GPM
Length of Drop Pipe: 42.00 ft. **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Formation Description	Thickness	Depth to Bottom
Sand Clayey	3.00	3.00
Sand	11.00	14.00
Gravel Clayey	8.00	22.00
Clay	6.00	28.00
Unidentified Consolidated Fm	33.00	61.00

Geology Remarks: 1. [SAND, CLAYEY] [3] [3] 2. [SAND] [14] [11] 3. [GRAVEL, CLAYEY] [22] [8] 4. [CLAY] [28] [6] 5. [ROCK] [61] [33]

Contractor Type: Unknown
Registration Number: 154
Business Name:
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks:

OTHER REMARKS

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:54

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000002944 **Import ID:** 52472903008

Tax No: 0620302100	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
NW¼ SW¼ SW¼	3	47N 29W		

Well ID: 52000002944

Elevation: 1570 ft

Latitude: 46.495790155

Longitude: -87.9280421638

Distance and Direction from Road Intersection: 2ND ON LEFT

Well Owner: Randall Joki

Well Address:
RT 1 BOX 88-B
HUMBOLDT MI 49814

Owner Address:
RT 1 BOX 88-B
HUMBOLDT MI 49814

Drilling Method: Cable Tool
Well Depth: 76.00 ft. **Well Use:** Household
Well Type: Replacement **Date Completed:** 1/4/1978
Casing Type: Unknown
Casing Joint: Welded
Diameter: 6.00 in. to 75.00 ft. depth

Bore Diameter 1:
Bore Diameter 2:
Bore Diameter 3:
Height: 1.00 ft. above grade
Casing Fitting: Drive shoe

Pump Installed: Yes **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: Other **Pump Type:** Submersible
Model Number: **Pump Capacity:** 0.00 GPM
Length of Drop Pipe: 65.00 ft. **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Static Water Level: 50.00 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:
69.00 ft. after 2.00 hrs. pumping at 8.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Formation Description	Thickness	Depth to Bottom
Gravel & Sand	38.00	38.00
Sand	38.00	76.00

Screen Installed: Yes **Well Intake:**
Filter Packed: No
Screen Diameter: 6.00 in. **Length:** 3.00 ft.
Screen Material Type:
Slot: 14.00 in. Set Between 73.00 ft. and 76.00 ft.
Blank: 0.00 ft. Above
Fittings:
Other

Well Grouted: No **Grouting Method:**
No. of Bags: **Additives:**
Grouting Materials:

Well Head Completion: Pitless adapter

Geology Remarks: 1. [GRAVEL,SAND] [38] [38] 2. [SAND] [76] [38]

Nearest source of possible contamination:

Type	Distance	Direction
None		

Contractor Type: Unknown
Registration Number: 575
Business Name:
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Drilling Machine Operator Name: KLEIMAN PUMP AND WELL DRILLING
Employment: Unknown

Signature of Registered Contractor **Date**

General Remarks: 12" ABOVE GRADE WELL HEAD COMPLETION

OTHER REMARKS **Screen Fittings:** Type Unknown **Pump Manufacturer:** REDA

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:55

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000002953 **Import ID:** 52472903017

Tax No: 06020303000	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
NE¼ SE¼ SW¼	3	47N 29W		

Distance and Direction from Road Intersection: 2ND HOUSE ON LEFT E. OF 95

Well ID: 52000002953

Elevation: 1580 ft

Latitude: 46.4951341227

Longitude: -87.9181971437

Well Owner: William Oja

Well Address:	Owner Address:
RT 1 BOX 100 CHAMPION MI 49814	RT 1 BOX 100 CHAMPION MI 49814

Drilling Method: Rotary
Well Depth: 282.00 ft. **Well Use:** Household
Well Type: Replacement **Date Completed:** 10/4/1990
Casing Type: Steel - black
Casing Joint: Welded
Diameter: 6.00 in. to 25.00 ft. depth

Bore Diameter 1: 8.00 in. to 25.00 ft. depth
Bore Diameter 2:
Bore Diameter 3:
Height: 1.50 ft. above grade
Casing Fitting: Drive shoe

Pump Installed: Yes **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: A.Y. McDonald **Pump Type:** Submersible
Model Number: **Pump Capacity:** 0.00 GPM
Length of Drop Pipe: 267.00 ft. **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Static Water Level: 15.00 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:
280.00 ft. after 24.00 hrs. pumping at 2.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well:
Abandoned well ID:

Formation Description	Thickness	Depth to Bottom
Sand Fine	6.00	6.00
Silt & Gravel W/Boulders	4.00	10.00
Granite	272.00	282.00

Screen Installed: No **Well Intake:** Unknown
Filter Packed:
Screen Diameter: **Length:**
Screen Material Type:
Slot:
Blank:
Fittings:

Well Grouted: Yes **Grouting Method:** Unknown
No. of Bags: **Additives:** None
Grouting Materials:
Other From 0.00 ft. to 25.00 ft.

Well Head Completion: 12 inches above grade, Other

Geology Remarks: 1. [FINE SAND] [6] [6] 2. [SILT,GRAVEL,AND BOULDERS] [10] [4] 3. [GRANITE] [282] [272]

Nearest source of possible contamination:

Type	Distance	Direction
Septic tank	75.00 ft.	Northeast

Contractor Type: Unknown
Registration Number: 2022
Business Name:
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Drilling Machine Operator Name: KLEIMAN PUMP AND WELL DRILLING
Employment: Unknown

Signature of Registered Contractor **Date**

General Remarks: HYDROFRACTURED
OTHER REMARKS **Grouting Material 1:** Listed as other in Wellkey **Well Head Completion:** 12 inch Above Grade

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:55

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000002954 **Import ID:** 52472903018

Tax No:	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
NW¼ SW¼ SE¼	3	47N 29W		

Well ID: 52000002954

Elevation: 1580 ft

Latitude: 46.4952608071

Longitude: -87.9177836156

Distance and Direction from Road Intersection:

Well Owner: Reino Pesola

Well Address:	Owner Address:
RT 1 BOX 107 CHAMPION MI 49814	RT 1 BOX 107 CHAMPION MI 49814

Drilling Method: Rotary

Well Depth: 105.00 ft. **Well Use:** Household

Well Type: Replacement **Date Completed:** 10/27/1976

Casing Type: Steel - black
Casing Joint: Welded
Diameter: 6.00 in. to 27.00 ft. depth

Bore Diameter 1:
Bore Diameter 2:
Bore Diameter 3:
Height: 1.00 ft. above grade
Casing Fitting: Drive shoe

Static Water Level: 18.00 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:
95.00 ft. after 0.00 hrs. pumping at 4.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Screen Installed: No **Well Intake:** Unknown
Filter Packed:
Screen Diameter: **Length:**
Screen Material Type:
Slot:
Blank:
Fittings:

Well Grouted: No **Grouting Method:**
No. of Bags: **Additives:**
Grouting Materials:

Well Head Completion: Pitless adapter

Nearest source of possible contamination:

Type	Distance	Direction
Septic tank	75.00 ft.	Northeast

Drilling Machine Operator Name: LENTZ WELL DRILLING

Employment: Unknown

Pump Installed: No **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: **Pump Type:**
Model Number: **Pump Capacity:**
Length of Drop Pipe: **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Formation Description	Thickness	Depth to Bottom
Red Sand Coarse	15.00	15.00
Sand & Gravel W/Boulders	11.00	26.00
Slate Michigammee Fm	45.00	71.00
Granite	34.00	105.00

Geology Remarks: 1. [COARSE RED SAND] [15] [15] 2. [SAND GRAVEL BOULDERS] [26] [11] 3. [MICHIGAMME SLATE] [71] [45] 4. [GRANITE] [105] [34]

Contractor Type: Unknown
Registration Number: 800
Business Name:
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks:

OTHER REMARKS

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:55

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000002956 **Import ID:** 52472903020

Tax No:	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
SE¼ NE¼ SW¼	3	47N 29W		

Well ID: 52000002956

Elevation: 1560 ft

Latitude: 46.4966909044

Longitude: -87.9185505686

Distance and Direction from Road Intersection:

Well Owner: Edna Koski

Well Address:	Owner Address:
BOX 295 A CHAMPION MI 49814	BOX 295 A CHAMPION MI 49814

Drilling Method: Rotary

Well Depth: 103.00 ft. **Well Use:** Household

Well Type: Replacement **Date Completed:** 7/6/1983

Casing Type: Steel - black
Casing Joint: Welded
Diameter: 6.00 in. to 29.50 ft. depth

Bore Diameter 1:
Bore Diameter 2:
Bore Diameter 3:
Height: 1.80 ft. above grade
Casing Fitting: Drive shoe

Pump Installed: Yes **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: Grundfos **Pump Type:** Submersible
Model Number: **Pump Capacity:** 0.00 GPM
Length of Drop Pipe: 92.00 ft. **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Static Water Level: 15.00 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:
100.00 ft. after 4.00 hrs. pumping at 1.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Formation Description	Thickness	Depth to Bottom
Hardpan W/Gravel Coarse	20.00	20.00
Sand Medium To Coarse	6.00	26.00
Hardpan	3.00	29.00
Granite	74.00	103.00

Screen Installed: No **Well Intake:** Unknown
Filter Packed:
Screen Diameter: **Length:**
Screen Material Type:
Slot:
Blank:
Fittings:

Well Grouted: No **Grouting Method:**
No. of Bags: **Additives:**
Grouting Materials:

Well Head Completion: 12 inches above grade, Other

Geology Remarks: 1. [COURSE GRAVEL & HARDPAN] [20] [20] 2. [MED & COARSE SAND] [26] [6] 3. [HARDPAN] [29] [3] 4. [GRANITE] [103] [74]

Nearest source of possible contamination:

Type	Distance	Direction
Fuel tank	75.00 ft.	Northeast

Contractor Type: Unknown
Registration Number: 575
Business Name:
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Drilling Machine Operator Name: KLEIMAN PUMP & WELL DRILLING
Employment: Unknown

Signature of Registered Contractor **Date**

General Remarks:

OTHER REMARKS **Well Head Completion:** 12 Inch Above Grade

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:55

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000002960 **Import ID:** 52472903024

Tax No: 0620304000	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
SW¼ SE¼ SW¼	3	47N 29W		

Well ID: 52000002960

Elevation: 1585 ft

Latitude: 46.4932730649

Longitude: -87.9220604511

Distance and Direction from Road Intersection:

Well Owner: Earl D Johnson

Well Address:
CHAMPION MI 49814

Owner Address:
PO BOX 187
ISHPEMING MI

Drilling Method: Unknown
Well Depth: 243.00 ft. **Well Use:** Household
Well Type: New **Date Completed:** 8/26/1988
Casing Type: Steel - black
Casing Joint: Welded
Diameter: 6.00 in. to 26.00 ft. depth

Bore Diameter 1: 8.00 in. to 25.00 ft. depth
Bore Diameter 2:
Bore Diameter 3:
Height: 1.00 ft. above grade
Casing Fitting: Drive shoe

Pump Installed: No **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: **Pump Type:**
Model Number: **Pump Capacity:**
Length of Drop Pipe: **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Static Water Level: 10.00 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Formation Description	Thickness	Depth to Bottom
Sand W/Boulders	10.00	10.00
Sand	5.00	15.00
Red Granite	75.00	90.00
Red Granite	53.00	143.00
Red Granite	87.00	230.00
Black Granite W/Dolomite	13.00	243.00

Screen Installed: No **Well Intake:** Unknown
Filter Packed:
Screen Diameter: **Length:**
Screen Material Type:
Slot:
Blank:
Fittings:

Well Grouted: Yes **Grouting Method:** Unknown
No. of Bags: **Additives:** None
Grouting Materials:
Other From 0.00 ft. to 25.00 ft.

Well Head Completion: Unknown

Geology Remarks: 1. [SAND AND BOULDERS] [10] [10] 2. [CLEAN SAND] [15] [5] 3. [GRANITE WITH RED AND BLACK LAYERS] [90] [75] 4. [GRANITE RED,LIGHT] [143] [53] 5. [GRANITE RED, DK] [230] [87] 6. [BLACK GRANITE AND DOLOMITE] [243] [13]

Nearest source of possible contamination:

Type	Distance	Direction
Septic tank	60.00 ft.	South

Contractor Type: Unknown
Registration Number: 575
Business Name:
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Drilling Machine Operator Name: KLEIMAN PUMP AND WELL DRILLING
Employment: Unknown

Signature of Registered Contractor **Date**

General Remarks:
OTHER REMARKS **Grouting Material 1:** Listed as other in Wellkey

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:55

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Well ID: 52000004260

Tax No: 52-06-203-04900	Permit No: 210201	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
SE¼ NE¼ SE¼	3	47N 29W		

Well ID: 52000004260

Elevation:

Latitude: 46.49651879

Longitude: -87.90930587

Distance and Direction from Road Intersection: 622 CT. RD F.A.

Well Owner: James Lindholm

Well Address:

Owner Address:
769 CO RD FA
CHAMPION MI 49814

Drilling Method: Rotary
Well Depth: 65.00 ft. **Well Use:** Household
Well Type: New **Date Completed:** 8/7/2001
Casing Type: Steel - black
Casing Joint: Unknown
Diameter: 6.00 in. to 36.00 ft. depth

Bore Diameter 1: 6.00 In. to 36.00 ft. depth
Bore Diameter 2:
Bore Diameter 3:
Height: 1.00 ft. above grade
Casing Fitting: Drive shoe

Pump Installed: No **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: **Pump Type:**
Model Number: **Pump Capacity:**
Length of Drop Pipe: **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Static Water Level: 11.00 ft. Below Grade(Not Flowing)
Yield Test Method: Test pump
Measurement Taken During Pump Test:
50.00 ft. after 24.00 hrs. pumping at 12.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Formation Description	Thickness	Depth to Bottom
Sand Fine	5.00	5.00
Clay & Sand	7.00	12.00
Clay Sand Gravel	14.00	26.00
Clay & Stones Fractured	10.00	36.00
Sandstone	29.00	65.00

Screen Installed: No **Well Intake:** Bedrock Well
Filter Packed:
Screen Diameter: **Length:**
Screen Material Type:
Slot:
Blank:
Fittings:

Well Grouted: Yes **Grouting Method:** Unknown
No. of Bags: 2 **Additives:** None
Grouting Materials:
Bentonite slurry

Well Head Completion: 12 inches above grade, Pitless adapter

Geology Remarks:

Nearest source of possible contamination:

Type	Distance	Direction
Septic tank	75.00 ft.	North

Contractor Type: Water well drilling contractor
Registration Number: 1635
Business Name: LARRY'S WELL AND PUMP SERVICE
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Drilling Machine Operator Name: LARRY LENTZ

Employment: Employee

Signature of Registered Contractor **Date**

General Remarks: BENTONITE AROUND CASING WHILE DRIVING OWNER HAS ASSUMED RESPONSIBILITY OF WELL ABANDONMENT

OTHER REMARKS

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

7/31/2002 10:32

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000005055

Tax No:	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
SE¼ NE¼ NE¼	3	47N 29W	2012252	001

Well ID: 52000005055

Elevation: 1549 ft

Latitude: 46.49873

Longitude: -87.91091

Distance and Direction from Road Intersection:

Well Owner: Grand Slam Bar

Well Address:	Owner Address:
11822 US-41 CHAMPION MI 49814	11822 US-41 CHAMPION MI 49814

Drilling Method: Unknown

Well Depth: 50.00 ft. | Well Use: Type II public

Well Type: Unknown | Date Completed: 11/11/1955

Casing Type:
Casing Joint:
Diameter: 4.00 in. to

Bore Diameter 1:
Bore Diameter 2:
Bore Diameter 3:
Height:
Casing Fitting:

Pump Installed: No
Pump Installation date:
Manufacturer:
Model Number: UNK
Length of Drop Pipe: 0.00 ft.
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pump Installation only: No
HP:
Pump Type: Submersible
Pump Capacity:
Id of Well:

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number :
Tank Capacity : Gallons
Pressure Relief Valve Installed : No

Static Water Level:
Yield Test Method:
Measurement Taken During Pump Test:

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Formation Description	Thickness	Depth to Bottom

Screen Installed: No
Filter Packed:
Screen Diameter:
Screen Material Type:
Slot:
Blank:
Fittings:

Well Intake:
Length:

Well Grouted: No Grouting Method:
No. of Bags:
Grouting Materials:

Additives:

Well Head Completion: 12 inches above grade, Other

Geology Remarks:

Nearest source of possible contamination:
Type Distance Direction

Contractor Type:
Registration Number:
Business Name:
Business Address:

Drilling Machine Operator Name: JOHN KISLING

Employment:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor Date

General Remarks:

OTHER REMARKS Well Head Completion:

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/17/2004 10:53

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000002959 **Import ID:** 52472903023

Tax No: 520620304800	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
SE¼ NE¼ SE¼	3	47N 29W		

Well ID: 52000002959

Elevation: 1580 ft

Latitude: 46.4967990695

Longitude: -87.907712275

Distance and Direction from Road Intersection: NEXT TO STETSON

Well Owner: Jerry Plattenburg

Well Address:
RT 1
CHAMPION MI 49814

Owner Address:
CHAMPIONGWINN MI 49814

Drilling Method: Cable Tool
Well Depth: 28.00 ft. **Well Use:** Household
Well Type: Replacement **Date Completed:**
Casing Type: Unknown
Casing Joint: Welded
Diameter: 6.00 in. to 28.00 ft. depth

Bore Diameter 1:
Bore Diameter 2:
Bore Diameter 3:
Height: 0.00 ft. above grade
Casing Fitting: None

Static Water Level: 6.00 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:
25.00 ft. after 2.00 hrs. pumping at 3.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Screen Installed: No **Well Intake:** Unknown
Filter Packed:
Screen Diameter: **Length:**
Screen Material Type:
Slot:
Blank:
Fittings:

Well Grouted: No **Grouting Method:**
No. of Bags: **Additives:**
Grouting Materials:

Well Head Completion: Pitless adapter

Nearest source of possible contamination:

Type	Distance	Direction
Septic tank	100.00 ft.	Southeast

Drilling Machine Operator Name: DAVID LENTZ DRILLING

Employment: Unknown

Pump Installed: No **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: **Pump Type:**
Model Number: **Pump Capacity:**
Length of Drop Pipe: **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Formation Description	Thickness	Depth to Bottom
Sand	20.00	20.00
Hardpan	5.00	25.00
Unidentified Consolidated Fm	3.00	28.00

Geology Remarks: 1. [SAND] [20] [20] 2. [HARDPAN] [25] [5] 3. [ROCK] [28] [3]

Contractor Type: Unknown
Registration Number: 1269
Business Name:
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks: ALSO 12" ABOVE GRADE WELL HEAD COMPLETION

OTHER REMARKS

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:55

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000002943 **Import ID:** 52472903007

Tax No: 0620302000	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
NW¼ SW¼ SW¼	3	47N 29W		

Well ID: 52000002943

Elevation: 1560 ft

Latitude: 46.4960820228

Longitude: -87.9274141717

Distance and Direction from Road Intersection: 175 FT S US41, HUMBOLDT LOC.

Well Owner: James Mitchell

Well Address:	Owner Address:
BOX 194 15909 US41 CHAMPION MI 49814	BOX 194 15909 US41 CHAMPION MI 49814

Drilling Method: Driven Hand

Well Depth: 26.00 ft. **Well Use:** Household

Well Type: Replacement **Date Completed:** 10/28/1974

Casing Type: Unknown
Casing Joint: Threaded & coupled
Diameter: 2.00 in. to 26.00 ft. depth

Bore Diameter 1:
Bore Diameter 2:
Bore Diameter 3:
Height: -6.00 ft. above grade
Casing Fitting: None

Pump Installed: Yes **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: Other **Pump Type:** Jet
Model Number: **Pump Capacity:**
Length of Drop Pipe: 0.00 ft. **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Static Water Level: 18.00 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Formation Description	Thickness	Depth to Bottom
Sand	26.00	26.00

Screen Installed: Yes **Well Intake:**
Filter Packed: No
Screen Diameter: 2.00 in. **Length:** 2.50 ft.
Screen Material Type:
Slot: 6.00 in. Set Between 0.00 ft. and 0.00 ft.
Blank: 0.00 ft. Above
Fittings:
None

Well Grouted: No **Grouting Method:**
No. of Bags: **Additives:**
Grouting Materials:

Well Head Completion: Unknown

Geology Remarks: 1. [SAND] [26] [26]

Nearest source of possible contamination:

Type	Distance	Direction
Septic tank	75.00 ft.	South

Contractor Type: Unknown
Registration Number:
Business Name:
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Drilling Machine Operator Name:

Employment: Unknown

Signature of Registered Contractor **Date**

General Remarks: 26+FT FOR WELL DEPTH MEANS I WILL BE NODING 6"OF TOPSOIL THIS SUMMER AND IT'S A LITTLE OVER 26 FT NOW

OTHER REMARKS **Pump Manufacturer:** MONTGOMERY WARD

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:55

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000002946 **Import ID:** 52472903010

Tax No: 0620302800	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
SE¼ SW¼ SW¼	3	47N 29W		

Well ID: 52000002946

Elevation: 1570 ft

Latitude: 46.4937509223

Longitude: -87.923931462

Distance and Direction from Road Intersection: HALFWAY RD

Well Owner: Marvin Mackey

Well Address:	Owner Address:
5178 CO RD FA RT BOX 92A CHAMPION MI 49814	5178 CO RD FA RT BOX 92A CHAMPION MI 49814

Drilling Method: Cable Tool

Well Depth: 82.00 ft. **Well Use:** Household

Well Type: Replacement **Date Completed:** 12/4/1974

Casing Type: Steel - black
Casing Joint: Welded
Diameter: 5.00 in. to 82.00 ft. depth

Bore Diameter 1:
Bore Diameter 2:
Bore Diameter 3:
Height: 1.00 ft. above grade
Casing Fitting: Drive shoe

Pump Installed: No **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: **Pump Type:**
Model Number: **Pump Capacity:**
Length of Drop Pipe: **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Static Water Level: 20.00 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:
25.00 ft. after 2.00 hrs. pumping at 20.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Formation Description	Thickness	Depth to Bottom
Topsoil	1.00	1.00
Sand Coarse	19.00	20.00
Sand & Clay Fine To Coarse	7.00	27.00
Sand & Clay Fine	51.00	78.00
Sand & Gravel Fine To Coarse	4.00	82.00

Screen Installed: No **Well Intake:** Unknown
Filter Packed:
Screen Diameter: **Length:**
Screen Material Type:
Slot:
Blank:
Fittings:

Well Grouted: No **Grouting Method:**
No. of Bags: **Additives:**
Grouting Materials:

Well Head Completion: 12 inches above grade, Other

Geology Remarks: 1. [TOP SOIL] [1] [1] 2. [COARES SAND] [20] [19] 3. [FINE TO COARSE SAND & CLAY] [27] [7] 4. [FINE SAND & CLAY] [78] [51] 5. [COARSE SAND & FINE TO COARSE GRAVEL] [82] [4]

Nearest source of possible contamination:

Type	Distance	Direction
Septic tank	60.00 ft.	East

Contractor Type: Unknown
Registration Number: 1269
Business Name:
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Drilling Machine Operator Name: DAVID LENTZ DRILLING

Employment: Unknown

Signature of Registered Contractor **Date**

General Remarks:

OTHER REMARKS **Well Head Completion:** 12 inch Above Grade

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:55

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000002951 **Import ID:** 52472903015

Tax No: 0620302200	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
SE¼ SW¼ SW¼	3	47N 29W		

Well ID: 52000002951

Elevation: 1570 ft

Latitude: 46.4932392599

Longitude: -87.9239621751

Distance and Direction from Road Intersection:

Well Owner: Jacob Oja

Well Address:	Owner Address:
5283 CO RD FA CHAMPION MI 49814	5283 CO RD FA CHAMPION MI 49814

Drilling Method: Rotary

Well Depth: 253.00 ft. **Well Use:** Household

Well Type: Replacement **Date Completed:** 11/11/1987

Casing Type: Steel - black
Casing Joint: Welded
Diameter: 6.00 in. to 43.70 ft. depth

Bore Diameter 1:
Bore Diameter 2:
Bore Diameter 3:
Height: 1.60 ft. above grade
Casing Fitting: Drive shoe

Pump Installed: Yes **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: A.Y. McDonald **Pump Type:** Submersible
Model Number: **Pump Capacity:** 0.00 GPM
Length of Drop Pipe: 57.00 ft. **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Static Water Level: 29.80 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:
251.00 ft. after 0.50 hrs. pumping at 1.00 GPM
50.00 ft. after 2.00 hrs. pumping at 5.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Formation Description	Thickness	Depth to Bottom
Sand	35.00	35.00
Sand Fine	6.00	41.00
Slate Broken	2.00	43.00
Gray Slate	7.00	50.00
Red Slate	55.00	105.00
Gray Slate	35.00	140.00
Red Slate	50.00	190.00
Gray Slate Hard	50.00	240.00
Red Slate	13.00	253.00

Screen Installed: No **Well Intake:** Unknown
Filter Packed:
Screen Diameter: **Length:**
Screen Material Type:
Slot:
Blank:
Fittings:

Well Grouted: No **Grouting Method:**
No. of Bags: **Additives:**
Grouting Materials:

Well Head Completion: 12 inches above grade, Other

Geology Remarks: 1. [SAND] [35] [35] 2. [FINE SAND] [41] [6] 3. [BROKEN SLATE] [43] [2] 4. [GRAY SLATE] [50] [7] 5. [RED SLATE] [105] [55] 6. [GRAY SLATE] [140] [35] 7. [RED SLATE] [190] [50] 8. [GRAY HARD SLATE] [240] [50] 9. [RED SLATE] [253] [13]

Nearest source of possible contamination:

Type	Distance	Direction
Septic tank	100.00 ft.	East

Contractor Type: Unknown
Registration Number: 575
Business Name:
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Drilling Machine Operator Name: KLEIMAN PUMP & WELL DRILLING
Employment: Unknown

Signature of Registered Contractor **Date**

General Remarks:
OTHER REMARKS **Well Head Completion:** 12 inch Above Grade

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:55

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000002955 | Import ID: 52472903019

Tax No: 0620306200	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
NW¼ SW¼ SE¼	3	47N 29W		

Well ID: 52000002955

Elevation: 1590 ft

Latitude: 46.4948649398

Longitude: -87.9171541396

Distance and Direction from Road Intersection:

Well Owner: Wm Lahtela

Well Address:	Owner Address:
3061 CR FA CHAMPION MI 49814	3061 CR FA CHAMPION MI 49814

Drilling Method: Cable Tool

Well Depth: 26.00 ft. | Well Use: Household

Well Type: Replacement | Date Completed: 3/8/1967

Casing Type: Unknown
Casing Joint: Threaded & coupled
Diameter: 5.00 in. to 23.00 ft. depth

Bore Diameter 1:
Bore Diameter 2:
Bore Diameter 3:
Height: 1.00 ft. above grade
Casing Fitting: None

Static Water Level: 999.99 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Screen Installed: No | Well Intake: Unknown
Filter Packed:
Screen Diameter: | Length:
Screen Material Type:
Slot:
Blank:
Fittings:

Well Grouted: No | Grouting Method:
No. of Bags: | Additives:
Grouting Materials:

Well Head Completion: Unknown

Nearest source of possible contamination:

Type	Distance	Direction
Unknown	0.00 ft.	
Unknown		

Drilling Machine Operator Name: WESLEY DRILLING

Employment: Unknown

Pump Installed: No | Pump Installation only: No
Pump Installation date: | HP:
Manufacturer: | Pump Type:
Model Number: | Pump Capacity:
Length of Drop Pipe: | Id of Well:
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : | Tank Capacity : Gallons
Pressure Relief Valve Installed : No

Formation Description	Thickness	Depth to Bottom
Red Clay	10.00	10.00
Boulders W/Gravel Brown	7.00	17.00
Sand & Silt W/Boulders	5.00	22.00
Red Unidentified Consolidated Fm	4.00	26.00

Geology Remarks: 1. [RED BROWN CLAY] [10] [10] 2. [BOULDERS RED BROWN GRAVEL] [17] [7] 3. [SAND SILT BOULDERS] [22] [5] 4. [RED & GRAY LEDGE] [26] [4]

Contractor Type: Unknown
Registration Number: 35
Business Name:
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor | Date

General Remarks:
OTHER REMARKS

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:55

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000002958 **Import ID:** 52472903022

Tax No: 0620304700	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
SE¼ NE¼ SE¼	3	47N 29W		

Well ID: 52000002958

Elevation: 1580 ft

Latitude: 46.4975308735

Longitude: -87.9073874027

Distance and Direction from Road Intersection:

Well Owner: Richard Stetson

Well Address:	Owner Address:
289 CO RD FA CHAMPION MI 49814	289 CO RD FA CHAMPION MI 49814

Drilling Method: Rotary

Well Depth: 63.00 ft. **Well Use:** Household

Well Type: Replacement **Date Completed:** 8/28/1981

Casing Type: Steel - black
Casing Joint: Welded
Diameter: 6.00 in. to 34.50 ft. depth

Bore Diameter 1:
Bore Diameter 2:
Bore Diameter 3:
Height: 1.00 ft. above grade
Casing Fitting: Drive shoe

Static Water Level: 24.00 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:
60.00 ft. after 2.00 hrs. pumping at 10.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Screen Installed: No **Well Intake:** Unknown
Filter Packed:
Screen Diameter: **Length:**
Screen Material Type:
Slot:
Blank:
Fittings:

Well Grouted: No **Grouting Method:**
No. of Bags: **Additives:**
Grouting Materials:

Well Head Completion: 12 inches above grade, Other

Nearest source of possible contamination:

Type	Distance	Direction
None		

Drilling Machine Operator Name: KLEIMAN PUMP AND WELL DRILLING
Employment: Unknown

Pump Installed: No **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: **Pump Type:**
Model Number: **Pump Capacity:**
Length of Drop Pipe: **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Formation Description	Thickness	Depth to Bottom
Gravel & Clay Hard	30.00	30.00
Granite Fractured	3.00	33.00
Granite	30.00	63.00

Geology Remarks: 1. [GRAVEL AND CLAY HARDPAN] [30] [30] 2. [FRACTURED GRANITE] [33] [3] 3. [GRANITE] [63] [30]

Contractor Type: Unknown
Registration Number: 575
Business Name:
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks:
OTHER REMARKS **Well Head Completion:** 12 inch Above Grade

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:55

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000002952 **Import ID:** 52472903016

Tax No:	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
SE¼ SE¼ SW¼	3	47N 29W		

Well ID: 52000002952

Elevation: 1580 ft

Latitude: 46.4940498966

Longitude: -87.919292954

Distance and Direction from Road Intersection: 95 S. 1ST HOUSE ON LEFT

Well Owner: James Hanninen ?

Well Address:	Owner Address:
RT 1 95 S HUMBOLT MI 49814	RT 1 95 S HUMBOLT MI 49814

Drilling Method: Cable Tool

Well Depth: 25.00 ft. **Well Use:** Household

Well Type: Replacement **Date Completed:** 4/14/1967

Casing Type: Unknown
Casing Joint: Threaded & coupled
Diameter: 5.00 in. to 25.00 ft. depth

Bore Diameter 1:
Bore Diameter 2:
Bore Diameter 3:
Height: 1.00 ft. above grade
Casing Fitting: Drive shoe

Static Water Level: 6.60 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:
10.00 ft. after 5.00 hrs. pumping at 5.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Screen Installed: No **Well Intake:** Unknown
Filter Packed:
Screen Diameter: **Length:**
Screen Material Type:
Slot:
Blank:
Fittings:

Well Grouted: No **Grouting Method:**
No. of Bags: **Additives:**
Grouting Materials:

Well Head Completion: Pitless adapter

Nearest source of possible contamination:

Type	Distance	Direction
Septic tank	75.00 ft.	East

Drilling Machine Operator Name: WESLY DRILLING

Employment: Unknown

Pump Installed: No **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: **Pump Type:**
Model Number: **Pump Capacity:**
Length of Drop Pipe: **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Formation Description	Thickness	Depth to Bottom
Brown Sand	10.00	10.00
Gray Sand & Silt	13.00	23.00
Gray Gravel W/Boulders Broken	2.00	25.00

Geology Remarks: 1. [BROWN SAND] [10] [10] 2. [GRAY SILT & SAND] [23] [13] 3. [GRAY GRAVEL & BROKEN LEDGE] [25] [2]

Contractor Type: Unknown
Registration Number: 35
Business Name:
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks:

OTHER REMARKS

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:55

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Well ID: 52000002947 — Failure to comply is a misdemeanor. — Import ID: 52472903011

Tax No: 0620303900	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
SW¼ SE¼ SW¼	3	47N 29W		

Well ID: 52000002947

Elevation: 1570 ft

Latitude: 46.4942135111

Longitude: -87.9228423436

Distance and Direction from Road Intersection: N OF CR FA, MOBILE HOME 3 RED LEFT NEAR RR

Well Owner: Clarence Manninen

Well Address:
CHAMPION MI 49814

Owner Address:
PO BOX 37
CHAMPIONGWINN MI 49814

Drilling Method: Rotary
Well Depth: 105.00 ft. — **Well Use:** Household
Well Type: Replacement — **Date Completed:** 6/14/1988
Casing Type: Steel - black
Casing Joint: Welded
Diameter: 5.00 in. to 26.00 ft. depth

Bore Diameter 1:
Bore Diameter 2:
Bore Diameter 3:
Height: 1.00 ft. above grade
Casing Fitting: Drive shoe

Pump Installed: No — **Pump Installation only:** No
Pump Installation date: — **HP:**
Manufacturer: — **Pump Type:**
Model Number: — **Pump Capacity:**
Length of Drop Pipe: — **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : — **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Static Water Level: 999.99 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Formation Description	Thickness	Depth to Bottom
Boulders W/Gravel	22.00	22.00
Iron Formation	83.00	105.00

Screen Installed: No — **Well Intake:** Unknown
Filter Packed:
Screen Diameter: — **Length:**
Screen Material Type:
Slot:
Blank:
Fittings:

Well Grouted: Yes — **Grouting Method:** Unknown
No. of Bags: — **Additives:** None
Grouting Materials:
Unknown — From 0.00 ft. to 0.00 ft.

Well Head Completion: Unknown

Geology Remarks: 1. [BOULDERS AND GRAVEL] [22] [22] 2. [ORE,GRANITE STRIPS,QUARTZ] [105] [83]

Nearest source of possible contamination:

Type	Distance	Direction
Unknown	0.00 ft.	
Unknown		

Contractor Type: Unknown
Registration Number: 1675
Business Name:
Business Address:

Drilling Machine Operator Name: MACDONALD WELL DRILLING

Employment: Unknown

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor — **Date**

General Remarks:
OTHER REMARKS

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:55

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000002938 **Import ID:** 52472903002

Tax No: 0620306300	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
NE¼ SE¼ SE¼	3	47N 29W		

Well ID: 52000002938

Elevation: 1590 ft

Latitude: 46.4955333033

Longitude: -87.9090944583

Distance and Direction from Road Intersection: .5 MI E OF RD FA

Well Owner: Ida Wisui

Well Address:
CR FA
HUMBOLDT MI 49814

Owner Address:
P.O. BOX 256
HUMBOLDT MI 49814

Drilling Method: Rotary
Well Depth: 143.00 ft. **Well Use:** Household
Well Type: Replacement **Date Completed:** 2/6/1987
Casing Type: Steel - black
Casing Joint: Unknown
Diameter: 6.00 in. to 24.00 ft. depth

Bore Diameter 1: 8.00 in. to 28.00 ft. depth
Bore Diameter 2:
Bore Diameter 3:
Height: 1.00 ft. above grade
Casing Fitting: None

Static Water Level: 11.00 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:
80.00 ft. after 0.50 hrs. pumping at 6.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Screen Installed: No **Well Intake:** Unknown
Filter Packed:
Screen Diameter: **Length:**
Screen Material Type:
Slot:
Blank:
Fittings:

Well Grouted: Yes **Grouting Method:** Unknown
No. of Bags: **Additives:** None
Grouting Materials:
Other From 0.00 ft. to 28.00 ft.

Well Head Completion: Pitless adapter

Nearest source of possible contamination:

Type	Distance	Direction
Septic tank	75.00 ft.	West

Drilling Machine Operator Name: KLEIMAN PUMP AND WELL DRILLING
Employment: Unknown

Pump Installed: No **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: **Pump Type:**
Model Number: **Pump Capacity:**
Length of Drop Pipe: **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Formation Description	Thickness	Depth to Bottom
Boulders W/Gravel	17.00	17.00
Red Unidentified Consolidated Fm Soft	11.00	28.00
Red Unidentified Consolidated Fm Brown	82.00	110.00
Greenstone Hard	33.00	143.00

Geology Remarks: 1. [BOULDERS, GRAVEL] [17] [17] 2. [SOFT RED ROCK] [28] [11] 3. [REDDISH BROWN ROCK] [110] [82] 4. [HARD DK GREEN ROCK] [143] [33]

Contractor Type: Unknown
Registration Number: 575
Business Name:
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks: 12" ABOVE GRADE WELL HEAD COMPLETION
OTHER REMARKS **Grouting Material 1:** Listed as other in Wellkey

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:54

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000002948 **Import ID:** 52472903012

Tax No: 0620303800	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
SW¼ SE¼ SW¼	3	47N 29W		

Well ID: 52000002948

Elevation: 1570 ft

Latitude: 46.4939776524

Longitude: -87.9210832395

Distance and Direction from Road Intersection: .25 MI W OF 95 ON FA

Well Owner: Matt Mackey,jr

Well Address:	Owner Address:
CR FA CHAMPION MI 49814	CR FA CHAMPION MI 49814

Drilling Method: Rotary
Well Depth: 43.00 ft. **Well Use:** Household
Well Type: Replacement **Date Completed:** 2/10/1987
Casing Type: Steel - black
Casing Joint: Welded
Diameter: 6.00 in. to 29.60 ft. depth

Bore Diameter 1: 8.00 in. to 28.00 ft. depth
Bore Diameter 2:
Bore Diameter 3:
Height: 1.00 ft. above grade
Casing Fitting: Drive shoe

Static Water Level: 6.00 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:
40.00 ft. after 0.50 hrs. pumping at 15.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well:
Abandoned well ID:

Screen Installed: No **Well Intake:** Unknown
Filter Packed:
Screen Diameter: **Length:**
Screen Material Type:
Slot:
Blank:
Fittings:

Well Grouted: Yes **Grouting Method:** Unknown
No. of Bags: **Additives:** None
Grouting Materials:
Other From 0.00 ft. to 28.00 ft.

Well Head Completion: Pitless adapter

Nearest source of possible contamination:

Type	Distance	Direction
Septic tank	70.00 ft.	Northwest

Drilling Machine Operator Name: KLEIMAN PUMP AND WELL DRILLING
Employment: Unknown

Pump Installed: No **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: **Pump Type:**
Model Number: **Pump Capacity:**
Length of Drop Pipe: **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Formation Description	Thickness	Depth to Bottom
Clay & Sand	16.00	16.00
Red Unidentified Consolidated Fm Soft	27.00	43.00

Geology Remarks: 1. [CLAY,SAND] [16] [16] 2. [SOFT RED ROCK] [43] [27]

Contractor Type: Unknown
Registration Number: 575
Business Name:
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks: ALSO 12" ABOVE GRADE WELL HEAD COMPLETION
OTHER REMARKS **Grouting Material 1:** Listed as other in Wellkey

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:55

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000002949 **Import ID:** 52472903013

Tax No: 520620303700	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
SW¼ SE¼ SW¼	3	47N 29W		

Well ID: 52000002949

Elevation: 1580 ft

Latitude: 46.4944124423

Longitude: -87.9207181087

Distance and Direction from Road Intersection: ACROSS FROM MANNEN ON HILL NOT ON CORNER

Well Owner: Ch. Mackey

Well Address:	Owner Address:
RT 1 BOX 96A CHAMPION MI 49814	RT 1 BOX 96A CHAMPION MI 49814

Drilling Method: Rotary

Well Depth: 51.00 ft. **Well Use:** Household

Well Type: Replacement **Date Completed:**

Casing Type: Steel - black
Casing Joint: Welded
Diameter: 6.00 in. to 25.00 ft. depth

Bore Diameter 1:
Bore Diameter 2:
Bore Diameter 3:
Height: -1.00 ft. above grade
Casing Fitting: Drive shoe

Static Water Level: 9.00 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:
0.00 ft. after 0.00 hrs. pumping at 2.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Screen Installed: No **Well Intake:** Unknown
Filter Packed:
Screen Diameter: **Length:**
Screen Material Type:
Slot:
Blank:
Fittings:

Well Grouted: No **Grouting Method:**
No. of Bags: **Additives:**
Grouting Materials:

Well Head Completion: Pitless adapter

Nearest source of possible contamination:

Type	Distance	Direction
Septic tank	100.00 ft.	North

Drilling Machine Operator Name: HAKALA WELL AND PUMP

Employment: Unknown

Pump Installed: Yes **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: Other **Pump Type:** Submersible
Model Number: **Pump Capacity:** 0.00 GPM
Length of Drop Pipe: 42.00 ft. **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Formation Description	Thickness	Depth to Bottom
Clay Sandy	17.00	17.00
Clay & Boulders	6.00	23.00
Unidentified Consolidated Fm Broken	2.00	25.00
Granite	26.00	51.00

Geology Remarks: 1. [SANDY CLAY] [17] [17] 2. [CLAY AND BOULDERS] [23] [6] 3. [BROKEN ROCK] [25] [2] 4. [GRANITE] [51] [26]

Contractor Type: Unknown
Registration Number: 206
Business Name:
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks:

OTHER REMARKS **Pump Manufacturer:** BERKLEY

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:55

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000002950 **Import ID:** 52472903014

Tax No: 0620301600	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
SW¼ SW¼ SW¼	3	47N 29W		

Well ID: 52000002950

Elevation: 1570 ft

Latitude: 46.4939326

Longitude: -87.9236453885

Distance and Direction from Road Intersection:

Well Owner: Lilian Piziali

Well Address:	Owner Address:
4896 CO RD FA CHAMPION MI 49814	4896 CO RD FA CHAMPION MI 49814

Drilling Method: Rotary

Well Depth: 64.00 ft. **Well Use:** Household

Well Type: Replacement **Date Completed:** 3/23/1977

Casing Type: Unknown
Casing Joint: Threaded & coupled
Diameter: 6.00 in. to 36.00 ft. depth

Bore Diameter 1:
Bore Diameter 2:
Bore Diameter 3:
Height: 1.00 ft. above grade
Casing Fitting: Drive shoe

Pump Installed: No **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: **Pump Type:**
Model Number: **Pump Capacity:**
Length of Drop Pipe: **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Static Water Level: 20.00 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:
58.00 ft. after 24.00 hrs. pumping at 4.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Formation Description	Thickness	Depth to Bottom
Interval Not Sampled	12.00	12.00
Sand Fine	21.00	33.00
Sand & Gravel Fine	3.00	36.00
Green Greenstone	11.00	47.00
Slate Michigammee Fm	5.00	52.00
Granite	12.00	64.00

Screen Installed: No **Well Intake:** Unknown
Filter Packed:
Screen Diameter: **Length:**
Screen Material Type:
Slot:
Blank:
Fittings:

Well Grouted: No **Grouting Method:**
No. of Bags: **Additives:**
Grouting Materials:

Well Head Completion: Pitless adapter

Geology Remarks: 1. [OPEN PIT] [12] [12] 2. [FINE SAND] [33] [21] 3. [FINE SAND GRAVEL] [36] [3] 4. [GREEN STONE] [47] [11] 5. [MICHIGAMME SLATE] [52] [5] 6. [GRANITE] [64] [12]

Nearest source of possible contamination:

Type	Distance	Direction
Septic tank	75.00 ft.	South

Contractor Type: Unknown
Registration Number: 800
Business Name:
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Drilling Machine Operator Name: LENTZ WELL DRILLING

Employment: Unknown

Signature of Registered Contractor **Date**

General Remarks:

OTHER REMARKS

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:55

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000002941 **Import ID:** 52472903005

Tax No: 0690006900	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
SE¼ NE¼ SW¼	3	47N 29W		

Well ID: 52000002941

Elevation: 1550 ft

Latitude: 46.497070027

Longitude: -87.9198007534

Distance and Direction from Road Intersection: NOW CROSS CUT CAFE AND MOTEL

Well Owner: Cross Cut Cafe And Motel

Well Address:	Owner Address:
RR1 BOX 296A US 41 CHAMPION MI 49814	RR1 BOX 296A US 41 CHAMPION MI 49814

Drilling Method: Cable Tool

Well Depth: 26.00 ft. **Well Use:** Type III public

Well Type: Replacement **Date Completed:**

Casing Type: Steel - black
Casing Joint: Threaded & coupled
Diameter: 6.00 in. to 24.00 ft. depth

Bore Diameter 1:
Bore Diameter 2:
Bore Diameter 3:
Height: -2.00 ft. above grade
Casing Fitting: Drive shoe

Static Water Level: 13.00 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:
0.00 ft. after 0.00 hrs. pumping at 12.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Screen Installed: Yes **Well Intake:**
Filter Packed: No
Screen Diameter: 6.00 in. **Length:** 2.00 ft.
Screen Material Type:
Slot: 12.00 in. Set Between 24.00 ft. and 26.00 ft.
Blank: 0.00 ft. Above
Fittings:
Neoprene packer

Well Grouted: No **Grouting Method:**
No. of Bags: **Additives:**
Grouting Materials:

Well Head Completion: Pitless adapter

Nearest source of possible contamination:

Type	Distance	Direction
Septic tank	75.00 ft.	West

Drilling Machine Operator Name: HAKALA WELL AND PUMP

Employment: Unknown

Pump Installed: Yes **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: Other **Pump Type:** Submersible
Model Number: **Pump Capacity:** 0.00 GPM
Length of Drop Pipe: 15.00 ft. **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Formation Description	Thickness	Depth to Bottom
Sand	15.00	15.00
Hardpan	7.00	22.00
Sand Medium To Coarse	4.00	26.00

Geology Remarks: 1. [SAND] [15] [15] 2. [SEMI HARDPAN] [22] [7] 3. [MED-COARSE SAND] [26] [4]

Contractor Type: Unknown
Registration Number: 206
Business Name:
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks:

OTHER REMARKS **Pump Manufacturer:** FAIRBANKS HORSE

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:54

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Well ID: 52000005082

Tax No:	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
SE¼ NE¼ SW¼	3	47N 29W	2018352	001

Well ID: 52000005082

Elevation: 1549 ft

Latitude: 46.49699

Longitude: -87.91747

Distance and Direction from Road Intersection: LOCATED IN SOUTHEAST CORNER OF INTERSECTION OF M-95 AND US-41

Well Owner: Koski Korners Mobile Mart

Well Address:	Owner Address:
13041 US-41 CHAMPION MI 49814	13041 US-41 CHAMPION MI 49814

Drilling Method: Cable Tool
Well Depth: 70.00 ft. **Well Use:** Type II public
Well Type: New **Date Completed:** 12/5/1973
Casing Type: Steel - black
Casing Joint: Threaded & coupled
Diameter: 5.00 in. to 63.00 ft. depth

Bore Diameter 1: 5.00 in. to 70.00 ft. depth
Bore Diameter 2:
Bore Diameter 3:
Height: 1.00 ft. above grade
Casing Fitting: Drive shoe

Static Water Level: 11.00 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:
45.00 ft. after 1.00 hrs. pumping at 15.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well:
Abandoned well ID:

Screen Installed: No **Well Intake:** Bedrock Well
Filter Packed:
Screen Diameter: **Length:**
Screen Material Type:
Slot:
Blank:
Fittings:

Well Grouted: No **Grouting Method:**
No. of Bags: **Additives:**
Grouting Materials:

Well Head Completion: 12 inches above grade

Nearest source of possible contamination:

Type	Distance	Direction
Septic tank	75.00 ft.	North

Drilling Machine Operator Name: D. LENTZ
Employment: Unknown

Pump Installed: No **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: **Pump Type:**
Model Number: **Pump Capacity:**
Length of Drop Pipe: **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Formation Description	Thickness	Depth to Bottom
Loam	2.00	2.00
Gravel & Sand	20.00	22.00
Lithology Unknown	40.00	62.00
Black Shale	8.00	70.00

Geology Remarks: [1] TOP SOIL [3] HARD PAN

Contractor Type: Water well drilling contractor
Registration Number: 1216
Business Name: DAVID LENTZ DRILLING
Business Address: MICHIGAMME, MI

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks:
OTHER REMARKS

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/17/2004 11:01

GEOLOGICAL SURVEY NO.

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

WATER WELL AND PUMP RECORD

PERMIT NUMBER

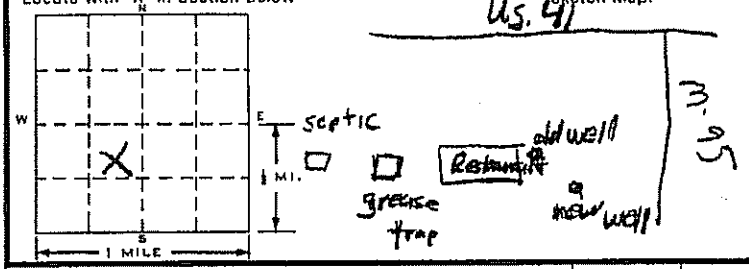
1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
Marquette	Humboldt	SE 1/4 NE 1/4 SW 1/4	3	47 N/S	29 E/W

Distance and Direction From Road Intersection: on the Junction of M-95 + US. 41 in Humboldt

Street Address & City of Well Location

Locate with "X" in Section Below



3 OWNER OF WELL

Address: Gossett Cafe + Inn, RR 1 Box 296A, Champion MI

Address Same As Well Location? [X] Yes [ ] No

4 WELL DEPTH: 38 FT. | Date Completed MO. 09 DAY 19 YEAR 90 | [ ] New Well [X] Replacement Well

5 [ ] Cable tool [X] Rotary [ ] Driven [ ] Dug [ ] Hollow rod [ ] Auger [ ] Jetted [ ]

6 USE: [ ] Domestic [ ] Type I Public [ ] Type III Public [ ] Irrigation [X] Type IIa Public [ ] Heat pump [ ] Test Well [ ] Type IIb Public [ ]

7 CASING: Diameter [X] Steel [ ] Threaded [ ] Plastic [X] Welded

6 in. to 36 ft. depth

_____ in. to _____ ft. depth

Grouted Drill Hole Diameter

8 in. to 25 ft. depth

_____ in. to _____ ft. depth

Height Above/Below Surface 1½ ft.

Weight 18.97 lbs./ft.

Drive Shoe [X] Yes [ ] No

2 FORMATION DESCRIPTION

FORMATION DESCRIPTION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
medium sand	20	20
clay / gravel	10	30
sand & gravel	8	38

Received SEP 28 1990 Env. Health MCHD

8 SCREEN: [ ] Not Installed

Type #304 St. St. Diameter 5"

Slot/Gauze 100 Length 3'

Set between 35 ft. and 38 ft.

FITTINGS: [X] K-Packer [ ] Lead Packer [ ] Bremer Check

[ ] Blank above screen _____ ft. Other _____

9 STATIC WATER LEVEL: 15 ft. below land surface [ ] Flow

10 PUMPING LEVEL: below land surface

35 ft. after ½ hrs. pumping at 12 G.P.M.

30 ft. after ½ hrs. pumping at 10 G.P.M.

11 WELL HEAD COMPLETION: [ ] Pitless adapter [X] 12" above grade [ ] Basement offset [ ] Approved pit

12 WELL GROUTED? [ ] No [X] Yes From 0 to 25 ft.

[ ] Neat cement [X] Bentonite [ ] Other _____

No. of bags of ~~cement~~ 1 Additives _____

13 Nearest source of possible contamination

Type Grease Trap Distance 75 ft. Direction West

Well disinfected upon completion? [X] Yes [ ] No

Was old well plugged? [ ] Yes [X] No

14 PUMP: [X] Not Installed [ ] Pump Installation Only

Manufacturer's name _____

Model number _____ HP _____ Volts _____

Length of Drop Pipe _____ ft. capacity _____ G.P.M.

TYPE: [ ] Submersible [ ] Jet _____

PRESSURE TANK:

Manufacturer's name _____

Model number _____ Capacity _____ Gallons

USE A 2ND SHEET IF NEEDED

15. Remarks, elevation, source of data, etc.

Type II - Supply

16. WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Kleiman Pump & Well Drlg. Inc. 2022

REGISTERED BUSINESS NAME REGISTRATION NO.

Address P.O. Box 704, Iron Mtn., Mi.

Signed Daryl Nemens Date 09-19-90

AUTHORIZED REPRESENTATIVE

17. Rig Operator's Name: Daryl Nemens

D67d 2/89

Authority: Act 368 PA 1978
Completion: Required
Penalty: Conviction of a violation of any provision is a misdemeanor.

GEOLOGICAL SURVEY COPY

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000002942 **Import ID:** 52472903006

Tax No: 0620301500	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
SW¼ NW¼ SW¼	3	47N 29W		

Well ID: 52000002942

Elevation: 1580 ft

Latitude: 46.4971218975

Longitude: -87.9272494079

Distance and Direction from Road Intersection: .125 MI W OF US41 AND M95

Well Owner: David Laitala

Well Address:	Owner Address:
15838 US41 HUMBOLDT MI 49814	15838 US41 HUMBOLDT MI 49814

Drilling Method: Cable Tool

Well Depth: 78.00 ft. **Well Use:** Household

Well Type: Replacement **Date Completed:** 3/7/1974

Casing Type: Unknown
Casing Joint: Threaded & coupled
Diameter: 5.00 in. to 76.00 ft. depth

Bore Diameter 1:
Bore Diameter 2:
Bore Diameter 3:
Height: 2.00 ft. above grade
Casing Fitting: Drive shoe

Pump Installed: Yes **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: Other **Pump Type:** Submersible
Model Number: **Pump Capacity:** 0.00 GPM
Length of Drop Pipe: 50.00 ft. **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Static Water Level: 999.99 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:
36.00 ft. after 1.00 hrs. pumping at 20.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Formation Description	Thickness	Depth to Bottom
Sand Gravel Clay	22.00	22.00
Sand & Gravel Fine W/Clay	18.00	40.00
Gravel Fine	38.00	78.00

Screen Installed: Yes **Well Intake:**
Filter Packed: No
Screen Diameter: 5.00 in. **Length:** 5.60 ft.
Screen Material Type:
Slot: 12.00 in. Set Between 72.40 ft. and 78.00 ft.
Blank: 0.00 ft. Above
Fittings:
Neoprene packer

Well Grouted: No **Grouting Method:**
No. of Bags: **Additives:**
Grouting Materials:

Well Head Completion: 12 inches above grade, Other

Geology Remarks: 1. [SAND, GRAVEL, CLAY] [22] [22] 2. [SAND, FINE GRAVEL, CLAY] [40] [18] 3. [FINE GRAVEL] [78] [38]

Nearest source of possible contamination:

Type	Distance	Direction
Septic tank	70.00 ft.	Northwest

Contractor Type: Unknown
Registration Number: 1269
Business Name:
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Drilling Machine Operator Name: DAVID LENTZ DRILLING

Employment: Unknown

Signature of Registered Contractor **Date**

General Remarks:

OTHER REMARKS **Well Head Completion:** 12 inch Above Grade **Pump Manufacturer:** VALLEY

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:55

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000002945 **Import ID:** 52472903009

Tax No: 0620302700	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
SW¼ SW¼ SW¼	3	47N 29W		

Well ID: 52000002945

Elevation: 1590 ft

Latitude: 46.4928860199

Longitude: -87.9265713645

Distance and Direction from Road Intersection: .5 MI W OF M95 US41, 1ST HOUSE ON LEFT

Well Owner: Elder Rautio

Well Address:	Owner Address:
CHAMPION MI 49814	CHAMPION MI 49814

Drilling Method: Cable Tool

Well Depth: 90.50 ft. **Well Use:** Household

Well Type: Replacement **Date Completed:**

Casing Type: Unknown
Casing Joint: Threaded & coupled
Diameter: 6.00 in. to 87.00 ft. depth

Bore Diameter 1:
Bore Diameter 2:
Bore Diameter 3:
Height: 1.00 ft. above grade
Casing Fitting: Drive shoe

Static Water Level: 42.00 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:
80.00 ft. after 1.00 hrs. pumping at 10.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Screen Installed: Yes **Well Intake:**
Filter Packed: No
Screen Diameter: 6.00 in. **Length:** 3.00 ft.
Screen Material Type:
Slot: 35.00 in. Set Between 87.00 ft. and 90.00 ft.
Blank: 0.00 ft. Above
Fittings:
Neoprene packer

Well Grouted: No **Grouting Method:**
No. of Bags: **Additives:**
Grouting Materials:

Well Head Completion: Pitless adapter

Nearest source of possible contamination:

Type	Distance	Direction
Septic tank	60.00 ft.	East

Drilling Machine Operator Name: HAKALA WELL AND PUMP

Employment: Unknown

Pump Installed: Yes **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: Other **Pump Type:** Submersible
Model Number: **Pump Capacity:** 0.00 GPM
Length of Drop Pipe: 69.00 ft. **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Formation Description	Thickness	Depth to Bottom
Sand & Gravel	7.00	7.00
Clay & Boulders Sandy	18.00	25.00
Gravel & Clay W/Boulders	56.00	81.00
Gravel Silty W/Clay	9.50	90.50

Geology Remarks: 1. [SAND AND GRAVEL] [7] [7] 2. [SANDY CLAY AND BOULDERS] [25] [18] 3. [PACKED GRAVEL,CLAY,BOULDERS] [81] [56] 4. [SILTY GRAVEL, SOME CLAY] [90.5] [9.5]

Contractor Type: Unknown
Registration Number: 206
Business Name:
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks:

OTHER REMARKS **Pump Manufacturer:** FAIRBANKS HORSE

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:55

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000005046

Tax No: 52-06-203-012-00	Permit No: 99-0257	County: Marquette	Township: Humbolt

Well ID: 52000005046

Elevation: 1549 ft

Latitude: 46.49634

Longitude: -87.9211

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
SW¼ NE¼ SW¼	3	47N 29W	2009152	003

Distance and Direction from Road Intersection: 250 feet south of US-41 on west side of junction US-41 & M-35

Well Owner: Francois Cafe

Well Address:	Owner Address:
Corner M-95 & US-41 Champion MI 49815	PO Box 41 Champion MI 49815

Drilling Method: Rotary

Well Depth: 325.00 ft. **Well Use:** Type II public

Well Type: Replacement **Date Completed:** 12/9/1999

Casing Type: Steel - black
Casing Joint: Welded
Diameter: 6.00 in. to 70.00 ft. depth

Bore Diameter 1: 6.00 in. to 325.00 ft. depth
Bore Diameter 2:
Bore Diameter 3:
Height: 1.00 ft. above grade
Casing Fitting: Drive shoe

Static Water Level: 32.00 ft. Below Grade(Not Flowing)
Yield Test Method: Test pump
Measurement Taken During Pump Test:
300.00 ft. after 24.00 hrs. pumping at 10.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well: Unknown
Abandoned well ID:

Screen Installed: No **Well Intake:** Bedrock Well
Filter Packed:
Screen Diameter: **Length:**
Screen Material Type:
Slot:
Blank:
Fittings:

Well Grouted: Yes **Grouting Method:** Driven/dry grout
No. of Bags: 5 **Additives:** None
Grouting Materials:
Bentonite dry granular From 0.00 ft. to 70.00 ft.

Well Head Completion: Pitless adapter

Nearest source of possible contamination:

Type	Distance	Direction
Septic tank	120.00 ft.	North
Other	100.00 ft.	North

Drilling Machine Operator Name: DEAN NUEUNS

Employment: Employee

Pump Installed: Yes **Pump Installation only:** No
Pump Installation date: **HP:** 5.00
Manufacturer: A.Y. McDonald **Pump Type:** Submersible
Model Number: #21075J2 **Pump Capacity:**
Length of Drop Pipe: 286.00 ft. **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: Yes
Pressure Tank Type: Diaphragm/bladder
Manufacturer: Well-X-Trol
Model Number : WX202 **Tank Capacity :** 32 Gallons
Pressure Relief Valve Installed : No

Formation Description	Thickness	Depth to Bottom
Gravel & Sand	10.00	10.00
Sand Coarse	5.00	15.00
Brown Gravel	15.00	30.00
Tan Sand	10.00	40.00
Brown Sand Silty	20.00	60.00
Sand & Gravel Silty	10.00	70.00
Black Unidentified Consolidated Fm Hard	40.00	110.00
Brown Unidentified Consolidated Fm	15.00	125.00
Black Unidentified Consolidated Fm Hard	75.00	200.00
Black & Gray Unidentified Consolidated Fm	10.00	210.00
Black Unidentified Consolidated Fm Hard	55.00	265.00
Brown Unidentified Consolidated Fm	5.00	270.00
Green Granite Hard	55.00	325.00

(Continued on Page 2)

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/17/2004 10:49

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000005046

Tax No: 52-06-203-012-00	Permit No: 99-0257	County: Marquette	Township: Humbolt

Well ID: 52000005046

Elevation: 1549 ft

Latitude: 46.49634

Longitude: -87.9211

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
SW¼ NE¼ SW¼	3	47N 29W	2009152	003

Distance and Direction from Road Intersection: 250 feet south of US-41 on west side of junction US-41 & M-35

Well Owner: Francois Cafe

Well Address:	Owner Address:
Corner M-95 & US-41 Champion MI 49815	PO Box 41 Champion MI 49815

(Continued from Page 1)

Formation Description	Thickness	Depth to Bottom

(Continued from Page 1)

Geology Remarks: [1] CLEAN GRAVEL & SAND [2] CLEAN COARSE GRAVEL [3] DARK BROWN DIRTY GRAVEL [8] SOFTER [10] SOFTER [12] SOFTER, WATER-BEARING [13] DARK GREEN AND HARD

Contractor Type: Water well drilling contractor
Registration Number: 575
Business Name: KLEIMAN PUMP & WELL DRILLING
Business Address: PO BOX 704, IRON MT, MI

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks: KEPT MOUNDED WITH GRANULAR BENTONITE WELL WAS HYDRAULICALLY FRACTURED

OTHER REMARKS **Source Type 2:** grease trap

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/17/2004 10:49

TAX NO: 52-06-203-026-00

MICHIGAN DEPARTMENT OF PUBLIC HEALTH
WATER WELL AND PUMP RECORD

PERMIT NO: 89-0247

1. LOCATION OF WELL

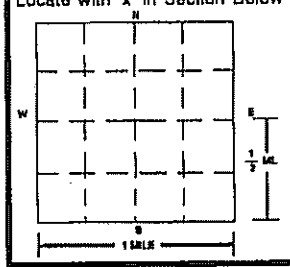
County	Township Name	Fraction	Section No.	Town No.	Range No.
Marquette	Humboldt	NW 1/4 SW 1/4 SW 1/4	3	47N	29W

Distance and Direction from Road Intersection

Street Address & City of Well Location

Locate with 'x' in Section Below

Sketch Map



3. OWNER OF WELL
Address Robert Flasch
Rt 1 Box 88A
Champion MI 49814
Address Same as Well Location ☒ Yes ☐ No

4. WELL DEPTH: 125 ft. Date Completed 9-1-89 ☐ New Well ☒ Replacement Well

5. ☐ Cable Tool ☒ Rotary ☐ Driven ☐ Dug ☐ Hollow Rod ☐ Auger/Bored ☐ Jetted ☐ ____

6. USE: ☒ Household ☐ Type I Public ☐ Type III Public ☐ Irrigation ☐ Type IIa Public ☐ Heat Pump ☐ Test Well ☐ Type IIb Public ☐ ____

7. CASING: ☒ Steel ☐ Threaded ☐ Plastic ☒ Welded ☐ Other ____
Diameter: 5 in. to 118 ft. depth
____ in. to ____ ft. depth
BORE HOLE:
Diameter: 5 in. to 125 ft. depth
____ in. to ____ ft. depth
Height: Above/~~Below~~ Surface: 1+ ft
Weight: 15 lbs./ft.
☒ Drive Shoe ☐ Shale Packer

8. SCREEN: ☐ Not Installed ☐ Gravel-Packed
Type Johnson S.S. Diameter 5"
Slot/Gauze .012 + .018 Length: 6'10
Set Between 118 ft. and 125 ft.
FITTINGS: ☒ K-Packer ☐ Bremer Check
☐ Blank Above Screen ____ ft. Other ____

9. STATIC WATER LEVEL:
48 ft. Below Land Surface ☐ Flowing

10. PUMPING LEVEL: Below Land Surface
90 ft. After 1 hrs. Pumping at 5+ G.P.M.
☐ Plunger ☐ Bailer ☒ Air ☐ Test Pump

11. WELL HEAD COMPLETION:
☒ Pitless Adapter ☐ 12" Above Grade
☐ Basement Offset ☐ Well House

12. WELL GROUTED? ☒ No ☐ Yes From ____ to ____ ft.
☐ Neat Cement ☐ Bentonite ☐ Other ____
No. of Bags ____ Additives ____

13. NEAREST SOURCE OF POSSIBLE CONTAMINATION NA
Type ____ Distance ____ ft. Direction ____
Type ____ Distance ____ ft. Direction ____

14. PUMP: ☐ Not Installed ☐ Pump Installation Only
Manufacturer's Name Georgia Pacific
Model Number 7C11 HP 1/2 Volts 230-2
Length of Drop Pipe 90 ft. Capacity ____ G.P.M.
TYPE: ☒ Submersible ☐ Jet ☐ Other ____
PRESSURE TANK:
Manufacturer's Name ____
Model Number ____ Capacity ____ Gallons ____

2. FORMATION DESCRIPTION

	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Sand, Clay + Boulders	30	30
Hardpan + Clay Mix	85	115
Mixed sand + gravel with Clay — loose	10	125

Received JAN 5 1996 Env. Health MCHD

PCB's from pump in old well (inside garage) -

USE A 2ND SHEET IF NEEDED

15. ABANDONED WELL PLUGGED? ☒ Yes ☐ No
Casing Diameter 6 in. Depth 100 ft.
PLUGGING MATERIAL: ☐ Neat Cement ☐ Bentonite Slurry
☐ Cement/Bentonite Slurry ☐ Concrete Grout ☒ Bentonite Chips
No. of Bags (15-20) ? Casing Removed? ☐ Yes ☒ No

16. REMARKS: (Elevation, Source of Data, etc.)

17. DRILLING MACHINE OPERATOR:
☒ Employee ☐ Subcontractor
Name [illegible]

15. WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
[illegible] Well + Pump 0206
REGISTERED BUSINESS NAME REGISTRATION NO.
Address Negaunee MI 49866
Signed [illegible] Date 1/5/96
AUTHORIZED REPRESENTATIVE

GW-2-228 9/93

Authority: Act 368 PA 1978
Completion: Required
Penalty: Conviction of a violation of any provision is a misdemeanor.

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No. [ ]

WATER WELL RECORD
ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

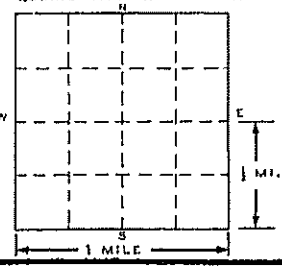
1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
Marquette	Humboldt	NE. SW SE¼	3	47 N/S.	29 E/W.

Distance And Direction from Road Intersections

Street address & City of Well Location

Locate with "X" in section below



Sketch Map:

Received
APR 1 1 1995
Env. Health MCHD

3 OWNER OF WELL: Steve Frisk
Address Rte 2 Box 875 Cottage
~~Humboldt, Michigan~~
Ishpeming, Michigan

4 WELL DEPTH: (completed) 183 ft. **Date of Completion** 4-28-77

5 ☐ Cable tool ☒ Rotary ☐ Driven ☐ Dug ☐ Hollow rod ☐ Jetted ☐ Bored ☐ ____

6 USE: ☒ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Air Conditioning ☐ Commercial ☐ Test Well ☐ ____

7 CASING: Threaded ☐ Welded ☒ Diam. 6 in. to 26'-10¾" Depth ____ in. to ____ ft. Depth
Height: Above/Below Surface 1 ft. Weight 18.97 lbs./ft. Drive Shoe? Yes ☒ No ☐

2 FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
clay & boulders	25	25
Slate	158	183

8 SCREEN:
Type: ____ Dia.: ____
Slot/Gauze ____ Length ____
Set between ____ ft. and ____ ft.
Fittings:

9 STATIC WATER LEVEL
2½ ft. below land surface

10 PUMPING LEVEL below land surface
183 ft. after 1 hrs. pumping ½ g.p.m.
____ ft. after ____ hrs. pumping ____ g.p.m.

11 WATER QUALITY in Parts Per Million:
Iron (Fe) ____ Chlorides (Cl) ____
Hardness ____ Other ____

12 WELL HEAD COMPLETION: ☐ In Approved Pit ☐ Pitless Adapter ☒ 12" Above Grade

13 Well Grouted? ☐ Yes ☒ No ☐ Neat Cement ☐ Bentonite ☐ ____
Depth: From ____ ft. to ____ ft.

14 Nearest Source of possible contamination None
____ feet ____ Direction ____ Type
Well disinfected upon completion ☒ Yes ☐ No

15 PUMP: ☒ Not Installed
Manufacturer's Name ____
Model Number ____ HP ____ Volts ____
Length of Drop Pipe ____ ft. capacity ____ G.P.M.
Type: ☐ Submersible ☐ Jet ☐ Reciprocating

USE A 2ND SHEET IF NEEDED

16 Remarks, elevation, source of data, etc.

DIST. 3 OFFICE
DNR - ESCANABA, MI
MAY 1 2 1995

17 WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Kleiman Pump & Well Drlg, Inc 0575
REGISTERED BUSINESS NAME REGISTRATION NO.
Address P.O. Box 704, Iron Mountain
Signed ____ Date 5-3-77
AUTHORIZED REPRESENTATIVE

D67d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No. [ ] JAN 5 1982 [ ]

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

1 LOCATION OF WELL

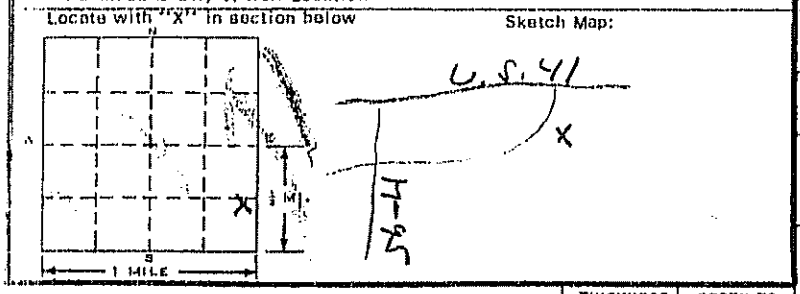
County	Township Name	Fraction	Section Number	Town Number	Range Number
MARQUETTE	HUMBOLDT	NE¼SE¼SE¼	3	47 (N)S.	29 E(W)

Distance And Direction from Road Intersections: ½ MILE EAST THEN ⅛ MILE SOUTH OF INTERSECT OF U.S. 41 + M-95

Street address & City of Well Location

Locate with "X" in section below

Sketch Map:



3 OWNER OF WELL: GLEN CHAPMAN

Address: CHAMPION, MI 49814

4 WELL DEPTH: (completed) 61' ft. Date of Completion: 12 DEC 81

5 [ ] Cable tool [x] Rotary [ ] Driven [ ] Dug [ ] Hollow rod [ ] Jetted [ ] Bored [ ]

6 USE: [x] Domestic [ ] Public Supply [ ] Industry [ ] Irrigation [ ] Air Conditioning [ ] Commercial [ ] Test Well [ ]

7 CASING: Threaded [ ] Welded [x] Diam. 6 in. to 28 ft. Depth; ___ in. to ___ ft. Depth

Height: Above/Below Surface 1 ft. Weight 19.45 lbs./ft. Drive Shoe? Yes [x] No [ ]

2 FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
SAND, CLAYEY	3	3
SAND	11	14
GRAVEL, CLAYEY	8	22
CLAY	6	28
ROCK	33	61

USE A 2ND SHEET IF NEEDED

8 SCREEN: Type: ___ Dia.: ___ Slot/Gauze ___ Length ___ Set between ___ ft. and ___ ft. Fittings:

9 STATIC WATER LEVEL: 6 ft. below land surface

10 PUMPING LEVEL below land surface: 25 ft. after ___ hrs. pumping 12 g.p.m.; ___ ft. after ___ hrs. pumping ___ g.p.m.

11 WATER QUALITY in Parts Per Million: Iron (Fe) ___ Chlorides (Cl) ___ Hardness ___ Other ___

12 WELL HEAD COMPLETION: [ ] In Approved Pit [x] Pitless Adapter [ ] 12" Above Grade

13 Well Grouted? [ ] Yes [x] No [ ] Neat Cement [ ] Bentonite [ ] ___ Depth: From ___ ft. to ___ ft.

14 Nearest Source of possible contamination: 75 feet NW Direction SEPTIC Type. Well disinfected upon completion [ ] Yes [ ] No

15 PUMP: [ ] Not installed. Manufacturer's Name MYERS. Model Number SH 52 E11 HP ½ Volts 230. Length of Drop Pipe 42 ft. capacity 11 G.P.M. Type: [x] Submersible [ ] Jet [ ] Reciprocating

16 Remarks, elevation, source of data, etc.

17 WATER WELL CONTRACTOR'S CERTIFICATION: This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

[signature] Sintala WELL DRILLING 0154

REGISTERED BUSINESS NAME REGISTRATION NO.

Address HANCOCK MI.

Signed [signature] Date 12/15/81

AUTHORIZED REPRESENTATIVE

D67d 100M (Rev. 12-68) JAN 7 1982

GEOLOGICAL SURVEY COPY

AMPLE No.

WATER WELL RECORD

ACT 294 PA 1965

SRR
Probably SW NW SE 3

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

1 LOCATION OF WELL	Township Name	Fraction	Section Number	Town Number	Range Number
MARQUETTE	HUMBOLT	PARCEL IN NW¼ SE ¼ ¼	3	47 N/S.	29 E/W.

Direction from Road Intersections

E 100' of W. 200' of NW 1/4 of SE 1/4 lying South of present Hwy US41

Sketch Map:

3 OWNER OF WELL: DONALD STRONGMAN

Address BOX 595 RTE 1 ISHPEMING, MICH.

4 WELL DEPTH: (completed) 70 ft. Date of Completion

5 [X] Cable tool [ ] Rotary [ ] Driven [ ] Dug [ ] Hollow rod [ ] Jetted [ ] Bored [ ]

6 USE: [X] Domestic [ ] Public Supply [ ] Industry [ ] Irrigation [ ] Air Conditioning [ ] Commercial [ ] Test Well [ ]

7 CASING: Threaded [X] Welded [ ] Diam. 5 in. to 63 ft. Depth ___ in. to ___ ft. Depth

Height: Above/Below Surface 1 ft. Weight 15 lbs./ft. Drive Shoe? Yes [X] No [ ]

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Top Soil	2	2
Gravel & Sand	20	22
Hard pand	40	62
Black Shale	8	70

8 SCREEN:

Type: ___ Dia.: ___

Slot/Gauze ___ Length ___

Set between ___ ft. and ___ ft.

Fittings:

9 STATIC WATER LEVEL

11 ft. below land surface

10 PUMPING LEVEL below land surface

45 ft. after 1 hrs. pumping 15 g.p.m.

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

11 WATER QUALITY in Parts Per Million:

Iron (Fe) ___ Chlorides (Cl) ___

Hardness ___ Other ___

12 WELL HEAD COMPLETION: [ ] In Approved Pit [ ] Pitless Adapter [X] 12" Above Grade

13 Well Grouted? [ ] Yes [X] No [ ] Neat Cement [ ] Bentonite [ ] ___

Depth: From ___ ft. to ___ ft.

14 Nearest Source of possible contamination

75 feet N Direction Septic Type

Well disinfected upon completion [ ] Yes [X] No

15 PUMP: [X] Not installed

Manufacturer's Name ___

Model Number ___ HP ___ Volts ___

Length of Drop Pipe ___ ft. capacity ___ G.P.M.

Type: [ ] Submersible [ ] Jet [ ] Reciprocating

Source of data, etc.

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

DAVID LENTZ DRILLING 1216

REGISTERED BUSINESS NAME REGISTRATION NO.

Address MICHIGAMME, MICH. 49861

Signed ___ Date 12/5/73

AUTHORIZED REPRESENTATIVE

Date ... 1974

GEOLOGICAL SURVEY SAMPLE No.

WATER WELL RECORD
ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

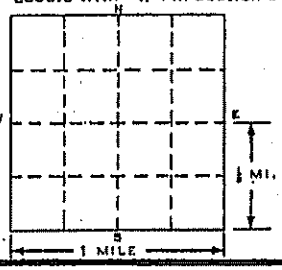
1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
Marquette	Humboldt	SW ¼ SW ¼ SW ¼	3	47 N/S.	29 W.

Distance and Direction from Road Intersections

Street address & City of Well Location

Locate with "X" in section below — Sketch Map:



3 OWNER OF WELL
Louis Pizzali

Address Humboldt

4 WELL DEPTH: (completed) Date of Completion
63 ft. 4-4-77

5
☐ Cable tool ☒ Rotary ☐ Driven ☐ Dug
☐ Hollow rod ☐ Jetted ☐ Bored ☐ ____

6 USE:
☒ Domestic ☐ Public Supply ☐ Industry
☐ Irrigation ☐ Air Conditioning ☐ Commercial
☐ Test Well ☐ ____

7 CASING:
Threaded ☒ Welded ☐ Diam.

6 in. to 32 ft. Depth

____ in. to ____ ft. Depth

Height (Above) Below Surface 1 ft.

Weight 20 lbs./ft.

Drive Shoe? Yes ☒ No ☐

2 FORMATION

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Open hole	12	12
Sand & gravel	6	18
Sand, gravel & clay	14	32
Michigamme granite	31	63

USE A 2ND SHEET IF NEEDED

8 SCREEN:
Type: NONE Dia.: ____

Slot/Gauze ____ Length ____

Set between ____ ft. and ____ ft.

Fittings:

9 STATIC WATER LEVEL
15 ft. below land surface

10 PUMPING LEVEL below land surface
40 ft. after 1 hrs. pumping 5 g.p.m.

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

11 WATER QUALITY in Parts Per Million:
Iron (Fe) ____ Chlorides (Cl) ____

Hardness ____ Other ____

12 WELL HEAD COMPLETION:
☐ In Approved Pit
☐ Pitless Adapter ☒ 12" Above Grade

13 Well Grouted?
☐ Yes ☒ No
☐ Neat Cement ☐ Bentonite ☐ ____

Depth: From ____ ft. to ____ ft.

14 Nearest Source of possible contamination
80 feet N Direction Septic Type

Well disinfected upon completion ☐ Yes ☐ No

15 PUMP:
☐ Not Installed

Manufacturer's Name ____

Model Number ____ HP ____ Volts ____

Length of Drop Pipe ____ ft. capacity ____ G.P.M.

Type: ☐ Submersible ☐ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.

17 WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Jerk Well Mfg. 0800

REGISTERED BUSINESS NAME — REGISTRATION NO.

Address 2870 M-35 Marquette

Signed Jerry Dent — Date 4-9-77

AUTHORIZED REPRESENTATIVE

D67d 100M (Rev. 12-68)

MAY 9 1977

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No.

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

1 LOCATION OF WELL

County	Twp.	Fraction	Section No.	Town	Range
Menominee	Hum. bold +	SW ¼ SW ¼	3	47 N/S	29 E/W

Distance And Direction from Road Intersections: 1/4 Mile North of US 41 or [illegible] US 41

OWNER No.

Street address & City of Well Location

3 OWNER OF WELL: Benson J. Carriere

Address: Box 116 Champion Mich.

2 FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
0'-2" Top soil	2	2
2'-30' Sand Clay	28	30
30'-60' Clay & Sand	30	60
60'-66' Clean Sand &	6	66
Gravel	T.D.	66'
[illegible] 5-13-68		
		66'

4 WELL DEPTH: (completed) 66 ft. Date of Completion 3/15/68

5 ☒ Cable tool ☐ Rotary ☐ Driven ☐ Dug ☐ Hollow rod ☐ Jetted ☐ Bored ☐

6 USE: ☒ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Air Conditioning ☐ Commercial ☐ Test Well ☐

7 CASING: Diam. 7 in. to 66 ft. Depth; Threaded ☒ Welded ☐; Height: Above/Below surface 66 ft.; Weight 28 lbs/ft.; Drive Shoe? Yes ☒ No ☐

8 SCREEN: Type: Dia.: Slot/Gauze Length Set between ft. and ft. Fittings:

9 STATIC WATER LEVEL 10' ft. below land surface

10 PUMPING LEVEL below land surface ft. after 24 hrs. pumping 6 g.p.m. ft. after hrs. pumping g.p.m.

11 WATER QUALITY in Parts Per Million: Iron (Fe) Chlorides (Cl) Hardness

12 WELL HEAD COMPLETION: ☐ In Approved Pit ☒ Pitless Adapter ☒ 12" Above Grade

13 GROUTING: Well Grouted? ☐ Yes ☒ No Material: ☐ Neat Cement ☐ Depth: From ft. to ft.

14 SANITARY: Nearest Source of possible contamination 65' feet N Direction Septic Tank Type Well disinfected upon completion ☒ Yes ☐ No

15 PUMP: Manufacturer's Name Model Number HP Length of Drop Pipe ft. capacity 6 G.P.M. Type: ☐ Submersible ☐ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.

17 WATER WELL CONTRACTOR'S CERTIFICATION: This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Lost Well Drillers — REGISTERED BUSINESS NAME

0800 — REGISTRATION NO.

Address Box 16 Michigamme Mich.

Signed Henry Lentz — AUTHORIZED REPRESENTATIVE

Date 3/20/68

0670 M 6-66

MAY - 6 '68 GEOLOGICAL SURVEY COPY

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000002957 | Import ID: 52472903021

Tax No:	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
SE¼ NE¼ SE¼	3	47N 29W		

Well ID: 52000002957

Elevation: 1580 ft

Latitude: 46.4975253695

Longitude: -87.9073794491

Distance and Direction from Road Intersection: 500 FT E OF M95 AND US 41 JUNCTION

Well Owner: Richard F Stetson

Well Address:	Owner Address:
US 41 CHAMPION MI 49814	US 41 CHAMPION MI 49814

Drilling Method: Driven Hand

Well Depth: 25.00 ft. | **Well Use:** Household

Well Type: Replacement | **Date Completed:** 8/13/1968

Casing Type: Unknown
Casing Joint: Threaded & coupled
Diameter: 1.25 in. to 25.00 ft. depth
3.00 in. to 25.00 ft. depth

Bore Diameter 1:
Bore Diameter 2:
Bore Diameter 3:
Height: 1.20 ft. above grade
Casing Fitting: Drive shoe

Pump Installed: Yes | **Pump Installation only:** No
Pump Installation date: | **HP:**
Manufacturer: Other | **Pump Type:** Jet
Model Number: | **Pump Capacity:**
Length of Drop Pipe: 25.00 ft. | **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : | **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Static Water Level: 15.00 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Formation Description	Thickness	Depth to Bottom
Sand	25.00	25.00

Screen Installed: No | **Well Intake:** Unknown
Filter Packed:
Screen Diameter: | **Length:**
Screen Material Type:
Slot:
Blank:
Fittings:

Well Grouted: Yes | **Grouting Method:** Unknown
No. of Bags: | **Additives:** None
Grouting Materials:
Unknown | From 0.00 ft. to 0.00 ft.

Well Head Completion: 12 inches above grade, Other

Geology Remarks: 1. [SAND] [25] [25]

Nearest source of possible contamination:

Type	Distance	Direction
Septic tank	50.00 ft.	North

Contractor Type: Unknown
Registration Number:
Business Name:
Business Address:

Drilling Machine Operator Name:

Employment: Unknown

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks:

OTHER REMARKS **Well Head Completion:** 12 inch Above Grade **Pump Manufacturer:** MONTGOMERY WARD

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:55

GEOLOGICAL SURVEY SAMPLE No.

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

✓AB

1 LOCATION OF WELL

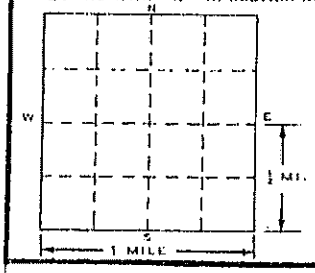
County	Township Name	Fraction	Section Number	Town Number	Range Number
Marquette	Humboldt	SW¼SW¼SW¼	3	47 N/S.	29 E/W.

Distance And Direction from Road Intersections

Street address & City of Well Location

Locate with "X" in section below

Sketch Map:



3 OWNER OF WELL:

Address: James DeLongchamp, Route 1, Box 88B, Champion, Michigan

4 WELL DEPTH: (completed)

76 ft. Date of Completion: ~~[illegible]~~ 1-4-78

5

☒ Cable tool ☐ Rotary ☐ Driven ☐ Dug ☐ Hollow rod ☐ Jetted ☐ Bored ☐ ____

6 USE:

☒ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Air Conditioning ☐ Commercial ☐ Test Well ☐ ____

7 CASING:

Threaded ☐ Welded ☒

Diam. 6 in. to 75 ft. Depth

____ in. to ____ ft. Depth

Height: Above/Below Surface 1 ft.

Weight 18.97 lbs./ft.

Drive Shoe? Yes ☒ No ☐

2

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Gravel, Sand	38	38
Sand	38	76

USE A 2ND SHEET IF NEEDED

8 SCREEN:

Type: #304 SS WW Dia.: 6"

Slot/Gauze 14 Length 3'

Set between 73 ft. and 76 ft.

Fittings: Std

9 STATIC WATER LEVEL

50 ft. below land surface

10 PUMPING LEVEL below land surface

69 ft. after 2 hrs. pumping 8 g.p.m.

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

11 WATER QUALITY in Parts Per Million:

Iron (Fe) ____ Chlorides (Cl) ____

Hardness ____ Other ____

12 WELL HEAD COMPLETION:

☐ In Approved Pit ☒ Pitless Adapter ☒ 12" Above Grade

13

Well Grouted? ☐ Yes ☒ No

☐ Neat Cement ☐ Bentonite ☐ ____

Depth: From ____ ft. to ____ ft.

14 Nearest Source of possible contamination

____ feet ____ Direction ____ Type

Well disinfected upon completion ☒ Yes ☐ No

15 PUMP:

☐ Not Installed

Manufacturer's Name Fada

Model Number 7D9P031 HP 1/3 Volts 230

Length of Drop Pipe 65 ft. capacity 7 G.P.M.

Type: ☒ Submersible ☐ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Kleiman Pump & Well Drlg, Inc. 0575

REGISTERED BUSINESS NAME / REGISTRATION NO.

Address P.O. Box 704, Iron Mountain

Signed N.P. [signature] Date 1-5-78

AUTHORIZED REPRESENTATIVE

D67d 100M (Rev. 12-68)

FEB 10 1978

GEOLOGICAL SURVEY COPY

Section 10

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000002987 **Import ID:** 52472910002

Tax No: 0621000810	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
SW¼ SW¼ SW¼	10	47N 29W		

Well ID: 52000002987

Elevation: 1600 ft

Latitude: 46.4788454783

Longitude: -87.9278202594

Distance and Direction from Road Intersection: CR FB 4079

Well Owner: Curt Skytta

Well Address:	Owner Address:
4079 CR FB CHAMPION MI 49814	4079 CR FB CHAMPION MI 49814

Drilling Method: Rotary

Well Depth: 303.00 ft. **Well Use:** Household

Well Type: Replacement **Date Completed:** 10/3/1978

Casing Type: Unknown
Casing Joint: Welded
Diameter: 6.00 in. to 26.40 ft. depth

Bore Diameter 1:
Bore Diameter 2:
Bore Diameter 3:
Height: 1.00 ft. above grade
Casing Fitting: Drive shoe

Pump Installed: No **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: **Pump Type:**
Model Number: **Pump Capacity:**
Length of Drop Pipe: **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Static Water Level: 10.00 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:
303.00 ft. after 3.00 hrs. pumping at 1.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Formation Description	Thickness	Depth to Bottom
Clay & Boulders	10.00	10.00
Black Granite	293.00	303.00

Screen Installed: No **Well Intake:** Unknown
Filter Packed:
Screen Diameter: **Length:**
Screen Material Type:
Slot:
Blank:
Fittings:

Well Grouted: Yes **Grouting Method:** Unknown
No. of Bags: **Additives:** None
Grouting Materials:
Other From 0.00 ft. to 25.00 ft.

Well Head Completion: 12 inches above grade, Other

Geology Remarks: 1. [CLAY AND BOULDERS] [10] [10] 2. [BLACK GRANITE] [303] [293]

Nearest source of possible contamination:

Type	Distance	Direction
None		

Contractor Type: Unknown
Registration Number: 575
Business Name:
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Drilling Machine Operator Name: KLEIMAN PUMP AND WELL DRILLING
Employment: Unknown

Signature of Registered Contractor **Date**

General Remarks:

OTHER REMARKS **Grouting Material 1:** Listed as other in Wellkey **Well Head Completion:** 12 inch Above Grade

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:55

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000002988 **Import ID:** 52472910003

Tax No: 0621000810	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
SW¼ SW¼ SW¼	10	47N 29W		

Well ID: 52000002988

Elevation: 1600 ft

Latitude: 46.4788619762

Longitude: -87.9278521362

Distance and Direction from Road Intersection:

Well Owner: Curt Skytta

Well Address:	Owner Address:
4079 CO RD FB CHAMPION MI 49814	4079 CO RD FB CHAMPION MI 49814

Drilling Method: Rotary
Well Depth: 199.00 ft. **Well Use:** Household
Well Type: Replacement **Date Completed:**
Casing Type: Unknown
Casing Joint: Welded
Diameter: 6.00 in. to 26.20 ft. depth

Bore Diameter 1:
Bore Diameter 2:
Bore Diameter 3:
Height: -1.00 ft. above grade
Casing Fitting: Drive shoe

Pump Installed: No **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: **Pump Type:**
Model Number: **Pump Capacity:**
Length of Drop Pipe: **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Static Water Level: 999.99 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Formation Description	Thickness	Depth to Bottom
Clay & Gravel	13.00	13.00
Granite	186.00	199.00

Screen Installed: No **Well Intake:** Unknown
Filter Packed:
Screen Diameter: **Length:**
Screen Material Type:
Slot:
Blank:
Fittings:

Well Grouted: Yes **Grouting Method:** Unknown
No. of Bags: **Additives:** None
Grouting Materials:
Other From 6.00 ft. to 26.00 ft.

Well Head Completion: 12 inches above grade, Other

Geology Remarks: 1. [CLAY AND GRAVEL] [13] [13] 2. [GRANITE] [199] [186]

Nearest source of possible contamination:

Type	Distance	Direction
Septic tank	75.00 ft.	South

Contractor Type: Unknown
Registration Number: 800
Business Name:
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Drilling Machine Operator Name: LENTZ WELL DRILLING

Employment: Unknown

Signature of Registered Contractor **Date**

General Remarks:
OTHER REMARKS **Grouting Material 1:** Listed as other in Wellkey **Well Head Completion:** 12 inch Above Grade

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:55

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000004037

Tax No:	Permit No: 200805	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
SW¼ NW¼ NW¼	10	47N 29W		

Well ID: 52000004037

Elevation:

Latitude: 46.4895342

Longitude: -87.92796934

Distance and Direction from Road Intersection: 1/4 MILE SOUTH EAST ON CO RD FNO FROM INT SECT WITH CO RD FA

Well Owner: Karl H Laaninen

Well Address:

Owner Address:
2806 AURORA DRIVE
LANSING MI 48910 3806

Drilling Method: Other

Well Depth: 301.00 ft. **Well Use:** Household

Well Type: New **Date Completed:** 9/29/2000

Casing Type: Steel - black
Casing Joint: Welded
Diameter: 6.00 in. to 30.00 ft. depth

Bore Diameter 1: 6.00 in. to 301.00 ft. depth
Bore Diameter 2:
Bore Diameter 3:
Height: 1.80 ft. above grade
Casing Fitting: Drive shoe

Pump Installed: No **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: **Pump Type:**
Model Number: **Pump Capacity:**
Length of Drop Pipe: **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Static Water Level: 14.00 ft. Below Grade(Not Flowing)
Yield Test Method: Air
Measurement Taken During Pump Test:
300.00 ft. after 1.00 hrs. pumping at 5.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Formation Description	Thickness	Depth to Bottom
See Comments	12.00	12.00
Sand & Gravel	3.00	15.00
Silt Sand Gravel	15.00	30.00
Red Granite White	60.00	90.00
White Unidentified Consolidated Fm Soft Green	30.00	120.00
Red Granite Black & White	181.00	301.00

Screen Installed: No **Well Intake:** Bedrock Well
Filter Packed:
Screen Diameter: **Length:**
Screen Material Type:
Slot:
Blank:
Fittings:

Well Grouted: Yes **Grouting Method:** Unknown
No. of Bags: 4 **Additives:** None
Grouting Materials:
Bentonite slurry

Well Head Completion: 12 inches above grade, Pitless adapter

Geology Remarks: #1 SILT, SAND W/GRAVEL COBBLE & BOULDERS

Nearest source of possible contamination:

Type	Distance	Direction
Septic tank	100.00 ft.	Southeast

Contractor Type: Water well drilling contractor
Registration Number: 2022
Business Name: KLEIMAN PUMP & WELL DRLG INC
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Drilling Machine Operator Name: DARYL NEUENS

Employment: Employee

Signature of Registered Contractor **Date**

General Remarks: THIS IS 2ND ATTEMPT; FIRST ATTEN CASING KINKED

OTHER REMARKS **Drilling Method:** ROTARY & PERCUSSION

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

3/26/2002 13:20

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000004311

Tax No: 52-06-210-003-50	Permit No: 210172	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
NE¼ SW¼ NW¼	10	47N 29W		

Distance and Direction from Road Intersection: 1/2 MILE EAST ON 601; ON LEFT

Well ID: 52000004311

Elevation:

Latitude: 46.48851052

Longitude: -87.92470231

Well Owner: Chris & Holly Ray

Well Address:	Owner Address:
CO 601 HUMBOLT MI	CO 601 HUMBOLT MI

Drilling Method: Rotary

Well Depth: 300.00 ft. **Well Use:** Household

Well Type: New **Date Completed:** 7/10/2001

Casing Type: Steel - black
Casing Joint: Welded
Diameter: 6.00 in. to 28.00 ft. depth

Bore Diameter 1: 8.00 in. to 28.00 ft. depth
Bore Diameter 2: 6.00 in. to 300.00 ft. depth
Bore Diameter 3:
Height: 2.00 ft. above grade
Casing Fitting: Drive shoe

Pump Installed: No **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: **Pump Type:**
Model Number: **Pump Capacity:**
Length of Drop Pipe: **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Static Water Level: 89.00 ft. Below Grade(Not Flowing)
Yield Test Method: Test pump
Measurement Taken During Pump Test:
280.00 ft. after 24.00 hrs. pumping at 4.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Formation Description	Thickness	Depth to Bottom
Loam W/Boulders	5.00	5.00
Boulders W/Clay Hard	7.00	12.00
See Comments	6.00	18.00
See Comments	52.00	70.00
Red Slate Soft Green	20.00	90.00
Iron Formation	50.00	140.00
Red Quartzite Gray	70.00	210.00
Gray Quartzite Stringers Red	90.00	300.00

Screen Installed: No **Well Intake:** Bedrock Well
Filter Packed:
Screen Diameter: **Length:**
Screen Material Type:
Slot:
Blank:
Fittings:

Well Grouted: Yes **Grouting Method:** Unknown
No. of Bags: 4 **Additives:** None
Grouting Materials:
Neat cement From 0.00 ft. to 28.00 ft.

Well Head Completion: 12 inches above grade

Geology Remarks: #3 BROKEN ROCK, QUARTZITE; #4 QUARTZITE WITH HEMIETITE

Nearest source of possible contamination:

Type	Distance	Direction
Septic tank	150.00 ft.	Southeast

Contractor Type: Water well drilling contractor
Registration Number: 575
Business Name: KLEIMAND PUMP & WELL
Business Address:

Drilling Machine Operator Name: DEAN NEUENS

Employment: Employee

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks: WELL TO BE HYDRO FRACTURED; 30 TOTAL PIPE

OTHER REMARKS

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

8/13/2002 13:38

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000002986 **Import ID:** 52472910001

Tax No: 0621000430	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
SW¼ NW¼ NW¼	10	47N 29W		

Well ID: 52000002986

Elevation: 1590 ft

Latitude: 46.4895130177

Longitude: -87.9277731009

Distance and Direction from Road Intersection: EITHER 3636 OR 3789

Well Owner: Michael Jarvi

Well Address:	Owner Address:
CR FND CHAMPION MI 49814	CR FND CHAMPION MI 49814

Drilling Method: Driven Hand

Well Depth: 22.00 ft. **Well Use:** Household

Well Type: Replacement **Date Completed:**

Casing Type: Unknown
Casing Joint: Unknown
Diameter: 1.50 in. to 22.00 ft. depth

Bore Diameter 1:
Bore Diameter 2:
Bore Diameter 3:
Height: 0.00 ft. above grade
Casing Fitting: None

Static Water Level: 15.00 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Screen Installed: Yes **Well Intake:**
Filter Packed: No
Screen Diameter: 1.25 in. **Length:** 0.00 ft.
Screen Material Type:
Slot: 0.00 in. Set Between 0.00 ft. and 0.00 ft.
Blank: 0.00 ft. Above
Fittings:
None

Well Grouted: Yes **Grouting Method:** Unknown
No. of Bags: **Additives:** None
Grouting Materials:
Unknown From 0.00 ft. to 0.00 ft.

Well Head Completion: 12 inches above grade, Other

Nearest source of possible contamination:

Type	Distance	Direction
Septic tank	80.00 ft.	North

Drilling Machine Operator Name:

Employment: Unknown

Pump Installed: Yes **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: Other **Pump Type:** Other
Model Number: **Pump Capacity:**
Length of Drop Pipe: 20.00 ft. **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Formation Description	Thickness	Depth to Bottom
Topsoil W/Sand	3.00	3.00
Stones W/Gravel	2.00	5.00
Clay	1.00	6.00
Gravel	1.00	7.00
Clay	1.00	8.00
Gravel	1.00	9.00
Gravel & Stones	3.00	12.00
Gravel & Cobbles	10.00	22.00

Geology Remarks: 1. [SAND, TOP SOIL] [3] [3] 2. [FIELD STONE AND GRAVEL] [5] [2] 3. [CLAY] [6] [1] 4. [GRAVEL] [7] [1] 5. [CLAY] [8] [1] 6. [GRAVEL] [9] [1] 7. [BIG STONES AND GRAVEL] [12] [3] 8. [GRAVEL AND ROCK] [22] [10]

Contractor Type: Unknown
Registration Number:
Business Name:
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks: AFTER 22' COULDN'T DRIVE POINT ANY MORE

OTHER REMARKS **Well Head Completion:** 12 Inch Above Grade **Pump Type:** Type Unknown **Pump Manufacturer:** EVERYREADY PISTON

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:55

Section 13

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Well ID: 52000005669

Tax No: 00520621300030	Permit No: 20050761	County: Marquette	Township: Humbolt

Well ID: 52000005669

Elevation:

Latitude: 46.475528

Longitude: -87.885083

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
SW¼ NW¼ NW¼	13	47N 29W		

Distance and Direction from Road Intersection: OFF CO RD 601

Well Owner: Naterra Lands

Well Address:

MI

Owner Address:
7750 HWY 51 PO BOX 108
MINOCQUA WI 54548

Drilling Method: Rotary
Well Depth: 250.00 ft. | Well Use: Household
Well Type: New | Date Completed: 8/11/2005
Casing Type: Steel - unknown
Casing Joint: Welded
Diameter: 6.00 in. to 25.00 ft. depth

Bore Diameter 1: 8.00 in. to 25.00 ft. depth
Bore Diameter 2: 6.00 in. to 250.00 ft. depth
Bore Diameter 3:
Height: 1.50 ft. above grade
Casing Fitting: Drive shoe

Static Water Level: 32.00 ft. Below Grade(Not Flowing)
Yield Test Method: Air
Measurement Taken During Pump Test:
240.00 ft. after 1.00 hrs. pumping at 4.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Screen Installed: No | Well Intake: Bedrock Well
Filter Packed:
Screen Diameter: | Length:
Screen Material Type:
Slot:
Blank:
Fittings:

Well Grouted: Yes | Grouting Method: Unknown
No. of Bags: 4 | Additives: None
Grouting Materials:
Neat cement From 0.00 ft. to 25.00 ft.

Well Head Completion: 12 inches above grade

Nearest source of possible contamination:

Type	Distance	Direction
Unknown		
Unknown		

Drilling Machine Operator Name: DEAN NEUENS

Employment: Employee

Pump Installed: No | Pump Installation only: No
Pump Installation date: | HP:
Manufacturer: | Pump Type:
Model Number: | Pump Capacity:
Length of Drop Pipe: | Id of Well:
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : | Tank Capacity : Gallons
Pressure Relief Valve Installed : No

Formation Description	Thickness	Depth to Bottom
Sand Clay Gravel	5.00	5.00
Black & White Granite	225.00	230.00
Green Granite	20.00	250.00

Geology Remarks:

Contractor Type: Water well drilling contractor
Registration Number: 575
Business Name: KLEIMAN PUMP & WELL DRLG INC
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor Date

General Remarks:
OTHER REMARKS

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

11/30/2005 09:25

Section 14

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000002989 **Import ID:** 52472914001

Tax No: 0621400500	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
SE¼ NE¼ NW¼	14	47N 29W		

Well ID: 52000002989

Elevation: 1585 ft

Latitude: 46.4753235546

Longitude: -87.8973219129

Distance and Direction from Road Intersection: 3 MI E. ON 601 HUMBOLDT

Well Owner: Glen Koski

Well Address:	Owner Address:
CR 601 # 8731 CHAMPION MI 49814	CR 601 # 8731 CHAMPION MI 49814

Drilling Method: Rotary
Well Depth: 240.00 ft. **Well Use:** Household
Well Type: Replacement **Date Completed:** 9/17/1991
Casing Type: Unknown
Casing Joint: Unknown
Diameter: 6.00 in. to 35.00 ft. depth

Bore Diameter 1:
Bore Diameter 2:
Bore Diameter 3:
Height: 1.00 ft. above grade
Casing Fitting: Drive shoe

Static Water Level: 20.00 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:

Abandoned Well Plugged: Yes
Reason for not plugging Well:

Abandoned well ID:

Screen Installed: No **Well Intake:** Unknown
Filter Packed:
Screen Diameter: **Length:**
Screen Material Type:
Slot:
Blank:
Fittings:

Well Grouted: No **Grouting Method:**
No. of Bags: **Additives:**
Grouting Materials:

Well Head Completion: Pitless adapter

Nearest source of possible contamination:

Type	Distance	Direction
Septic tank	75.00 ft.	West

Drilling Machine Operator Name: KLEIMAN PUMP AND WELL DRILLING
Employment: Unknown

Pump Installed: No **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: **Pump Type:**
Model Number: **Pump Capacity:**
Length of Drop Pipe: **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Formation Description	Thickness	Depth to Bottom
Gravel Hard W/Boulders	23.00	23.00
Sand	2.00	25.00
Gravel Silty W/Boulders	10.00	35.00
Granite Hard	205.00	240.00

Geology Remarks: 1. [HARD GRAVEL AND BOULDERS] [23] [23] 2. [SAND] [25] [2] 3. [SILTY GRAVEL AND BROKEN ROCK] [35] [10] 4. [HARD GRANITE, WHITE AND BLACK] [240] [205]

Contractor Type: Unknown
Registration Number: 2023
Business Name:
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks:
OTHER REMARKS

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:55

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000005397

Tax No: 00520621400100	Permit No: 20041244	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
SW¼ NW¼ NE¼	14	47N 29W		

Distance and Direction from Road Intersection: AT THE END OF CORD FFM ABOUT 1/8 MILE EAST OF CO RD 601

Well ID: 52000005397

Elevation:

Latitude: 46.47489

Longitude: -87.896934

Well Owner: Tyrone Rosten

Well Address:	Owner Address:
669 CO RD FFM CHAMPION MI 49814	669 CO RD FFM CHAMPION MI 49814

Drilling Method: Rotary

Well Depth: 300.00 ft. | **Well Use:** Household

Well Type: Replacement | **Date Completed:** 10/20/2004

Casing Type: Steel - unknown
Casing Joint: Welded
Diameter: 6.00 in. to 25.00 ft. depth

Bore Diameter 1: 8.00 in. to 25.00 ft. depth
Bore Diameter 2: 25.00 in. to 300.00 ft. depth
Bore Diameter 3:
Height: 1.50 ft. above grade
Casing Fitting: Drive shoe

Static Water Level: 18.00 ft. Below Grade(Not Flowing)
Yield Test Method: Air
Measurement Taken During Pump Test:
300.00 ft. after 1.00 hrs. pumping at 1.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well: Unknown
Abandoned well ID:

Screen Installed: No **Well Intake:** Bedrock Well
Filter Packed:
Screen Diameter: **Length:**
Screen Material Type:
Slot:
Blank:
Fittings:

Well Grouted: Yes **Grouting Method:** Unknown
No. of Bags: 4 **Additives:** None
Grouting Materials:
Neat cement From 0.00 ft. to 25.00 ft.

Well Head Completion: 12 inches above grade

Nearest source of possible contamination:

Type	Distance	Direction
Animal yard/Feedlot	90.00 ft.	North
Septic tank	110.00 ft.	North

Drilling Machine Operator Name: DARYL NEUENS

Employment: Employee

Pump Installed: No **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: **Pump Type:**
Model Number: **Pump Capacity:**
Length of Drop Pipe: **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Formation Description	Thickness	Depth to Bottom
Sand & Gravel W/Cobbles Clayey	10.00	10.00
Granite Broken	8.00	18.00
Gray & White Granite	20.00	38.00
Granite W/Clay Broken	4.00	42.00
Gray & White Granite	258.00	300.00

Geology Remarks:

Contractor Type: Water well drilling contractor
Registration Number: 575
Business Name: KLEIMAN PUMP AND WELL DRILLING
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks:

OTHER REMARKS

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

1/11/2005 15:14

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000005872

Tax No:	Permit No: 20051556	County: Marquette	Township: Humbolt

Well ID: 52000005872

Elevation:

Latitude: 46.47133

Longitude: -87.89458

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
SW¼ SW¼ NE¼	14	47N 29W		

Distance and Direction from Road Intersection:

Well Owner: Mathew Lacosse

Well Address:	Owner Address:
10357 COUNTY ROAD 601 CHAMPION MI 49814	PO BOX 22 CHAMPION MI 49814

Drilling Method: Other

Well Depth: 32.00 ft. **Well Use:** Household

Well Type: New **Date Completed:** 10/6/2006

Casing Type: Steel - black
Casing Joint: Welded
Diameter: 6.00 in. to 28.00 ft. depth

Bore Diameter 1: 6.00 in. to 39.00 ft. depth
Bore Diameter 2:
Bore Diameter 3:
Height: 2.00 ft. above grade
Casing Fitting: Drive shoe

Static Water Level: 17.00 ft. Below Grade(Not Flowing)
Yield Test Method: Air
Measurement Taken During Pump Test:
25.00 ft. after 1.00 hrs. pumping at 9.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Screen Installed: Yes **Well Intake:**
Filter Packed: No
Screen Diameter: 5.00 in. **Length:** 6.00 ft.
Screen Material Type: Stainless steel-wire wrapped
Slot: 15.00 in. Set Between 28.00 ft. and 32.00 ft.
Blank:
Fittings:
Neoprene packer

Well Grouted: Yes **Grouting Method:** Unknown
No. of Bags: 2 **Additives:** None
Grouting Materials:
Bentonite dry granular From 0.00 ft. to 28.00 ft.

Well Head Completion: 12 inches above grade

Nearest source of possible contamination:

Type	Distance	Direction
Unknown		
Unknown		

Drilling Machine Operator Name: JIM HAKALA

Employment: Employee

Pump Installed: No **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: **Pump Type:**
Model Number: **Pump Capacity:**
Length of Drop Pipe: **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Formation Description	Thickness	Depth to Bottom
Sand W/Clay W/Boulders	16.00	16.00
Sand Medium	5.00	21.00
Hardpan W/Sand W/Clay	12.00	33.00
Clay	6.00	39.00

Geology Remarks:

Contractor Type: Water well drilling contractor
Registration Number: 206
Business Name: HAKALA WELL & PUMP SER
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks:

OTHER REMARKS **Drilling Method:** CABLE TOOL & ROTARY

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

12/4/2006 15:05

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Well ID: 52000005838

Tax No: 00520621400200	Permit No: 20051556	County: Marquette	Township: Humbolt

Well ID: 52000005838

Elevation:

Latitude: 46.53957

Longitude: -87.90639

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
SW¼ SW¼ NE¼	14	47N 29W		

Distance and Direction from Road Intersection:

Well Owner: Matthew Lacosse

Well Address:	Owner Address:
10357 COUNTY ROAD 601 CHAMPION MI 49814	PO BOX 22 CHAMPION MI 49814

Drilling Method: Rotary
Well Depth: 37.00 ft. | Well Use: Household
Well Type: Replacement | Date Completed: 6/19/2006
Casing Type: Steel - black
Casing Joint: Welded
Diameter: Unknown in. to

Bore Diameter 1: 6.00 in. to 37.00 ft. depth
Bore Diameter 2:
Bore Diameter 3:
Height:
Casing Fitting: None

Pump Installed: No | Pump Installation only: No
Pump Installation date: | HP:
Manufacturer: | Pump Type:
Model Number: | Pump Capacity:
Length of Drop Pipe: | Id of Well:
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : | Tank Capacity : Gallons
Pressure Relief Valve Installed : No

Static Water Level: Unknown
Yield Test Method: Unknown
Measurement Taken During Pump Test:

Abandoned Well Plugged: Yes
Reason for not plugging Well:

Abandoned well ID:

Formation Description	Thickness	Depth to Bottom
Sand	18.00	18.00
Gravel	19.00	37.00

Screen Installed: No | Well Intake: Bedrock Well
Filter Packed:
Screen Diameter: | Length:
Screen Material Type:
Slot:
Blank:
Fittings:

Well Grouted: Yes | Grouting Method: Unknown
No. of Bags: 3 | Additives: None
Grouting Materials:
Bentonite dry granular | From 0.00 ft. to 37.00 ft.

Well Head Completion: Unknown

Geology Remarks:

Abandonment Details
Casing Diameter: 6 | Well Depth: 37ft
Plugging Material: Bentonite chips/pellets | No.of Bags:10
Casing Removed: No

Nearest source of possible contamination:

Type	Distance	Direction
Unknown		
Unknown		

Contractor Type: Water well drilling contractor
Registration Number: 1780
Business Name: MACDONALD WELL DRLG INC
Business Address:

Drilling Machine Operator Name: DANNY MACDONALD JR

Employment: Employee

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor | Date

General Remarks: CASING BENT
OTHER REMARKS

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

10/25/2006 07:24

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000002990 **Import ID:** 52472914002

Tax No: 0621400900	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
SE¼ SW¼ NW¼	14	47N 29W		

Well ID: 52000002990

Elevation: 1570 ft

Latitude: 46.4723074841

Longitude: -87.9027971425

Distance and Direction from Road Intersection: CR FO #1485

Well Owner: Fred Brawley

Well Address:
CR FO #1485
CHAMPION MI 49814

Owner Address:
RTE 1 BOX 290A
CHAMPION MI 49814

Drilling Method: Rotary
Well Depth: 31.00 ft. **Well Use:** Household
Well Type: New **Date Completed:**
Casing Type: Steel - black
Casing Joint: Welded
Diameter: 6.00 In. to 27.00 ft. depth

Bore Diameter 1: 8.00 in. to 22.00 ft. depth
Bore Diameter 2:
Bore Diameter 3:
Height: -1.00 ft. above grade
Casing Fitting: Drive shoe

Static Water Level: 15.00 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:
23.00 ft. after 1.00 hrs. pumping at 10.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Screen Installed: Yes **Well Intake:**
Filter Packed: No
Screen Diameter: 4.00 in. **Length:** 4.00 ft.
Screen Material Type:
Slot: 10.00 In. Set Between 27.00 ft. and 31.00 ft.
Blank: 0.00 ft. Above
Fittings:
Neoprene packer

Well Grouted: Yes **Grouting Method:** Unknown
No. of Bags: **Additives:** None
Grouting Materials:
Other From 5.00 ft. to 22.00 ft.

Well Head Completion: Pitless adapter

Nearest source of possible contamination:

Type	Distance	Direction
Septic tank	80.00 ft.	Southeast

Drilling Machine Operator Name: HAKALA WELL AND PUMP

Employment: Unknown

Pump Installed: Yes **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: Other **Pump Type:** Submersible
Model Number: **Pump Capacity:** 0.00 GPM
Length of Drop Pipe: 15.00 ft. **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Formation Description	Thickness	Depth to Bottom
Sand W/Boulders	8.00	8.00
Clay & Sand W/Boulders	12.00	20.00
Sand & Clay Fine	5.00	25.00
Gravel & Clay	6.00	31.00

Geology Remarks: 1. [SAND, ROCKS] [8] [8] 2. [CLAY, SAND , BOULDERS] [20] [12] 3. [FINE SAND, CLAY] [25] [5] 4. [GRAVEL, CLAY, LOOSE] [31] [6]

Contractor Type: Unknown
Registration Number: 206
Business Name:
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks:
OTHER REMARKS **Grouting Material 1:** Listed as other in Wellkey **Pump Manufacturer:** GEORGIA PACIFIC

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:55

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000002991 **Import ID:** 52472914003

Tax No: 0621401300	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
SW¼ SW¼ NE¼	14	47N 29W		

Well ID: 52000002991

Elevation: 1600 ft

Latitude: 46.4719787345

Longitude: -87.8966638632

Distance and Direction from Road Intersection:

Well Owner: Andrew Randall

Well Address:	Owner Address:
10505 CR 601 CHAMPION MI 49814	260 GOLD ISHPEMING MI 49814

Drilling Method: Rotary

Well Depth: 60.00 ft. **Well Use:** Household

Well Type: New **Date Completed:**

Casing Type: Steel - black
Casing Joint: Welded
Diameter: 6.00 in. to 32.00 ft. depth

Bore Diameter 1:
Bore Diameter 2:
Bore Diameter 3:
Height: -1.00 ft. above grade
Casing Fitting: Drive shoe

Pump Installed: Yes **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: Other **Pump Type:** Submersible
Model Number: **Pump Capacity:** 0.00 GPM
Length of Drop Pipe: 40.00 ft. **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Static Water Level: 27.00 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:
40.00 ft. after 1.00 hrs. pumping at 3.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Formation Description	Thickness	Depth to Bottom
Sand	6.00	6.00
Clay & Sand W/Boulders	26.00	32.00
Granite	28.00	60.00

Screen Installed: No **Well Intake:** Unknown
Filter Packed:
Screen Diameter: **Length:**
Screen Material Type:
Slot:
Blank:
Fittings:

Well Grouted: No **Grouting Method:**
No. of Bags: **Additives:**
Grouting Materials:

Well Head Completion: Pitless adapter

Geology Remarks: 1. [SAND] [6] [6] 2. [CLAY, SAND, BOULDERS] [32] [26] 3. [GRANITE] [60] [28]

Nearest source of possible contamination:

Type	Distance	Direction
Unknown	0.00 ft.	
Unknown		

Contractor Type: Unknown
Registration Number: 206
Business Name:
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Drilling Machine Operator Name: HAKALA WELL AND PUMP

Employment: Unknown

Signature of Registered Contractor **Date**

General Remarks:

OTHER REMARKS **Pump Manufacturer:** GEORGIA PACIFIC

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:55

Section 15

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000002993 **Import ID:** 52472915002

Tax No: 0621500600	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
NW¼ NW¼ NW¼	15	47N 29W		

Well ID: 52000002993

Elevation: 1615 ft

Latitude: 46.4764851933

Longitude: -87.928117149

Distance and Direction from Road Intersection: OFF M95 IN NWNWNW OF 15

Well Owner: Bernhardt Maki

Well Address:	Owner Address:
4929 CO RD RB CHAMPION MI 49814	4929 CO RD RB CHAMPION MI 49814

Drilling Method: Rotary
Well Depth: 27.00 ft. **Well Use:** Household
Well Type: Replacement **Date Completed:** 3/2/1979
Casing Type: Unknown
Casing Joint: Welded
Diameter: 6.00 in. to 24.00 ft. depth

Bore Diameter 1:
Bore Diameter 2:
Bore Diameter 3:
Height: 1.00 ft. above grade
Casing Fitting: Drive shoe

Pump Installed: Yes **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: Other **Pump Type:** Submersible
Model Number: **Pump Capacity:** 0.00 GPM
Length of Drop Pipe: 22.00 ft. **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Static Water Level: 13.00 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:
20.00 ft. after 1.00 hrs. pumping at 5.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Formation Description	Thickness	Depth to Bottom
Gravel & Boulders	27.00	27.00

Screen Installed: Yes **Well Intake:**
Filter Packed: No
Screen Diameter: 6.00 in. **Length:** 3.00 ft.
Screen Material Type:
Slot: 20.00 in. Set Between 24.00 ft. and 27.00 ft.
Blank: 0.00 ft. Above
Fittings:
Neoprene packer

Well Grouted: No **Grouting Method:**
No. of Bags: **Additives:**
Grouting Materials:

Well Head Completion: Pitless adapter

Geology Remarks: 1. [GRAVEL AND BOULDERS] [27] [27]

Nearest source of possible contamination:

Type	Distance	Direction
None		

Contractor Type: Unknown
Registration Number: 575
Business Name:
Business Address:

Drilling Machine Operator Name: KLEIMAN PUMP AND WELL DRILLING
Employment: Unknown

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks: ALSO 12" ABOVE GRADE WELL HEAD COMPLETION
OTHER REMARKS **Pump Manufacturer:** REDA

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ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:55

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000002994 **Import ID:** 52472915003

Tax No:	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
SE¼ NW¼ SE¼	15	47N 29W		

Distance and Direction from Road Intersection: 1.5 MI E. HWY 95; CR FO 4258

Well ID: 52000002994

Elevation: 1580 ft

Latitude: 46.4691631494

Longitude: -87.9129722421

Well Owner: Mike And Jill Rankinen

Well Address:	Owner Address:
RT 1 BOX 290 CHAMPION MI 49814	RT 1 BOX 290 CHAMPION MI 49814

Drilling Method: Rotary

Well Depth: 275.00 ft. **Well Use:** Household

Well Type: Replacement **Date Completed:** 8/1/1988

Casing Type: Steel - black
Casing Joint: Welded
Diameter: 6.00 in. to 27.00 ft. depth

Bore Diameter 1: 8.00 in. to 25.00 ft. depth
Bore Diameter 2:
Bore Diameter 3:
Height: -1.00 ft. above grade
Casing Fitting: Drive shoe

Pump Installed: No **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: **Pump Type:**
Model Number: **Pump Capacity:**
Length of Drop Pipe: **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Static Water Level: 50.00 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:
275.00 ft. after 1.00 hrs. pumping at 1.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Formation Description	Thickness	Depth to Bottom
Sand & Gravel	8.00	8.00
Granite	267.00	275.00

Screen Installed: No **Well Intake:** Unknown
Filter Packed:
Screen Diameter: **Length:**
Screen Material Type:
Slot:
Blank:
Fittings:

Well Grouted: Yes **Grouting Method:** Unknown
No. of Bags: **Additives:** None
Grouting Materials:
Other From 5.00 ft. to 25.00 ft.

Well Head Completion: Pitless adapter

Geology Remarks: 1. [SAND,GRAVEL] [8] [8] 2. [GRANITE] [275] [267]

Nearest source of possible contamination:

Type	Distance	Direction
Septic tank	75.00 ft.	

Contractor Type: Unknown
Registration Number: 506
Business Name:
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Drilling Machine Operator Name:

Employment: Unknown

Signature of Registered Contractor **Date**

General Remarks:

OTHER REMARKS **Grouting Material 1:** Listed as other in Wellkey

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:55

GEOLOGICAL SURVEY NO.

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

WATER WELL AND PUMP RECORD

PERMIT NUMBER: 9 3 0 2 5 4

1 LOCATION OF WELL

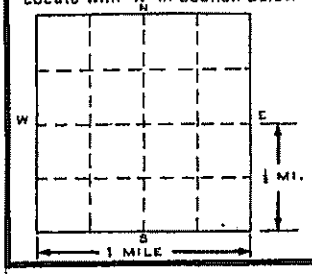
County	Township Name	Fraction	Section Number	Town Number	Range Number
Marquette	Humboldt	NW ¼ NE ¼ NW ¼	15	47 N/S	29 E/W

Distance And Direction From Road Intersection

Rankinen Michael L.
4258 Co. Rd. FO
Champion, Michigan 49814

Street Address & City of Well Location

Locate with "X" in Section Below — Sketch Map:



3 OWNER OF WELL

Rankinen Michael
Address 4258 Co. Rd. FO
Champion, MI. 49814
Address Same As Well Location? [X] Yes [ ] No

4 WELL DEPTH: 44 FT. — Date Completed MO. 9 DAY YEAR 93 — [X] New Well [ ] Replacement Well

5 [ ] Cable tool [X] Rotary [ ] Driven [ ] Dug [ ] Hollow rod [ ] Auger [ ] Jetted [ ]

6 USE: [X] Domestic [ ] Type I Public [ ] Type III Public [ ] Irrigation [ ] Type IIa Public [ ] Heat pump [ ] Test Well [ ] Type IIb Public [ ]

7 CASING: Diameter [X] Steel [ ] Threaded [ ] Plastic [X] Welded
to in. to 30 ft. depth
in. to ft. depth
Grouted Drill Hole Diameter
in. to ft. depth
in. to ft. depth
Height: Above/Below Surface 1" ft.
Weight 19 lbs./ft
Drive Shoe [X] Yes [ ] No

8 SCREEN: [X] Not Installed
Type Diameter
Slot/Gauze Length
Set between ft. and ft
FITTINGS: [ ] K-Packer [ ] Lead Packer [ ] Bremer Check [ ] Blank above screen ft. Other

9 STATIC WATER LEVEL: 14 ft. below land surface [ ] Flow

10 PUMPING LEVEL: below land surface
44 ft. after 1 hrs. pumping at 30 G.P.M.
ft. after hrs. pumping at G.P.M.

11 WELL HEAD COMPLETION: [ ] Pitless adapter [X] 12" above grade [ ] Basement offset [ ] Approved pit

12 WELL GROUTED? [X] No [ ] Yes From to ft.
[ ] Neat cement [ ] Bentonite [ ] Other
No. of bags of cement Additives

13 Nearest source of possible contamination
Type Septic Distance 75+ ft. Direction N
Well disinfected upon completion? [X] Yes [ ] No
Was old well plugged? [ ] Yes [ ] No

14 PUMP: [X] Not Installed [ ] Pump Installation Only
Manufacturer's name
Model number HP 1/2 Volts 230
Length of Drop Pipe 30 ft. capacity 12 G.P.M.
TYPE: [X] Submersible [ ] Jet
PRESSURE TANK:
Manufacturer's name
Model number Capacity Gallons

2 FORMATION DESCRIPTION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Clay	3	3
Fine Sand	7	10
Hard Sand	7	17
Clay + Gravel	3	20
Hardpan	4	24
Sand, gravel	3	27
Broken Rock - Clay	3	30
Granite - fractured	14	44
@ 35'		
TAX ID 52-06-215-013-00		

USE A 2ND SHEET IF NEEDED

Received
MAR 17 1994
Env. Health
MCHD

15. Remarks, elevation, source of data, etc.

17. Rig Operator's Name: Jim Hakala

Apr 20 1994

16. WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Hakala Well & Pump 0206
REGISTERED BUSINESS NAME REGISTRATION NO.
Address Negaunee MI. 49866
Signed AUTHORIZED REPRESENTATIVE Date 3-11-94

Authority: Act 368 PA 1978
Completion: Required
Penalty: Conviction of a violation of any provision is a misdemeanor.

D87d 2/89

GEOLOGICAL SURVEY COPY

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000002995 **Import ID:** 52472915004

Tax No: 0621501200	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
SW¼ SW¼ SW¼	15	47N 29W		

Well ID: 52000002995

Elevation: 1585 ft

Latitude: 46.464833438

Longitude: -87.9268735846

Distance and Direction from Road Intersection: 2.5 MI ON M95 S OF US41

Well Owner: Gregg And D Beauchamp

Well Address:	Owner Address:
M95 S OF US 41 ISHPEMING MI 49849	329 S LAKE ST. ISHPEMING MI 49849

Drilling Method: Rotary

Well Depth: 42.00 ft. **Well Use:** Household

Well Type: New **Date Completed:** 6/20/1990

Casing Type: Steel - black
Casing Joint: Welded
Diameter: 5.00 in. to 25.00 ft. depth

Bore Diameter 1:
Bore Diameter 2:
Bore Diameter 3:
Height: 1.00 ft. above grade
Casing Fitting: Drive shoe

Static Water Level: 12.00 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:
30.00 ft. after 1.00 hrs. pumping at 4.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Screen Installed: No **Well Intake:** Unknown
Filter Packed:
Screen Diameter: **Length:**
Screen Material Type:
Slot:
Blank:
Fittings:

Well Grouted: No **Grouting Method:**
No. of Bags: **Additives:**
Grouting Materials:

Well Head Completion: Pitless adapter

Nearest source of possible contamination:

Type	Distance	Direction
None		

Drilling Machine Operator Name: HAKALA WELL AND PUMP

Employment: Unknown

Pump Installed: No **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: **Pump Type:**
Model Number: **Pump Capacity:**
Length of Drop Pipe: **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Formation Description	Thickness	Depth to Bottom
Sand & Gravel W/Boulders	15.00	15.00
Hardpan W/Clay W/Boulders	9.00	24.00
Unidentified Consolidated Fm Broken	1.00	25.00
Granite	17.00	42.00

Geology Remarks: 1. [SAND, GRAVEL, BOULDERS] [15] [15] 2. [HARDPAN, CLAY,BOULDERS] [24] [9] 3. [BROKEN ROCK] [25] [1] 4. [GRANITE] [42] [17]

Contractor Type: Unknown
Registration Number: 206
Business Name:
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks:
OTHER REMARKS

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:55

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.

Failure to comply is a misdemeanor.

Well ID: 52000002992 **Import ID:** 52472915001

Tax No: 0621500800	Permit No:	County: Marquette	Township: Humbolt

Fraction:	Section:	Town/Range:	WSSN:	Source ID/Well No:
SW¼ NW¼ NW¼	15	47N 29W		

Well ID: 52000002992

Elevation: 1630 ft

Latitude: 46.4761615921

Longitude: -87.9259049608

Distance and Direction from Road Intersection:

Well Owner: Ed Heikkila

Well Address:	Owner Address:
8482 M95 CHAMPION MI 49814	8482 M95 CHAMPION MI 49814

Drilling Method: Rotary

Well Depth: 250.00 ft. **Well Use:** Household

Well Type: Replacement **Date Completed:** 3/23/1973

Casing Type: Unknown
Casing Joint: Welded
Diameter: 6.00 in. to 26.50 ft. depth

Bore Diameter 1:
Bore Diameter 2:
Bore Diameter 3:
Height: 1.00 ft. above grade
Casing Fitting: Drive shoe

Pump Installed: Yes **Pump Installation only:** No
Pump Installation date: **HP:**
Manufacturer: Other **Pump Type:** Submersible
Model Number: **Pump Capacity:** 0.00 GPM
Length of Drop Pipe: 240.00 ft. **Id of Well:**
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Tank Type:
Manufacturer:
Model Number : **Tank Capacity :** Gallons
Pressure Relief Valve Installed : No

Static Water Level: 17.00 ft. Below Grade(Not Flowing)
Yield Test Method: Unknown
Measurement Taken During Pump Test:
250.00 ft. after 1.00 hrs. pumping at 1.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Formation Description	Thickness	Depth to Bottom
Lithology Unknown	15.00	15.00
Granite	235.00	250.00

Screen Installed: No **Well Intake:** Unknown
Filter Packed:
Screen Diameter: **Length:**
Screen Material Type:
Slot:
Blank:
Fittings:

Well Grouted: Yes **Grouting Method:** Unknown
No. of Bags: **Additives:** None
Grouting Materials:
Other From 0.00 ft. to 25.00 ft.

Well Head Completion: Pitless adapter

Geology Remarks: 1. [TILL] [15] [15] 2. [GRANITE] [250] [235]

Nearest source of possible contamination:

Type	Distance	Direction
Septic tank	75.00 ft.	South

Contractor Type: Unknown
Registration Number: 574
Business Name:
Business Address:

Drilling Machine Operator Name: KLEIMAN PUMP AND WELL DRILLING
Employment: Unknown

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks: ALSO 12" ABOVE GRADE WELL HEAD COMPLETION

OTHER REMARKS **Grouting Material 1:** Listed as other in Wellkey **Pump Manufacturer:** REDA

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/18/2000 03:55

TAX NO: 52-06-215-009-00

MICHIGAN DEPARTMENT OF PUBLIC HEALTH
WATER WELL AND PUMP RECORD

PERMIT NO: 95-0368

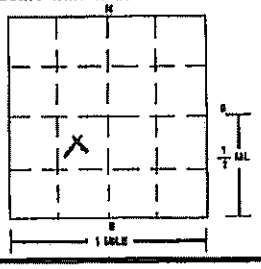
1. LOCATION OF WELL

County	Township Name	Fraction	Section No.	Town No.	Range No.
Marquette	Humboldt	NE 1/4 NE 1/4 SW 1/4	15	47N	29W

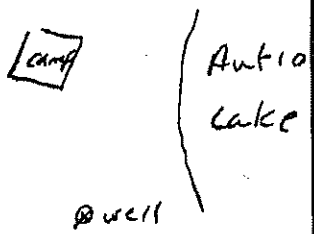
Distance and Direction from Road Intersection: 3/8 mile EAST of M-95 on Private Rd

Street Address & City of Well Location:

Locate with 'x' in Section Below



Sketch Map



3. OWNER OF WELL
Address: Roger Hooper, 121 Washington, Iron Ridge, WI 53035
Address Same as Well Location ☐ Yes ☒ No

4. WELL DEPTH: 202 ft. | Date Completed: 10/24/95 | ☒ New Well ☐ Replacement Well

5. ☐ Cable Tool ☒ Rotary ☐ Driven ☐ Dug ☐ Hollow Rod ☐ Auger/Bored ☐ Jetted ☐ _____

6. USE: ☒ Household ☐ Type I Public ☐ Type III Public ☐ Irrigation ☐ Type IIa Public ☐ Heat Pump ☐ Test Well ☐ Type IIb Public ☐ _____

7. CASING: ☒ Steel ☐ Threaded ☐ Plastic ☒ Welded ☐ Other _____
Diameter: 6 in. to 25 ft. depth; _____ in. to _____ ft. depth
Height: Above/Below Surface: 1.5 ft
Weight: 18.97 lbs./ft.
BORE HOLE: Diameter: 8 in. to 25 ft. depth; 6 in. to 201 ft. depth
☒ Drive Shoe ☐ Shale Packer

2. FORMATION DESCRIPTION

FORMATION DESCRIPTION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
sand	4	4
silty sand & gravel w/ boulders	17	21
red granite	49	70
grey granite	20	90
red granite	111	201

USE A 2ND SHEET IF NEEDED

Received NOV 3 0 1995 Env. Health MCHD

8. SCREEN: ☒ Not Installed ☐ Gravel-Packed
Type _____ Diameter _____
Slot/Gauze _____ Length: _____
Set Between _____ ft. and _____ ft.
FITTINGS: ☐ K-Packer ☐ Bremer Check
☐ Blank Above Screen _____ ft. Other _____

9. STATIC WATER LEVEL: 28 ft. Below Land Surface ☐ Flowing

10. PUMPING LEVEL: Below Land Surface
200 ft. After .5 hrs. Pumping at .5 G.P.M.
☐ Plunger ☐ Baller ☒ Air ☐ Test Pump

11. WELL HEAD COMPLETION:
☐ Pitless Adapter ☒ 12" Above Grade
☐ Basement Offset ☐ Well House

12. WELL GROUTED? ☐ No ☒ Yes From 0 to 25 ft.
☒ Neat Cement ☐ Bentonite ☐ Other _____
No. of Bags 6 Additives _____

13. NEAREST SOURCE OF POSSIBLE CONTAMINATION:
Type Septic Distance 150 ft. Direction N
Type _____ Distance _____ ft. Direction _____

14. PUMP: ☒ Not Installed ☐ Pump Installation Only
Manufacturer's Name _____
Model Number _____ HP _____ Volts _____
Length of Drop Pipe _____ ft. Capacity _____ G.P.M.
TYPE: ☐ Submersible ☐ Jet ☐ Other _____
PRESSURE TANK:
Manufacturer's Name _____
Model Number _____ Capacity _____ Gallons _____

15. ABANDONED WELL PLUGGED? ☐ Yes ☐ No N/A
Casing Diameter _____ in. Depth _____ ft.
PLUGGING MATERIAL: ☐ Neat Cement ☐ Bentonite Slurry ☐ Cement/Bentonite Slurry ☐ Concrete Grout ☐ Bentonite Chips
No. of Bags _____ Casing Removed? ☐ Yes ☐ No

16. REMARKS: (Elevation, Source of Data, etc.)

DIST. 3 OFFICE DNR, ESCANABA

17. DRILLING MACHINE OPERATOR:
☒ Employee ☐ Subcontractor
Name Daryl Neuens

DEC 13 1995

WATER WELL CONTRACTOR'S CERTIFICATION: This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Kleiman Pump & Well Drlg. Inc. # 575
REGISTERED BUSINESS NAME — REGISTRATION NO.
Address P.O. Box 704, Iron Mtn, MI 49801
Signed _____ Date 10-26-95
AUTHORIZED REPRESENTATIVE

GW-2-228 9/93

GEOLOGICAL SURVEY COPY

Authority: Act 368 PA 1978 Completion: Required
Penalty: Conviction of a violation of any provision is a misdemeanor.

Appendix C

Biological Surveys

C-1

Biological Survey: Plant Communities, Wildlife, and Wetland Evaluation 2006

BIOLOGICAL SURVEY:
PLANT COMMUNITIES, WILDLIFE, AND WETLAND EVALUATION

Kennecott Eagle Minerals Company
Humboldt Mill
Marquette County, Michigan

Prepared for:

Foth Infrastructure & Environment

Prepared by:

King & MacGregor Environmental, Inc.
2520 Woodmeadow SE
Grand Rapids, Michigan 49546
www.king-macgregor.com

April 5, 2007

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Table 2-3 Overall List of Plant Species Organized by Plant Community – Humboldt Mill Site

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Table 3-4 September 2006 Bird Species Summary – Humboldt Mill Site

Table 3-5a Small Mammal Survey: September 25, 2006 – Humboldt Mill Site

Table 3-5b Small Mammal Survey: September 26, 2006 – Humboldt Mill Site

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PHOTOGRAPHS

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Photos 7 and 8 Sampling Point 4 Photos– Bird and Small Mammals

Photos 9 and 10 Sampling Point 5 Photos– Bird and Small Mammals

Photos 11 and 12 Sampling Point 6 Photos– Bird and Small Mammals
Photos 13 and 14 Sampling Point 7 Photos– Bird and Small Mammals
Photos 15 and 16 Sampling Point 8 Photos– Bird and Small Mammals
Photos 17 and 18 Sampling Point 9 Photos– Bird and Small Mammals
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Photos 37 and 38 Wetland Location Photos, Wetlands P and Q
Photos 39 and 40 Wetland Location Photos, Wetlands R and S
Photos 41 and 42 Wetland Location Photos, Wetlands T and U
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APPENDIX

Form A-1 KME Humboldt Mill Bird Sampling Data Form
Form A-2 KME Humboldt Mill Mammal Sampling Data Form
Form A-3 KME Humboldt Mill Frog and Toad Sampling Data Form
Form A-4 Sample Wetland Data Form (Part 303, MDEQ)

LIST OF ACRONYMS

HTDF	Humboldt Tailings Disposal Facility
KME:	King & MacGregor Environmental, Inc.
KEMC:	Kennecott Eagle Minerals Company
MDEQ:	Michigan Department of Environmental Quality
MDNR:	Michigan Department of Natural Resources
MIRIS:	Michigan Resource Information System
MNFI:	Michigan Natural Features Inventory
SSURGO:	Soil Survey Geographic
NWI	National Wetlands Inventory

1.0 INTRODUCTION

King and MacGregor Environmental Inc. (KME) was contracted by Foth & Van Dyke (now Foth Infrastructure & Environment, LLC (Foth I&E)) to conduct baseline biological and wetland investigations within the Humboldt Mill Site in Marquette County, Michigan (Figure 1-1). This report includes evaluations of upland and wetland vegetative communities and habitat, birds, mammals, frogs and toads, and threatened and endangered species within the study area.

1.1 Study Area

The study area for this investigation includes the Humboldt Tailings Disposal Facility (HTDF) and processing facility known as the Humboldt Mill Site and surrounding undeveloped areas. The study area is located west of Ishpeming, in the southeast corner of the intersection of U.S. 41 and Highway 95 and occupies all or portions of Sections 1, 2, 3, 10, 11, 12, 13, 14 and 15, T47N, R29W, Humboldt Township, Marquette County, Michigan. The study area is approximately 3,169 acres in size (Figure 1-2). A majority of the study area drains to the south and west to tributaries of Black River within the Escanaba River watershed. The Middle Branch of the Escanaba River flows through the northeast corner of the study area. The abandoned Humboldt Mill includes an existing processing building, tailing basins partially covered with vegetation, excavated areas, the HTDF and other evidence of surface mining such as iron pellets mixed with topsoil in many locations and an extensive system of trails and roads. Other portions of the study area not directly affected by historical mining include heavily vegetated upland areas of varying topography, localized rocky outcrops, pothole wetlands, Lake Lory, and small streams with riparian wetland vegetation. There are some private residences within the study area.

In order to facilitate a detailed survey of the plant species and wetlands in the vicinity where most proposed development impacts would occur, a 186-acre detailed study area (Figure 1-2) was established within the overall study area. The survey for threatened and endangered plant species and the wetland boundary delineation were conducted within this smaller area.

1.2 Project Purpose

Documentation of this baseline ecological information will assist with KEMC planning activities.

2.0 PLANT COMMUNITY AND HABITAT EVALUATION

2.1 Plant Community and Habitat Descriptions – Overall Study Area

2.1.1 Methods

KME initially reviewed the study area using aerial photography available from the Michigan Department of Natural Resources (MDNR, 2001a) and 1978 Land Use/Land Cover classifications (MDNR, 1999). A site reconnaissance and on-site meeting with representatives of KEMC was conducted. KME biologists then visited the study area on June 9-11, August 14-15, and September 27-28, 2006 for the purpose of inventorying the flora and mapping the plant community and habitat types found within the study area. Meander surveys were conducted to identify plant communities. The plant communities and habitat types confirmed by field investigations were sketched onto color aerial photographs. References for plant species identification and plant natural history details included Voss (1972, 1985 and 1996).

In mapping the natural plant communities in the study area, KME followed to the extent possible the natural plant community categories employed by the Michigan Natural Features Inventory (MNFI). These have been published online as Michigan's Natural Communities Draft List and Descriptions (April 21, 2006). With the exception of the Open Water/Submergent Marsh plant community type, plant species lists were compiled for each plant community type throughout the study area. Although a survey of the plants in the Open Water/Submergent Marsh plant community type was not conducted, areas classified as this plant community type were mapped and are included on Figure 2-1.

The Michigan Resource Information System (MIRIS) Current Use Inventory (MDNR, 1990) classification system definitions were used to map the anthropogenic habitats (i.e. Single Family/Duplex; Extractive; Road Transportation), as well as for those natural plant communities for which the MNFI was not sufficient for purposes of this study (i.e. Herbaceous Openland; Shrubland; Streams and Waterways).

2.1.2 Results

Figure 2-1 is a map of the plant communities and habitat types identified in the study area. It includes eleven natural plant communities and three anthropogenic land uses. The locations of rock ledges (the Cliff plant community) are not shown because the scale of the map is too large. The MNFI's Hardwood-Conifer Swamp community has been combined with the very similar Northern Swamp because of observed overlap of the two communities in the field. The Muskeg community and the similar Poor Conifer Swamp community have also been merged because of observed overlap in the field. Table 2-1 is an overall list of the plant species found in the study area. Table 2-2 lists the plant communities and habitat types and the approximate acreage of each within the study area. Table 2-3 lists the plant species that were observed within each of the plant communities in the study area.

The following is a brief description of each of the plant community or habitat classifications for this study:

Mesic Northern Forest

Mesic northern forest is the most common plant community in the study area, covering approximately 1,877 acres. For mapping purposes, this plant community has been divided into two subcategories using the following classifications: Coniferous Forest and Broadleaf Deciduous Forest. The Coniferous Forest covers approximately 1,023 acres and the Broadleaf Deciduous Forest covers approximately 854 acres. The Broadleaf Deciduous Forest plant community dominates the northern half of the study area and also occupies a large area within the southeastern corner. There are smaller occurrences of the Broadleaf Deciduous Forest in the southwest portion of the study area. The Coniferous Forest plant community dominates the southwest half of the study area, and is common throughout other portions of the study area as well.

The MNFI defines the Mesic Northern Forest (Northern Hardwood Forest) plant community as, "a forest type of moist to dry-mesic sites lying mostly north of the transition zone, characterized by the presence of northern hardwoods, hemlock and low levels of white pine." It is usually dominated by sugar maple (*Acer saccharum*). Other typical trees are American beech (*Fagus grandifolia*), red oak (*Quercus rubra*), and eastern hemlock (*Tsuga canadensis*). This description applies to areas classified as Broadleaf Deciduous Forest. Tree species commonly found in areas classified as Coniferous Forest are white pine (*Pinus strobus*) and white spruce (*Picea glauca*).

Hardwood-Conifer Swamp / Northern Swamp

The Hardwood-Conifer Swamp / Northern Swamp plant community covers approximately 108 acres within the study area. It appears in several sites in the study area with the largest concentration in the southwest corner.

The MNFI defines the Hardwood-Conifer Swamp community as, "a minerotrophic swamp of less saturated conditions than conifer swamps and dominated by a mixture of northern hardwoods and lowland conifers." A minerotrophic wetland derives water from groundwater as well as rainwater. Dominant plants include northern white-cedar (*Thuja occidentalis*), black ash (*Fraxinus nigra*), yellow birch (*Betula allegheniensis*), tamarack (*Larix laricina*), balsam fir (*Abies balsamea*), eastern hemlock (*Tsuga canadensis*), eastern white pine (*Pinus strobus*), and balsam poplar (*Populus balsamifera*).

The MNFI defines the Northern Swamp community as "a seasonally inundated, primarily deciduous forest type located north of the tension zone on hydric mineral soils and shallow muck over mineral soils." Dominant plants include balsam fir (*Abies balsamea*), red maple (*Acer rubrum*), black ash (*Fraxinus nigra*), green ash (*Fraxinus pennsylvanica*), northern bugleweed (*Lycopus uniflorus*), sensitive fern (*Onoclea sensibilis*), sphagnum moss (*Sphagnum* spp.), skunk cabbage (*Symplocarpus foetidus*), American yew (*Taxus canadensis*), American basswood (*Tilia americana*), and American elm (*Ulmus americana*).

Northern Shrub Thicket

The Northern Shrub Thicket community is relatively common in the study area and covers approximately 167 acres.

The MNFI defines the Northern Shrub Thicket community as, "a fairly persistent shrub-dominated wetland located north of the transition zone." Plant dominance is

overwhelmingly by speckled alder (*Alnus incana* ssp. *rugosa*), but other shrubs such as withe-rod (*Viburnum nudum*), highbush-cranberry (*V. trilobum*), and sweet gale (*Myrica gale*) can be present.

Emergent Marsh

Emergent marshes are common in the study area, especially in the southwestern quarter, where they are associated with major drainage ways. Emergent marshes cover approximately 294 acres within the study area.

The MNFI defines the Emergent Marsh community as, "a shallow water marsh characterized by emergent narrow- and broad-leaved herbs and grass-like plants as well as floating-leaved herbs at the shores of lakes and streams." Characteristic emergent plant genera are water-plantain (*Alisma*), sedge (*Carex*), spikerush (*Eleocharis*), rice cut-grass (*Leersia*), duckweed (*Lemna*), water-lily (*Nyphaea*), smartweed (*Polygonum*), pickerel-weed (*Pontederia*), arrowhead (*Sagittaria*), bulrush (*Scirpus*), bur-reed (*Sparganium*), and cattail (*Typha*).

Muskeg / Poor Conifer Swamp

The Muskeg / Poor Conifer Swamp community is relatively uncommon in the study area, covering approximately 112 acres. There is a large example of this community in the southwestern part of the site and several smaller examples in other southwestern parts of the site.

The MNFI defines the Muskeg community as, "an ombrotrophic peatland which is characterized by clumped and scattered trees set in a matrix of Sphagnum moss." An ombotrophic wetland receives water from rainwater alone (compared to a minerotropic wetland, which receives both rainwater and groundwater). The Muskeg community type is characterized by sphagnum hummocks on which grow ericaceous (heath family) shrubs and stunted conifers. Dominant species are black spruce (*Picea mariana*), leatherleaf (*Chamaedaphne calyculata*), and Labrador-tea (*Ledum groenlandicum*).

The MNFI defines the Poor Conifer Swamp community as, "an ombrotrophic or very weakly minerotrophic forested peatland occurring mostly north of the transition zone." Black spruce usually dominates solitarily or with tamarack and balsam fir. Jack pine (*Pinus banksiana*) can also dominate, presumably where the other conifers were eliminated by fire. Ground layer dominants include sphagnum moss (*Sphagnum* spp.) and three-seed sedge (*Carex trisperma*).

Herbaceous Openland

In the study area, this plant community type occurs primarily in roadway easements, utility easements, and near residential areas. Herbaceous Openland covers approximately 68 acres of the study area.

MIRIS states, "Herbaceous open lands (prairies, grassland, rangeland) are dominated by grasses and forbs. Such areas are often subjected to continuous disturbance such as mowing, grazing or burning to maintain the herbaceous character. Typical plant species are quackgrass [*Agropyron repens*], Kentucky bluegrass [*Poa pratensis*], upland and lowland sedges [*Carex* spp.], reed canary grass [*Phalaris arundinacea*] and clovers [*Trifolium* spp.]."

Shrubland

This plant community type is found in relatively few locations within the study area and covers approximately 27 acres. Young stands of paper birch (*Betula papyrifera*), quaking aspen (*Populus tremuloides*), and big tooth aspen (*Populus grandidentata*) are common components of this plant community type in the study area. Although the MIRIS description of Shrubland could apply to both upland and wetland plant communities, for purposes of this project all areas mapped as Shrubland are upland and do not contain the wetland species listed above, such as dogwood (*Cornus* spp.), willow (*Salix* spp.), or tag alder (also called speckled alder – *Alnus incana* ssp. *rugosa*). Wetland shrub plant communities in the study area are labeled as Northern Shrub Thickets using the MNFI's classification system.

This MIRIS plant community type is described as, "dominated by native shrubs and low woody plants. If left undisturbed, such areas are soon dominated by young tree growth. Typical shrub species include blackberry and raspberry [*Rubus* spp.] briars, dogwood [*Cornus* spp.], willow [*Salix* spp.], sumac [*Rhus* spp.] and tag alder."

Single Family/Duplex

This classification is relatively uncommon in the study area. Approximately fifteen residences, covering an estimated 20 acres, are in the study area.

MIRIS describes this residential category as, "having detached single and two-family structures generally containing an average gross density of no more than six dwelling units per acre. Lawns, driveways, and associated structures such as garages, tool sheds, garden sheds, etc., are included" in this category.

Extractive

In the study area, the Extractive classification applies to the HTDF and associated rock stockpiles, tailings basins, and abandoned concentrating and processing plants, conveyor structures, and maintenance buildings. Areas classified as Extractive cover approximately 187 acres of the study area.

MIRIS defines this classification as follows: "Extractive mineral land encompasses both surface and subsurface mining operations, such as sand and gravel pits, stone quarries, oil and gas well, and metallic and nonmetallic mines. In size, these mineral activities range from the large open pit mines covering thousands of acres to the often unidentified oil and gas wells less than a foot square. Surface structure and equipment operations utilizing large power shovels and production trucks, installed primary crusher, concentrating or processing plants, stockpiles, maintenance buildings, waste dumps, tailings basins and parking lots."

Open Water / Submergent Marsh

The main "submergent marshes" in the study area are Lake Lory in the southeast and the open water areas immediately north of Lake Lory. Another significant open water area is the flooded HTDF in the northwest portion of the study area. However, it is doubtful that the flooded HTDF has much of a submergent flora due to its great depth and steep rocky side slopes. These "submergent marshes" cover approximately 265 acres within the study area.

The MNFI defines the Submergent Marsh community as, "a chiefly submerged marsh of deep to sometimes shallow water in lakes and streams." Characteristic submergent plant genera are coontail (*Ceratophyllum*), waterweed (*Elodea*), water-milfoil (*Myriophyllum*), pondweed (*Potamogeton*), naiad (*Najas*), wild-celery (*Vallisneria*), and stonewort (*Chara*).

Streams and Waterways

The Middle Branch of the Escanaba River flows through the northeast corner of the study area. In addition, two unnamed tributaries of the Black River flow through the study area. One of the tributaries flows south and west out of Lake Lory. The other flows south and east from a tailings pond on the west border of the study area. These two tributaries join together in the south central portion of the study area.

MIRIS describes this category as including, "rivers, streams, creeks, canals, drains, and other linear bodies of water." Streams and waterways cover approximately 2 acres of the study area.

Road Transportation

The Road Transportation land use type covers approximately 42 acres of the study area. Most of the roads within the study area are gravel roads, paved two-lane roads, or former logging trails and railroad grades that have been converted to recreational use.

MIRIS describes the Road Transportation land use type as, "those areas related to road transportation. The major components of this category are pavements, interchanges, rest areas, and rights of way."

Cliff

The Cliff community is present on the Humboldt Mill site, as there are many exposed rock ledges.

The MNFI defines the Cliff community as, "primarily vertical exposures of bedrock which support little vascular plant vegetation, although rock surfaces usually are covered by lichens, mosses, and liverworts." The MNFI description notes that, "nearly all cliffs have a dry upper lip, characterized by such species as *Polypodium virginianum* [common polypody], *Diervilla lonicera* [northern bush-honeysuckle], etc. and a moister base around which often grows, at moist cliffs at least, *Impatiens capensis* [jewelweed]."

2.1.3 Discussion

The natural communities that occur in the study area are characteristic of much of the western Upper Peninsula, including Marquette County. Within the study area, the Mesic Northern Forest (Northern Hardwood Forest) and the Emergent Marsh are the most commonly occurring plant communities. No unusual or rare natural plant communities were identified in the study area. Three invasive plant species, spotted knapweed (*Centaurea maculosa*), reed canarygrass (*Phalaris arundinacea*), and purple loosestrife (*Lythrum salicaria*), were identified within the study area, but none of them occurred at problematic levels.

Anthropogenic habitat types are found throughout the study area but occur especially in the central portion of the site. These habitat types include single-family residences, hill-

sized rock piles, roads, abandoned railroad beds, sites of present and former mine buildings, tailing basins, and the HTDF.

2.2 Threatened and Endangered Plant Species – Detailed Study Area

2.2.1 Methods

The MNFI maintains the database of all known threatened and endangered plant species in Michigan. A query was made of the MNFI to identify any known threatened or endangered plant species on the study area. Surveys for rare plant species were conducted in the study area on June 9-11, August 14-15, and September 27-28, 2006. Attention was focused on the 186-acre detailed study area, which is where most proposed development impacts would occur. The site was carefully surveyed using a series of meander surveys within all representative habitats present. Particular attention was given to rock ledges since these sometimes host rare plants.

2.2.2 Results

The MNFI database query did not identify any known threatened or endangered plant species in the study area. In addition, none of the plant species observed in the study area (Table 2-1 and Table 2-3) are listed as threatened or endangered species.

2.2.3 Discussion

Threatened and endangered plants typically occur in rare plant habitats. All of the identified study area plant communities are typical, with no unusual plant communities that may harbor rare plants identified. Historical mining and logging activities within the study area also limit the likelihood of rare plant species being present on site.

3.0 WILDLIFE

3.1 Birds – Overall Study Area

3.1.1 Methods

Prior to conducting field assessments, KME reviewed published information about bird species presence in the study area. This included information maintained by the MNFI and published information in *The Atlas of Breeding Birds of Michigan* (Brewer, et al., 1991). Surface resource features of the project location were reviewed by using MDNR aerial photography (MDNR 2001a) and topographic mapping. A query was made of the MNFI to identify any known threatened or endangered species on the study area. Based upon review of this information and an initial on-site reconnaissance meeting with representatives of KEMC, eleven sampling points were established for the bird studies (Figure 3-1). Diurnal survey methods included using a series of point count surveys, which are a commonly accepted method for identifying birds in a region (Howe, et al., 1997; Sauer, et al., 2005). The sampling points were established within differing habitat types in order to maximize documentation of bird species present. Each sampling point was flagged in the field and the position located by Global Positioning System (GPS). Photographs and general habitat descriptions of each sampling point were documented (Photographs 1-22).

The survey protocol included ten-minute, unlimited radius counts at each of the eleven points, recording all birds seen or heard, consistent with *The Atlas of Breeding Birds of Michigan* protocol. A breeding bird survey was conducted June 11-12, 2006. A fall bird migration study was conducted September 25-26, 2006. The same eleven sampling points were used in the June and September surveys. All eleven points were surveyed on two consecutive days for the breeding season and fall migration surveys. The surveys were generally conducted in reverse order on the second day of sampling in order to stagger the time of day each point was surveyed. Most sampling was conducted from early morning to early afternoon. All bird species encountered in the study area while traveling from survey point to survey point, or during other on-site activities, were recorded on data sheets as incidental species. Bird presence data was recorded on data sheets. A sample data sheet is enclosed (Form A-1, Appendix). Weather conditions and habitat types were recorded for all observations. Point surveys were not conducted during times of strong wind or heavy rain.

In addition to the eleven point surveys, KME also conducted an assessment of an existing great blue heron (*Ardea herodias*) nesting colony that had previously been identified within the study area. KME also assessed a bald eagle (*Haliaeetus leucocephalus*) nesting site in relative proximity to the heron nesting colony (Figure 1-2) This bald eagle nesting colony had been previously identified and was mentioned by KEMC during initial conversations with KME. Review of both the heron nesting colony and the eagle nest location was conducted through visual observation from a distance by the use of a spotting scope and binoculars to minimize disturbance to the birds. For the heron nesting colony, the total number of nests was counted and documentation of adult and nestlings presence was recorded.

All eagle sightings within the study area were noted. Observations of all threatened and endangered bird species were documented and are discussed in Section 3.4, Threatened and Endangered Wildlife Species.

3.1.2 Results

A total of 346 birds representing 70 species were identified on site during the June and September, 2006 surveys. The June breeding bird survey identified 207 birds representing 59 species (Table 3-1, Table 3-2), while the September migration survey resulted in 139 birds representing 26 species (Table 3-3, Table 3-4). Some of the most commonly identified species during the June survey included the American robin (*Turdus migratorius*), blue jay (*Cyanocitta cristata*) and crow (*Corvus brachyrhynchos*). During the September survey, commonly identified species included the pine siskin (*Carduelis pinus*), rock pigeon (*Columba livia*) and black capped chickadee (*Poecile atricapillus*).

The great blue heron nesting colony was found to be active during the June survey. Thirty-one nests were identified in the heron nesting colony, an area adjacent to Lake Lory (Figure 1-2). Historically this human-made area has been consistently flooded. Twenty-six of the 31 nests appeared to be active with adult and/or young great blue herons present. The 13 immature herons that were counted were able to stand, but had not yet fledged. Five of the nests were occupied by double-crested cormorants (*Phalacrocorax auritus*) with young in each of the five nests. The immature cormorants had not yet fledged.

3.1.3 Discussion

The bird species identified within the study area during the June breeding survey and September fall migration survey are consistent with the bird species one would expect in the habitats present on site. Fewer bird species were identified during the September survey, which is not surprising since many of the summer resident species, such as members of the vireo (*Vireo* spp.) and warbler (*Dendroica* spp.) families, had already moved south. The study area is not located within a known migration pathway; it is therefore not unusual that large numbers of migrating birds, such as waterfowl and raptors, were not observed during the September survey.

The existing nesting colony of great blue herons appears to be healthy, given the high number of occupied nests. The presence of some double-crested cormorants within the heron colony is evidence of the recent expansion of Michigan's population of double-crested cormorants. Double-crested cormorants have been documented as competing with other colonial water birds for nesting locations (Wires, et al., 2001).

3.2 Mammals

3.2.1 Small Mammals – Overall Study Area

3.2.1.1 Methods

Prior to conducting field assessments, KME reviewed published information about mammal species presence in the study area. This included information maintained by the MNFI and published information in *Mammals of the Great Lakes Region* (Kurta, 1995). Surface resource features of the project location were reviewed by using MDNR aerial photography and topographic mapping. A query was made of the MNFI to identify any known threatened or endangered species in the study area. Based upon these reviews, the same 11 sampling points that were established for the bird survey were also

used for the small mammal studies (Figure 3-1). Each sampling point was flagged in the field and the position located by GPS. Photographs and general habitat descriptions of each sampling point were documented (Photographs 1-22)

The use of a combination of snap traps and live traps is common in research involving small mammals (Schemnitz, 2005; Kurta, 1995). KME used a combination of two small snap traps, one large snap trap, and one Sherman live trap at each sampling location. The array of four traps was deployed typically within one to two meters of each sampling point. Traps were placed in strategic locations, such as against fallen trees, to enhance the likelihood of capturing small mammals and to hide the traps from curious birds or other non-target species. Bait for the traps consisted of peanut butter and oatmeal on the three snap traps and wheat crackers in the Sherman traps. Sampling was conducted on three consecutive days: September 25-27, 2006. The identification of all trapped small mammals, in addition to notes regarding any other apparent activity at the traps, was recorded on data sheets. A sample data sheet is enclosed (Form A-2, Appendix).

3.2.1.2 Results

Thirteen small mammals representing eight species were identified during the September 25-27, 2006 trapping period (Table 3-5a, b, c)**.** These eight species included: deer mouse (*Peromyscus maniculatus*), white-footed mouse (*Peromyscus leucopus*), Eastern chipmunk (*Tamias striatus*), least chipmunk (*Tamias minimus*), pygmy shrew (*Sorex hoyi*), red squirrel (*Tamiasciurus hudsonicus*), red backed vole (*Clethrionomys gapperi*) and meadow vole (*Microtus pennsylvanicus*). The most commonly encountered small mammal was the Eastern chipmunk. Typically one or two specimens per sampling point were captured over the duration of the sampling period. Some traps were snapped with either the bait missing or bait intact. No threatened or endangered small mammals were encountered during the sampling period.

3.2.1.3 Discussion

The small mammals encountered are typical of those expected in the habitats present in the study area. Small mammals were distributed throughout mature wooded habitats, shrub and open habitats, and wetland habitats. The highly visible and vocal eastern chipmunk was widely distributed throughout the wooded upland habitats. The red squirrel was also routinely noted by sight and sound in coniferous habitats, both upland and wetland.

3.2.2 Large Mammals – Overall Study Area

3.2.2.1 Methods

All evidence of large mammal presence was noted during the small mammal surveys and also during the course of conducting other biological surveys in the study area in 2006. Documentation of direct observation or indirect evidence such as scat, tracks, feeding areas or similar evidence was made. Observation of large mammals was recorded either on the data sheets of other surveys (small mammal or bird) as incidental observations or otherwise written as field notes.

3.2.2.2 Results

The following four large mammal species were directly observed in the study area: white tail deer (*Odocoileus virginianus*), coyote (*Canis latrans*), red fox (*Vulpes vulpes*), and

mink (*Mustela vison*). Indirect evidence was observed for the following species: cottontail rabbit (*Sylvilagus floridanus*), gray wolf (*Canis lupus*), beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), raccoon (*Procyon lotor*), and skunk (*Mephitis mephitis*). The gray wolf was the only threatened or endangered large mammal species possibly identified on site and is discussed in more detail in Section 3.4 - Threatened and Endangered Wildlife Species.

3.2.2.3 Discussion

The large mammals identified on site are consistent with the species expected in the vegetative habitats present. Other relatively common large mammal species possibly present within the study area, but not detected during our surveys, include wood chuck (*Marmonta monax*) porcupine (*Erethizon dorsatum*), bobcat (*Lynx rufus*), black bear (*Ursus americanus*) and river otter (*Lutra canadensis*).

3.3 Frogs and Toads – Overall Study Area

3.3.1 Methods

The survey for frogs and toads was conducted according to the survey protocol developed by the MDNR Wildlife Division (MDNR, 2002). Survey methodology consists of listening to frog and toad breeding calls in established survey locations for ten-minute periods. Survey protocol requires that surveys be conducted on evenings with calm air or mild winds and air temperatures greater than 45 degrees Fahrenheit in the early spring (April 1 through May 5), greater than 55 degrees Fahrenheit in the late spring (May 6 through June 10), and greater than 65 degrees Fahrenheit in the summer (June 11 through July 10). Temperatures were taken using thermometers located in vehicles parked near the sampling points. Weather observations and temperatures were recorded on data sheets at each sampling point.

Five survey points were selected during site reconnaissance at locations in Section 11 of the detailed study area. These points were adjacent to semi-permanently flooded wetlands that would likely have breeding frogs and toads present during the appropriate time of the spring and early summer (Figure 3-1). These five survey points are generally representative of the aquatic habitats in the study area that are likely to harbor frog and toad populations. Surveys were conducted after sunset on June 8, 2006 and June 26, 2006. These dates were chosen in an effort to survey breeding frog and toad species active in late spring as well as those species more active in the early summer.

KME biologists recorded the species of frogs and toads heard calling during a ten-minute period at each of the survey points and recorded the relative abundance of each species heard according to the Call Index Value from the MDNR survey protocol (MDNR, 2002). A Call Index Value of 1 indicates that individuals can be counted and there is space between calls. A Call Index Value of 2 indicates that individuals can still be counted, but there is some overlapping of calls. A Call Index Value of 3 indicates a full chorus; calls are continuous and overlapping, and individuals cannot be distinguished. A sample data sheet is enclosed (Form A-3, Appendix).

3.3.2 Results

A total of four species of frogs was heard during the survey periods (Table 3-6a, b). Species recorded included northern spring peepers (*Pseudacris crucifer*), eastern gray tree frogs (*Hyla versicolor*), green frogs (*Rana clamitans*), and mink frogs (*Rana*

septentrionalis). No toads were identified during the survey. Although the weather conditions were within the range suggested by the MDNR protocol, calling activity was limited to Call Index Values 1 and 2. No full chorus of calling activity (Call Index Value 3) was heard. No threatened or endangered frog or toad species were identified during the survey.

3.3.3 Discussion

Four of the five sites surveyed exhibited use by frogs for breeding. The most abundant recorded frog species was the green frog. This was also the only species of frog heard at Site Number 2, which is at the south end of the HTDF. This is not surprising since the steep rocky shore of the HTDF prevents growth of submergent and emergent vegetation, which is an important component of amphibian habitat. Frog and toad presence is an indicator that the aquatic community surveyed is healthy, with clean water and abundant and diverse vegetation that supports breeding frog populations. Other frog and toad species may be present in the study area but were either not located at the five survey points, or were not vocal during the survey periods. The frog species identified are typical of those expected in the habitats present in the study area.

3.4 Threatened and Endangered Wildlife Species – Overall Study Area

3.4.1 Methods

Prior to conducting field assessments, KME requested from the MNFI a review of the study area to identify any known occurrences of protected species within or immediately adjacent to the study area. In accordance with MDNR (2001b) guidelines, KME surveyed the site for any MNFI listed species or their habitats during the appropriate season. KME also noted other protected species observed during field investigations but not previously identified by MNFI. KME assessed the use of the existing bald eagle nest through visual observation during the spring season.

3.4.2 Results

The MNFI database query conducted on May 15, 2006 resulted in identification of the existing bald eagle nest near Lake Lory. No other threatened or endangered wildlife species, including birds, mammals, and frogs and toads, were identified in the MNFI query. The existing great blue heron nesting colony was noted on the MNFI database even though the great blue heron is not a threatened or endangered species. The MNFI database includes records of known notable habitat features, such as water bird nesting colonies, even though these habitat features are not afforded protection under Michigan's threatened and endangered species regulations.

The KME bird surveys in June and September, 2006, resulted in the identification of three state threatened bird species. These included the bald eagle (noted on the MNFI database), the common loon (*Gavia immer*) and the merlin (*Falco columbarius*).

The bald eagle nest near Lake Lory was observed and appeared to be used during the 2006 breeding season. Adult and immature bald eagles were observed during both the June survey and the September survey. All of the bald eagle observations were made in the proximity of the bald eagle nest and Lake Lory.

Common loons were heard calling on Lake Lory during the June survey and one was observed flying during the September, 2006 survey. One merlin was identified on site

approximately 300 feet south of the existing buildings associated with Humboldt Mill during the June 2006 survey.

Possible evidence of a gray wolf was observed one time during the September survey. Evidence consisted of large canine tracks and related scat.

3.4.3 Discussion

It is likely that two of the three adult bald eagles observed in June were the parents of the two immature eagles observed in the nest. No other eagle nest locations were identified during the surveys. Nesting site fidelity by adult eagles and their young is not uncommon, especially if an abundant food source is nearby. This appears to be true in this case since the eagles were still present at Lake Lory in September. If abundant food is not available, adult and immature eagles will leave the nesting location to forage for food. The fisheries survey of Lake Lory documented that a healthy and diverse fish community is present (AEM, Inc., 2007).

Common loons prefer remote and undeveloped lakes at least 10 acres in size that have a healthy fisheries present as a food source (Dahmer, 1986). A floating bog mat or island is desirable for nesting habitat. It appears Lake Lory has limited suitable nesting habitat for loons because much of the shoreline lacks the necessary floating wetland vegetation. The presence of loons during both surveys indicates that Lake Lory is at least a favored loafing and feeding area for loons with some potential nesting habitat present.

Merlins are medium-sized falcons that prefer nesting in boreal forests. In Michigan they prefer spruce forests near bogs or open water. The merlin's major breeding grounds are in Canada, and its population is expected to be low throughout the Upper Peninsula (Cuthrell, 2002).

On March 12, 2007, the U.S. Fish and Wildlife Service removed gray wolves in the western Great Lakes region from protection under the federal Endangered Species Act. However, the gray wolf remains listed as a threatened species by the State of Michigan. Evidence of a gray wolf or other large canine on site included a one-time observation of large canine tracks and associated scat. To further detail the potential for wolf presence within the study area, KME contacted Mr. Brian Roell, Wolf Coordinator for the Michigan Department of Natural Resources. Mr. Roell indicated that the wolves in the Upper Peninsula of Michigan travel extensively in the summer months, with wolf packs not forming until fall and winter months. He stated that during the summer months, wolves travel through a variety of habitats that may not be essential habitat components with regard to pack location. Mr. Roell related that the MDNR uses winter track surveys, aerial surveys, and tracking collars to document wolf pack presence and population locations during the winter months. He indicated that the study area and the immediately surrounding area were not within a known wolf pack territory and that there was not a known wolf denning area in or near the study area (pers. comm., 2006).

4.0 WETLAND EVALUATION

4.1 Preliminary Wetland Evaluation – Overall Study Area

4.1.1 Methods

A preliminary wetland evaluation was conducted in order to generally identify wetland habitat within the 3,169-acre study area. This evaluation was conducted in accordance with the Michigan Department of Environmental Quality (MDEQ) Wetland Identification Manual: A Technical Manual for Identifying Wetlands in Michigan (MDEQ, 2001), the statutory language and rules found in the Natural Resources and Environmental Protection Act, Public Act 451 of 1994, Part 303, Wetland Protection (Part 303), and the procedures and general practices used by the MDEQ when conducting a preliminary wetland evaluation. Figure 4-1 shows the wetlands identified by the National Wetlands Inventory (NWI) (USFWS, 1979-1994) in the Humboldt Mill study area.

KME reviewed in-office materials including the portion of the Soil Survey Geographic (SSURGO) database for Marquette County, Michigan that includes the Humboldt Mill site (Figure 4-2); NWI mapping; MDNR MIRIS Current Use Inventory; and MDNR 1998 aerial photography to identify potential wetland areas within the study area. KME conducted on-site evaluations within the study area on June 6-8, August 14-15, and September 7 and 27-28, 2006 to verify wetland presence. Not all of the identified wetland areas were evaluated on site.

Based on review of the in-office material, air photo interpretation, and on site evaluation, a graphic was prepared depicting wetlands identified within the study area (Figure 4-3). Each wetland was described using general descriptions consistent with the NWI classification system (Cowardin, et al., 1979) including forested wetland, emergent wetland, scrub-shrub wetland and open water/unknown bottom.

4.1.2 Results

Figure 4-3 depicts the identified wetlands within the study area. A total of 1,008.1 acres of wetland, consisting of approximately 289.5 acres of emergent wetland, approximately 281.4 acres of forested wetland, approximately 166.9 acres of scrub-shrub wetland and approximately 270.3 acres of open water, were identified within the study area. No potentially rare or exceptional wetland habitats were identified within the study area.

The emergent wetland areas identified in the preliminary wetland evaluation include habitats described in Section 2.1.2 of this report as Emergent Marsh. Common plant species identified within emergent wetlands include emergent narrow- and broad-leaved herbs and grass-like plants as well as floating-leaved herbs such as water-plantain (*Alisma* spp.), sedge (*Carex* spp.), spikerush (*Eleocharis* spp.), rice cut-grass (*Leersia oryzoides*), duckweed (*Lemna* spp.), smartweed (*Polygonum* spp.), pickerel-weed (*Pontederia cordata*), arrowhead (*Sagittaria* spp.), bulrush (*Scirpus* spp.), bur-reed (*Sparganium* spp.), and cattail (*Typha* spp.).

The scrub-shrub wetland areas identified in the preliminary wetland evaluation include habitats described in Section 2.1.2 of this report as Northern Shrub thicket. Common plant species identified within emergent wetlands include speckled alder (*Alnus rugosa*), withe-rod (*Viburnum cassinoides*), highbush-cranberry (*V. trilobum*), sweet gale (*Myrica gale*), balsam poplar (*Populus balsamifera*), red maple (*Acer rubrum*), black ash

(*Fraxinus nigra*), green ash (*Fraxinus pennsylvanica*), sedge (*Carex*), spikerush (*Eleocharis*), and rice cut-grass.

The forested wetland areas identified in the preliminary wetland evaluation include habitats described in Section 2.1.2 of this report as Hardwood-Conifer Swamp /Northern Swamp and Muskeg / Poor Conifer Swamp. Plant species identified in the forested wetlands include black spruce (*Picea mariana*), jack pine (*Pinus banksiana*) sphagnum moss (*Sphagnum* spp.), three-seed sedge (*Carex trisperma*), northern white cedar (*Thuja occidentalis*), black ash (*Fraxinus nigra*), yellow birch (*Betula allegheniensis*), tamarack (*Larix laricina*), balsam fir (*Abies balsamea*), eastern hemlock (*Tsuga canadensis*), eastern white pine (*Pinus strobus*), and balsam poplar (*Populus balsamifera*).

The open water/unknown bottom areas identified in the preliminary wetland evaluation include habitats described in Section 2.1.2 of this report as Open Water/ Submergent Marsh and Lakes and Waterways. Common plant species identified in the open water/ unknown bottom include coontail (*Ceratophyllum* spp.), waterweed (*Elodea* spp.), water-milfoil (*Myriophyllum* spp.), pondweed (*Potamogeton* spp.), naiad (*Najas* spp.), wild-celery (*Vallisneria* spp.), and stonewort (*Chara* spp.).

4.1.3 Discussion

The wetland areas identified in this preliminary evaluation are similar to wetland habitats that commonly occur within Marquette County. No potential rare or exceptional wetland habitats were identified within the study area. The identified wetlands are located within the Black River watershed and the Middle Branch of the Escanaba River watershed.

Because the majority of the identified wetlands are contiguous to lakes, stream, rivers and/or ponds, they are regulated under Part 303. A permit must be obtained from the MDEQ prior to conducting most filling, dredging and/or draining activities or maintaining a use of a regulated wetland.

4.2 Wetland Boundary Delineation – Detailed Study Area

4.2.1 Methods

A wetland delineation was conducted within the 186-acre detailed wetland study area. This wetland delineation was conducted in accordance with the MDEQ Wetland Identification Manual: A Technical Manual for Identifying Wetlands in Michigan (MDEQ, 2001); the statutory language and rules found in the Natural Resources and Environmental Protection Act, Public Act 451 of 1994, Part 303, Wetland Protection (Part 303); and the procedures and general practices used by the MDEQ when using the point determination method.

KME reviewed in-office materials including the SSURGO database for Marquette County, Michigan (USDA, 2005) (Figure 4-2), National Wetland Inventory mapping, MDNR MIRIS Current Use Inventory, and MDNR 1998 aerial photography to identify potential wetlands within the detailed wetland study area.

KME conducted an on-site wetland delineation on August 14-15 and September 7 and 27-28, 2006. At each area of potential wetland, an evaluation was conducted to determine if wetland vegetation, visual evidence of wetland hydrology and hydric soils

were present. Based on this evaluation, an upland/wetland boundary was identified. The wetland boundary was delineated by placing numbered pink flagging at intervals along the identified boundary. A photograph of each wetland complex was taken. Photos of individual wetlands can be found in Photographs 23 through 44. A Part 303 – Wetland Data Form was used to record information for each flagged wetland (Form A-4, Appendix). Each numbered flag was located by GPS (Global Positioning System) equipment with sub-meter accuracy capability. The GPS data was incorporated with a topographic survey to create a wetland delineation graphic (Figure 4-4).

4.2.2 Results

Twenty-four individual wetlands were delineated and are described below. These wetlands comprise less than 16 acres of the total 186-acre detailed study area. Figure 4-4 shows the delineation.

Wetland A

This 0.25-acre emergent wetland is located in the central portion of the detailed wetland study area, directly east of the existing buildings. This wetland has been impacted by previous ditching and ore processing activities. Plant species identified within this wetland included speckled alder (*Alnus incana* ssp. *rugosa*), balsam poplar, sedge (*Carex* sp.), redtop grass (*Agrostis gigantea*), blue-joint grass (*Calamagrostis canadensis*), alpine rush (*Juncus alpinoarticulatus*) soft rush (*Juncus effusus*), broad-leaved cattail (*Typha latifolia*), wool grass (*Scirpus cyperinus*), grass-leaved goldenrod (*Euthamia graminifolia*), petioled willow (*Salix petiolaris*), and balsam willow (*Salix pyrifolia*). Evidence of standing water was present within portions of this wetland. The boundaries of this wetland were identified using flags A1 through A31.

Wetland B

This 0.82-acre emergent wetland is located in the central portion of the detailed wetland study area, east of Wetland A. This wetland has been impacted by previous ditching and ore processing activities. Rubble is present throughout the southern portion of this wetland. Plant species identified within this wetland included redtop grass, blue-joint grass, reed canary grass (*Phalaris arundinacea*), bedstraw (*Galium trifidum*), water parsnip (*Sium suave*), water-horehound (*Lycopus uniflorus*), soft rush, broad-leaved cattail, wool grass, grass-leaved goldenrod, bebb willow (*Salix bebbiana*), pussy willow (*Salix discolor*), shining willow (*Salix lucida*), purple loosestrife (*Lythrum salicaria*), ostrich fern (*Matteucia struthiopteris*), speckled alder, and balsam poplar. Standing water is present within the northern portion of this wetland. The boundaries of this wetland were identified using flags B1 through B36.

Wetland D

This 0.12-acre scrub-shrub wetland is located in the eastern portion of the detailed wetland study area, east of Wetland B. This wetland has been impacted by previous ore processing activities. Rubble is present throughout the southern portion of this wetland. Plant species identified within this wetland included redtop grass, blue-joint grass, reed canary grass, bedstraw, water-parsnip, water-horehound, soft rush, broad-leaved cattail, wool grass, grass-leaved goldenrod, water horsetail (*Equisetum fluviatile*), shining willow, bebb willow, tamarack and balsam poplar. Standing water is present within the northern portion of this wetland. The boundaries of this wetland were identified using flags D1 through D16.

Wetland E

This 2.84-acre forested, scrub-shrub wetland is located in the northeast portion of the detailed wetland study area. Plant species identified within this wetland included blue-joint grass, cinnamon fern (*Osmunda cinnamomea*), lady fern (*Athyrium filix-femina*), marsh-marigold (*Caltha palustris*), white turtlehead (*Chelone glabra*), fowl manna grass (*Glyceria striata*), sensitive fern (*Onoclea sensibilis*), water-horehound, spotted joe-pye weed (*Eupatorium maculatum*), woodland horsetail (*Equisetum sylvaticum*), balsam fir, red maple, speckled alder, paper birch (*Betula papyrifera*), black ash (*Fraxinus nigra*), and balsam poplar. Standing water is present within the portions of this wetland. The southern portion of this wetland contains a stream which appears to flow seasonally from northwest to southeast. This stream channel begins at flag E40 and ends at flag E3. The boundaries of this wetland were identified using flags E1 through E161.

Wetland F

This 0.4-acre emergent, scrub-shrub wetland is located in the northern portion of the detailed wetland study area, west of Wetland E. Plant species identified within this wetland included blue-joint grass, wild black currant (*Ribes americanum*), European swamp thistle (*Cirsium palustre*), ostrich fern, red maple, sugar maple (*Acer saccharum*), speckled alder, and basswood (*Tilia americana*). This wetland has been impacted by the construction of a roadway located to the north of this wetland. Portions of this wetland appear to have been created to serve as a ditch. Surface water from this wetland flows seasonally into Wetland E. The boundaries of this wetland were identified using flags F1 through F39.

Wetland G

This 0.1-acre emergent, scrub-shrub wetland is located in the northern portion of the detailed wetland study area, north of Wetland E. Plant species identified within this wetland included blue-joint grass, ostrich fern, lady fern, sensitive fern, maned sedge (*Carex crinita*), spotted joe-pye weed, European swamp thistle, fowl manna grass, wool-grass, large-leaved aster (*Aster macrophyllus*), red maple, black ash, and speckled alder. This wetland has been impacted by the construction of a roadway located to the south of this wetland. Cabling and other construction debris was observed within this wetland. Evidence of seasonal standing water was also observed. This wetland is separated from Wetland E by a roadway. The boundaries of this wetland were identified using flags G1 through G22.

Wetland H

This 0.07-acre emergent, scrub-shrub wetland is located in the northern portion of the detailed wetland study area, south of Wetland E. Plant species identified within this wetland included ostrich fern, fowl manna grass, European swamp thistle, red maple, and speckled alder. It appears that this wetland receives seasonal surface water flows from Wetland E. The boundaries of this wetland were identified using flags H1 through H11.

Wetland I

This 0.33-acre emergent wetland is located in the south-central portion of the detailed wetland study area. This wetland has been impacted by previous ditching, tailings basin construction, and ore processing activities. Rock rubble and tailings are present throughout this wetland. Plant species identified within this wetland included nodding beggar-ticks (*Bidens cernuus*), European swamp thistle, water horsetail, duckweed

(*Lemna minor*), water-horehound, reed canary grass, wild red raspberry (*Rubus strigosus*), broad-leaved cattail, wool-grass, speckled alder and bebb willow. Standing water is present within the majority of this wetland. The boundaries of this wetland were identified using flags I1 through I30.

Wetland J, P and Q

This 8.67-acre emergent wetland complex is located in the western portion of the detailed wetland study area, adjacent to County Road 601. This wetland complex continues west outside the detail wetland study area. The northern and western portions of this wetland complex have been impacted by previous mining and ore processing activities. An active beaver lodge is present within this wetland and recent beaver activity was observed. Plant species identified within this wetland included blue-joint grass, reed canary grass, marsh-marigold, beggar-ticks (*Bidens tripartitus*), European swamp thistle, node pondweed (*Potamogeton nodosus*), wool grass, broad-leaved cattail, bebb willow, sedge, spotted joe-pye weed, blue-joint grass, red maple and speckled alder. Approximately two acres of open water exist within the central portion of Wetland J. Several beaver dams are present within this wetland and appear to temporarily affect the water levels within this wetland complex. The boundaries of this wetland were identified using flags J1 through J171, P1 though P15 and Q1 though Q35.

Wetland K

This 0.14-acre emergent wetland is located in the southern portion of the detailed wetland study area, west of Wetland L. Plant species identified within this wetland included water-horehound, wool-grass, red maple, and speckled alder. Standing water is present over the majority of this wetland. The boundaries of this wetland were identified using flags K1 through K9.

Wetland L

This 0.57-acre emergent, scrub-shrub wetland is located in the southern portion of the detailed wetland study area, east of Wetland K. Plant species identified within this wetland included speckled alder, broad-leaved cattail, northern white-cedar (*Thuja occidentalis*), sensitive fern, blue-stem, and bebb willow. This wetland has been impacted by the previous mining and ore processing activities. Standing water is present over much of this wetland. The boundaries of this wetland were identified using flags L1 through L48.

Wetland M

This 0.01-acre scrub-shrub wetland is located in the south-central portion of the detailed wetland study area, south of Wetland BB. Plant species identified within this wetland included speckled alder, bebb willow, tamarack, wild red raspberry, grass-leaved goldenrod and sedge species. This wetland is a small depression that appears to have been created by ore processing activities. The boundaries of this wetland were identified using flags M1 through M5.

Wetland N

This 0.006-acre emergent wetland is located in the south-central portion of the detailed wetland study area, west of Wetland L. Plant species identified within this wetland included willow species and sensitive fern. Surface water is present over much this small rocky pothole. The boundaries of this wetland were identified using flags N1 through N4.

Wetland O

This 0.06-acre emergent, scrub-shrub wetland is located in the southern portion of the detailed wetland study area, east of Wetland P. Plant species identified within this wetland included speckled alder, sensitive fern, wool-grass, bebb willow and red maple. Standing water is present over much of this wetland. Discarded building material and other rubbish was observed throughout this wetland. The boundaries of this wetland were identified using flags O1 through O12.

Wetland R

This 0.6-acre emergent, scrub-shrub wetland is located in the southern portion of the detailed wetland study area. Plant species identified within this wetland included speckled alder, sensitive fern, blue-joint grass, wool-grass, bebb willow and red maple. This wetland appears to have held standing water in the past; however, evidence of recent inundation was not observed. The boundaries of this wetland were identified using flags R1 through R12 and RR1 through RR13.

Wetland S

This 0.06-acre emergent wetland is located in the southern portion of the detailed wetland study area. Plant species identified within this wetland included speckled alder, sensitive fern, blue-joint grass, wool-grass and bebb willow. This wetland appears to have held standing water in the past. Based on the shape of this wetland and piping which is present on the western end of this wetland, it appears that this wetland may have been created to serve as a discharge settling basin. The boundaries of this wetland were identified using flags S1 through S8.

Wetland T

This 0.07-acre emergent wetland is located in the central portion of the detailed wetland study area, north of Wetland J. Plant species identified within this wetland included redtop grass, soft rush, wool-grass and speckled alder. Processed ore pellets were observed throughout this wetland. A roadway is located directly north of this wetland. The boundaries of this wetland were identified using flags T1 through T9.

Wetland U

This 0.1-acre emergent, scrub-shrub wetland is located in the central portion of the detailed wetland study area, north of Wetland J. Plant species identified within this wetland included tamarack, speckled alder, blueberry (*Vaccinium* spp.), wool-grass, bebb willow, soft rush and blue-joint grass. Processed ore pellets were observed throughout this wetland. This wetland is located over what appears to be an abandoned railroad bed. The boundaries of this wetland were identified using flags U1 through U12.

Wetland V

This 0.01-acre emergent wetland is located in the eastern portion of the detailed wetland study area, south and west of Wetland D. Plant species identified within this wetland included redtop grass, soft rush, quaking aspen, bebb willow, pussy willow, balsam willow and wool-grass. This wetland has been impacted by the previous ore processing activities. This small depression appears to hold surface water seasonally. The boundaries of this wetland were identified using flags V1 through V4.

Wetland AA

This 0.004-acre emergent/scrub-shrub wetland is located in the western portion of the detailed wetland study area, north of Wetland J. Plant species identified within this wetland included speckled alder, lady fern, blue-joint grass, reed canary grass, bracken fern and wool-grass. The boundaries of this wetland were identified using flags AA1 through AA3.

Wetland BB

This 0.006-acre emergent, wetland is located in the south-central portion of the detailed wetland study area, east of Wetland J. Plant species identified within this wetland included red maple, brownish sedge (*Carex brunnescens*), tribulus sedge (*Carex tribuloides*) and quaking aspen. This wetland is a small depression that appears to have been created during previous ore processing activities. This small depression appears to hold surface water seasonally. The boundaries of this wetland were identified using flags BB1 through BB4.

Wetland CC

This 0.07-acre emergent/scrub-shrub wetland is located in the western portion of the detailed wetland study area, north of Wetland J Plant species identified within this wetland included speckled alder, sedge, soft rush and wool-grass. Processed ore pellets were observed throughout this wetland. A roadway is located directly north of this wetland. The boundaries of this wetland were identified using flags CC1 through CC5.

4.2.3 Discussion

Twenty-four wetlands were identified within the detailed wetland study area. Without exception, the identified wetlands have been impacted by the previous mining and ore processing activities conducted within this area. Ten of the delineated wetlands appear to have developed within areas of ditching or other grading activities including wetlands A, G, I, L, M N, U, V, T, and CC. Three of the delineated wetlands appear to have developed within water discharge or tails processing areas including wetlands D, S, and R.

No threatened or endangered plant species were identified within the delineated wetlands.

5.0 CONCLUSION

KME conducted environmental surveys in 2006 for KEMC to establish baseline environmental information within the Humboldt Mill study area in Marquette County, Michigan. The study area is a combination of an abandoned iron ore facility and surrounding undeveloped upland and wetland habitats.

The surveys for birds, small mammals, large mammals, and frogs and toads, as well as the plant community evaluation and preliminary wetland evaluation, were conducted within the overall study area. The detailed study area was focused on for threatened and endangered species evaluations and wetland boundary delineation.

The plant community survey identified eleven natural plant communities on site, all typical plant community types for Marquette County. A total of 70 bird species were identified on site, including the following three state threatened species: bald eagle, common loon and merlin. A total of eight small mammal species and five large mammal species were identified on site. The gray wolf was the only protected large mammal species identified. The study area does not appear to be part of a wolf pack home range. Four species of frogs were identified on site. All of the bird, mammal and frog species identified on site are typical of those species associated with the vegetative communities on site.

The wetland survey identified 24 distinct wetlands in the detailed wetland study area. All of the wetland communities are typical for Marquette County, Michigan.

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FIGURES

Baraga

Michigamme Twp

Champion Twp

Powell Twp

Ishpeming Twp

Marquette Twp

Negaunee Twp

Ely Twp

Van Riper State Park

Marquette

Champion Mine Site

Ropes Mine Site

~24 Miles

US 41

Marquette

Lake Superior

Ishpeming

Negaunee

Humboldt Mill
Project Location

US 95

CR 601

Republic Twp

Sands Twp

Chocolay Twp

Tilden Mine Site

Empire Mine Site

Tilden Twp

Richmond Twp

Humboldt Twp

West Branch Twp

Skandia Twp

NOTES

1. Horizontal datum based on NAD 83/94.
   Horizontal coordinates based on UTM Zone 16.
2. All base information downloaded from Michigan Center of Geographic Information (http://www.michigan.gov/cgi).
3. Site Location - Project Site within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.

LEGEND

- Counties
- Minor Civil Divisions
- Lakes and Rivers
- KEMC Project Location
- Highways
- Major Roads
- Minor Roads
- Railroads

N

King & MacGregor Environmental, Inc.

Foth Infrastructure & Environment, LLC

M:\06w003\mxd\KME\kmc_humboldt_ProjectLocation_11x17.mxd October 24, 2007

Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	AKM	DATE: APR. '07
APPROVED BY:	SVD1	DATE: APR. '07
APPROVED BY:		DATE:

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FIGURE 1-1

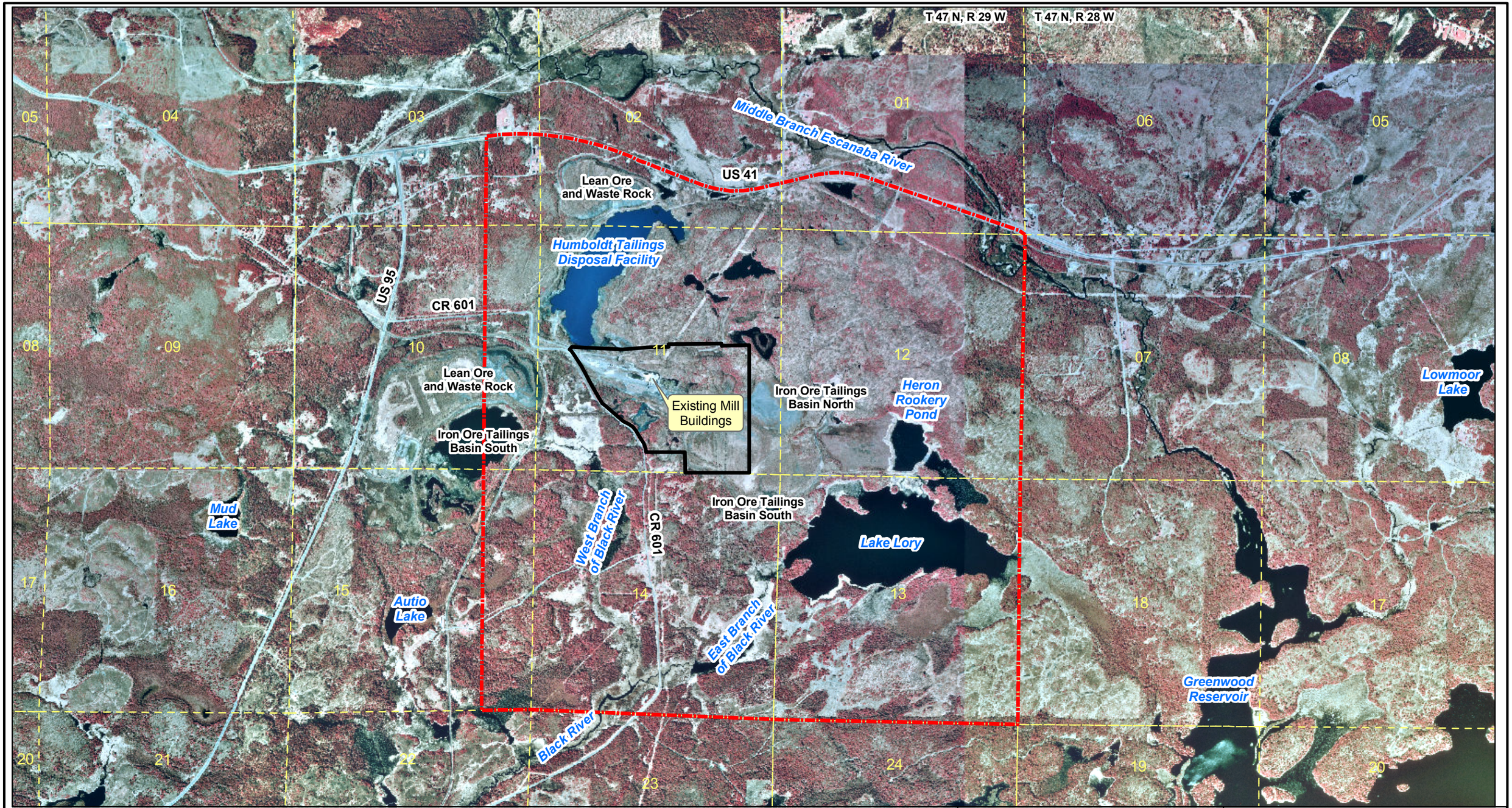
HUMBOLDT MILL PROJECT
PROJECT LOCATION

Scale: 0 1.5 3 Miles

Date: APRIL 2007

Prepared by: DAT

Project No: 06W003



NOTES

1. Base Information, USGS georeferenced Digital Raster Graphics (DRG) and 1998 Digital Orthophoto Quads are from Michigan Center of Geographic Information (http://www.michigan.gov/cgi/)
2. Horizontal datum based on NAD 83/94. Horizontal coordinates based on UTM Zone 16.
3. Site Location - Project Site within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.

LEGEND

- Overall Study Area for 2006 Biological Survey
- Detailed Wetland Study Area, Wetlands in this area not shown
- PLSS Sections

N

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CHECKED BY:	AKM	DATE:	APR. '07
APPROVED BY:	SVD1	DATE:	APR. '07
APPROVED BY:		DATE:	

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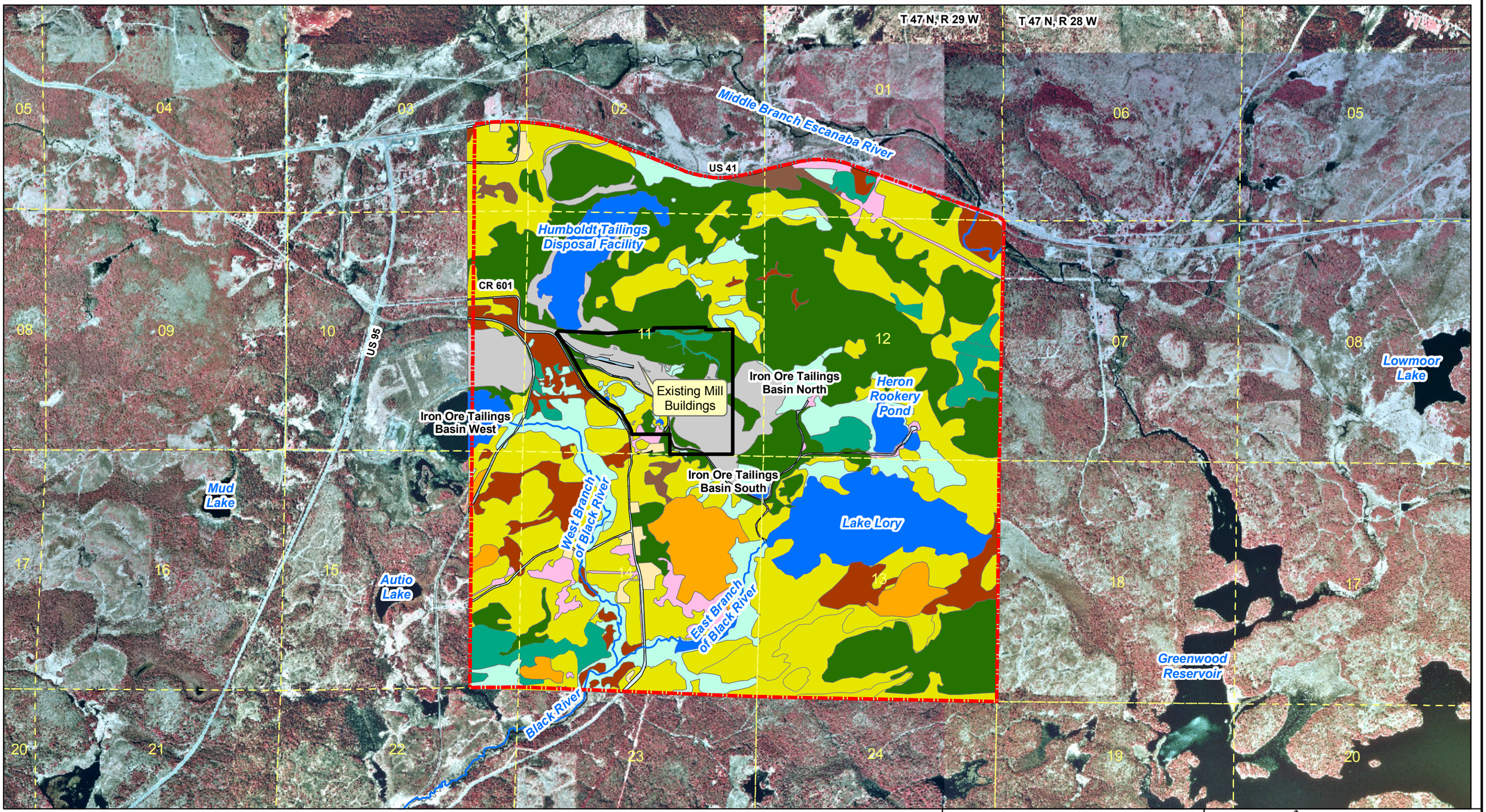
FIGURE 1-2
HUMBOLDT MILL PROJECT
STUDY AREA LOCATION MAP

Scale: 0 1,000 2,000 Feet		Date:	APRIL 2007
Prepared by:	DAT	Project No:	06W003



NOTES

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2. Horizontal datum based on NAD 83/94. Horizontal coordinates based on UTM Zone 16.
3. Site Location - Project Site within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.

LEGEND

- Overall Study Area for 2006 Biological Survey
- Detailed Wetland Study Area for 2006 Biological Survey
- PLSS Sections

- Mesic Northern Forest (Coniferous)
- Mesic Northern Forest ((Boradleaved Forest) (Generally Deciduous))
- Muskeg/Poor Conifer Swamp
- Hardwood Conifer Swamp/Northern Swamp
- Emergent Marsh
- Shrubland
- Northern Shrub Thicket
- Residential Single Family/ Duplexes
- Extractive
- Streams and Waterways
- Open Water/Submergent Marsh
- Herbaceous Openland
- Road Transportation

N

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CHECKED BY:	AKM	DATE: OCT. '07
APPROVED BY:	SVD1	DATE: OCT. '07
APPROVED BY:		DATE:

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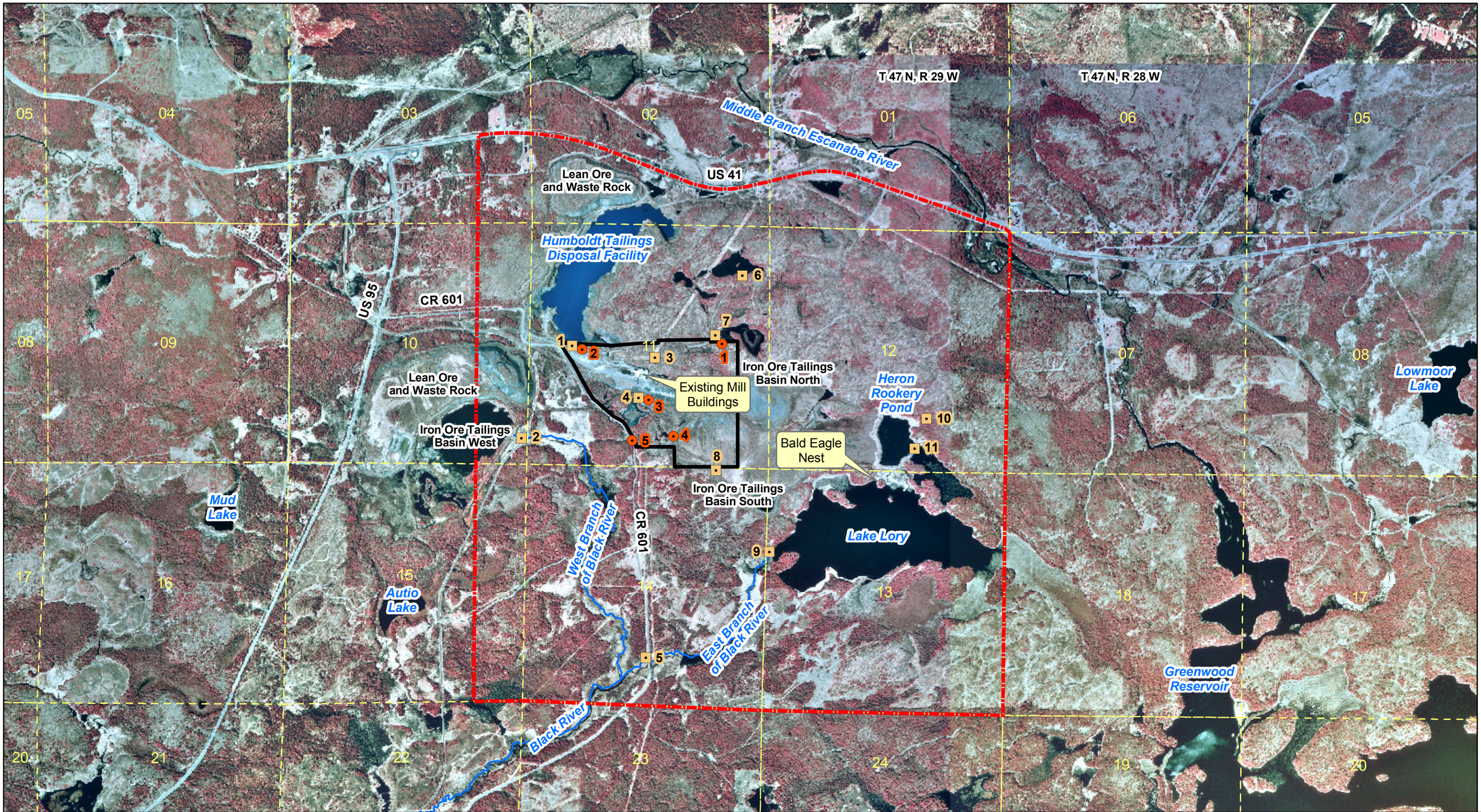
FIGURE 2-1
HUMBOLDT MILL PROJECT
PLANT COMMUNITY AND HABITAT/ LAND USE DESCRIPTIONS

Scale: 0 1,000 2,000 Feet	Date: OCTOBER 2007
Prepared by: DAT	Project No: 06W003



NOTES

1. Base Information, USGS georeferenced Digital Raster Graphics (DRG) and 1998 Digital Orthophoto Quads are from Michigan Center of Geographic Information (http://www.michigan.gov/cgi/)
2. Horizontal datum based on NAD 83/94.
   Horizontal coordinates based on UTM Zone 16.
3. Site Location - Project Site within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.

LEGEND

- Overall Study Area for 2006 Biological Survey
- Detailed Wetland Study Area for 2006 Biological Survey
- PLSS Sections
- 2006 Spring frog and toad sample locations
- 2006 Avian and small mammal sample locations

N

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CHECKED BY:	AKM	DATE: APR. '07	
APPROVED BY:	SVD1	DATE: APR. '07	
APPROVED BY:		DATE:	

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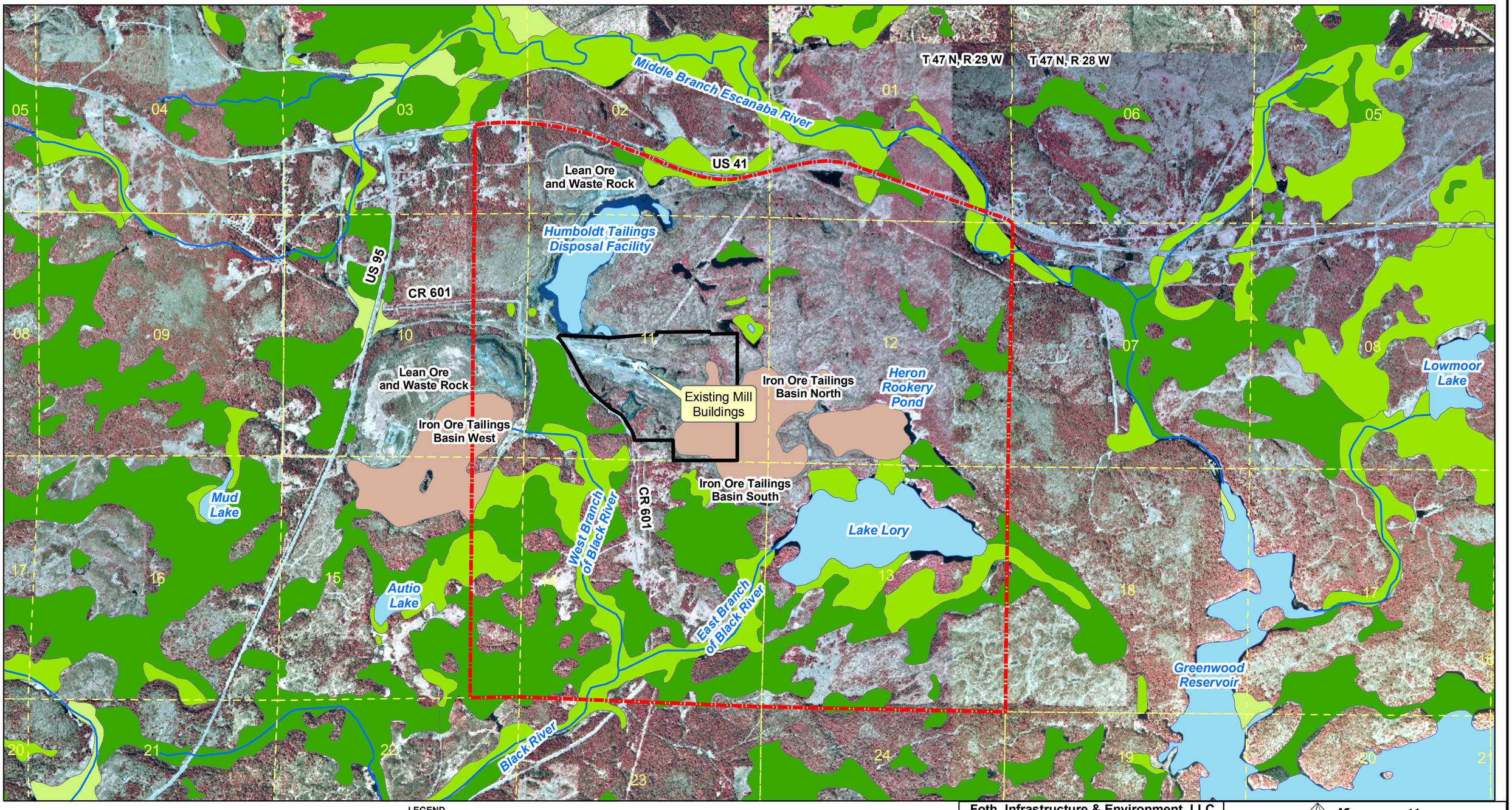
FIGURE 3-1
HUMBOLDT MILL PROJECT
DETAILED WETLAND STUDY AREA
AND SAMPLE LOCATION MAP

Scale: 0 1,000 2,000 Feet

Date: APRIL, 2007

Prepared by: DAT

Project No: 06W003



NOTES

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2. Horizontal datum based on NAD 83/94. Horizontal coordinates based on UTM Zone 16.
3. Site Location - Project Site within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.

LEGEND

- Overall Study Area for 2006 Biological Survey
- Detailed Wetland Study Area for 2006 Biological Survey
- PLSS Sections

Marquette County NWI

- Emergent
- Scrub-Shrub
- Forested
- Unconsolidated Bottom
- Open Water/Unknown Bottom

N

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APPROVED BY:	SVD1	DATE: APR. '07	
APPROVED BY:		DATE:	

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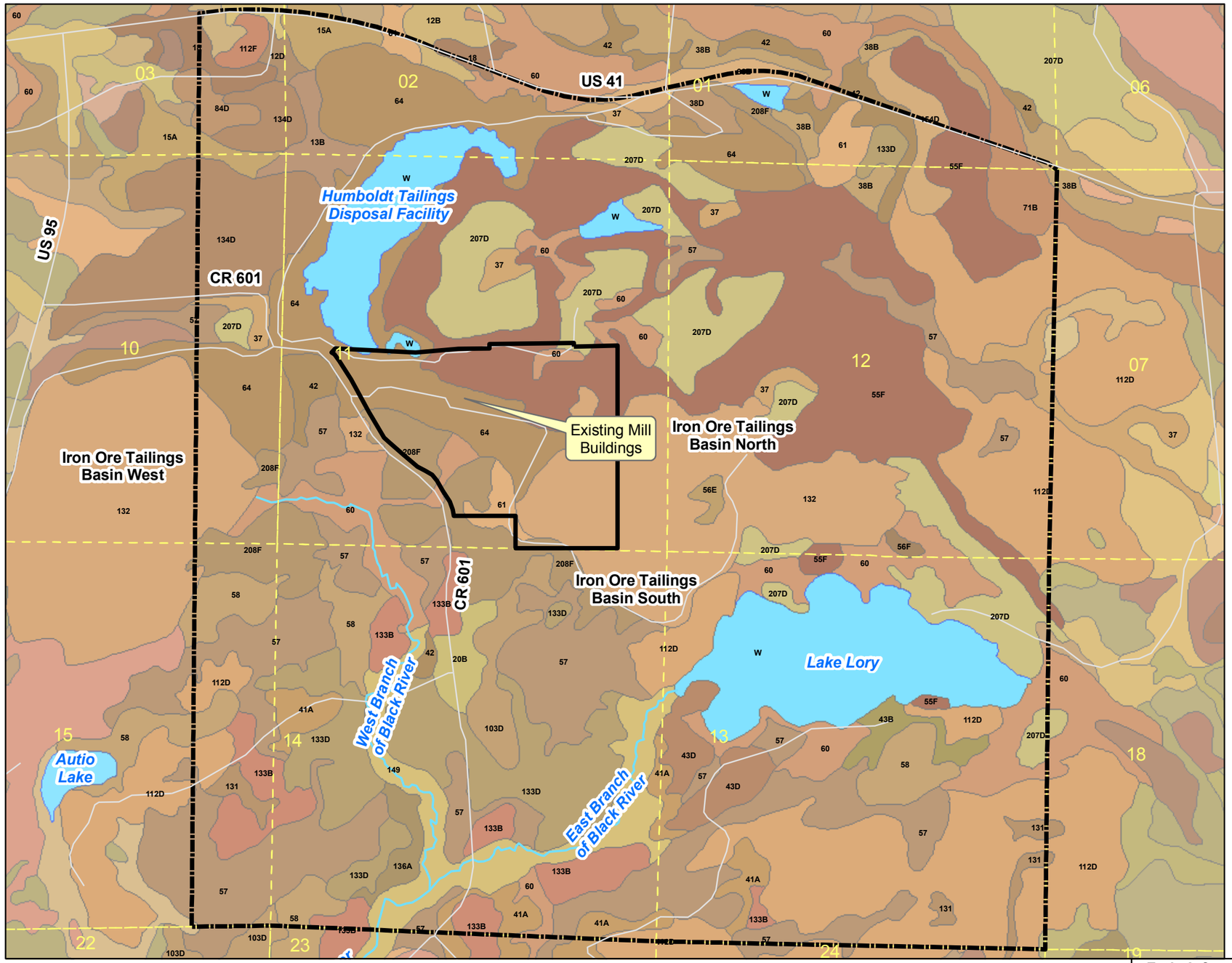
FIGURE 4-1
HUMBOLDT MILL PROJECT
NWI IDENTIFIED WETLANDS

Scale: 0 1,000 2,000 Feet

Date: APRIL 2007

Prepared by: DAT

Project No: 06W003



SSURGO Soils

- 57 - Carbondale and Tawas soils
- 41A - Channing fine sandy loam - 0 to 3 percent slopes
- 15A - Croswell sand - 0 to 3 percent slopes
- 207D - Dishno-Michigamme-Rock outcrop complex - 6 to 25 percent slopes - very bouldery
- 149 - Evart-Cathro complex
- 71B - Evart-Pelkie-Sturgeon complex - 0 to 4 percent slopes
- 58 - Greenwood and Dawson soils
- 60 - Histosols and Aquents - ponded
- 13B - Kalkaska sand - 0 to 6 percent slopes
- 43B - Karlin sandy loam - 1 to 6 percent slopes
- 43D - Karlin sandy loam - 6 to 18 percent slopes
- 134D - Keewaydin cobbly fine sandy loam - 6 to 18 percent slopes - bouldery
- 133B - Keewaydin-Dishno complex - 1 to 6 percent slopes - rocky - bouldery
- 133D - Keewaydin-Dishno complex - 6 to 18 percent slopes - rocky - bouldery
- 208F - Keewaydin-Michigamme cobbly fine sandy loams - 18 to 45 percent slopes - rocky - very bouldery
- 112F - Keewaydin-Michigamme-Rock outcrop complex - 25 to 60 percent slopes - very bouldery
- 112D - Keewaydin-Michigamme-Rock outcrop complex - 6 to 25 percent slopes - very bouldery
- 18 - Kinross muck
- 55F - Michigamme-Rock outcrop complex - 25 to 70 percent slopes - very bouldery
- 42 - Minocqua muck
- 136A - Minocqua-Channing complex - 0 to 3 percent slopes
- 38B - Pence fine sandy loam - 0 to 6 percent slopes
- 38D - Pence fine sandy loam - 6 to 18 percent slopes
- 56E - Peshekee-Rock outcrop complex - 18 to 35 percent slopes - very bouldery
- 56F - Peshekee-Rock outcrop complex - 35 to 70 percent slopes - very bouldery
- 61 - Pits - borrow
- 64 - Pits and Dumps - mine
- 20B - Rousseau-Ocqueoc fine sands - 0 to 6 percent slopes
- 12B - Rubicon sand - 0 to 6 percent slopes
- 12D - Rubicon sand - 6 to 18 percent slopes
- 84D - Rubicon-Ishpeming-Rock outcrop complex - 6 to 25 percent slopes
- 103D - Rubicon-Ocqueoc-Rock outcrop complex - 6 to 25 percent slopes
- 154D - Rubicon-Sayner complex - 6 to 18 percent slopes - rocky
- 132 - Slickens
- 66B - Udipsamments-Urban land complex - nearly level and gently sloping
- W - Water
- 37 - Witbeck very stony muck - extremely bouldery
- 131 - Witbeck-Cathro complex - very bouldery

NOTES

1. Base Information, USGS georeferenced Digital Raster Graphics (DRG) and 1998 Digital Orthophoto Quads are from Michigan Center of Geographic Information (http://www.michigan.gov/cgi/)
2. Horizontal datum based on NAD 83/94.
   Horizontal coordinates based on UTM Zone 16.
3. Site Location - Project Site within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.

LEGEND

- Detailed Wetland Study Area for 2006 Biological Survey
- Soils Study Area
- 22 Section Number
- Roads
- Lakes and Rivers

N

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APPROVED BY:	SVD1	DATE: APR. '07	
APPROVED BY:		DATE:	

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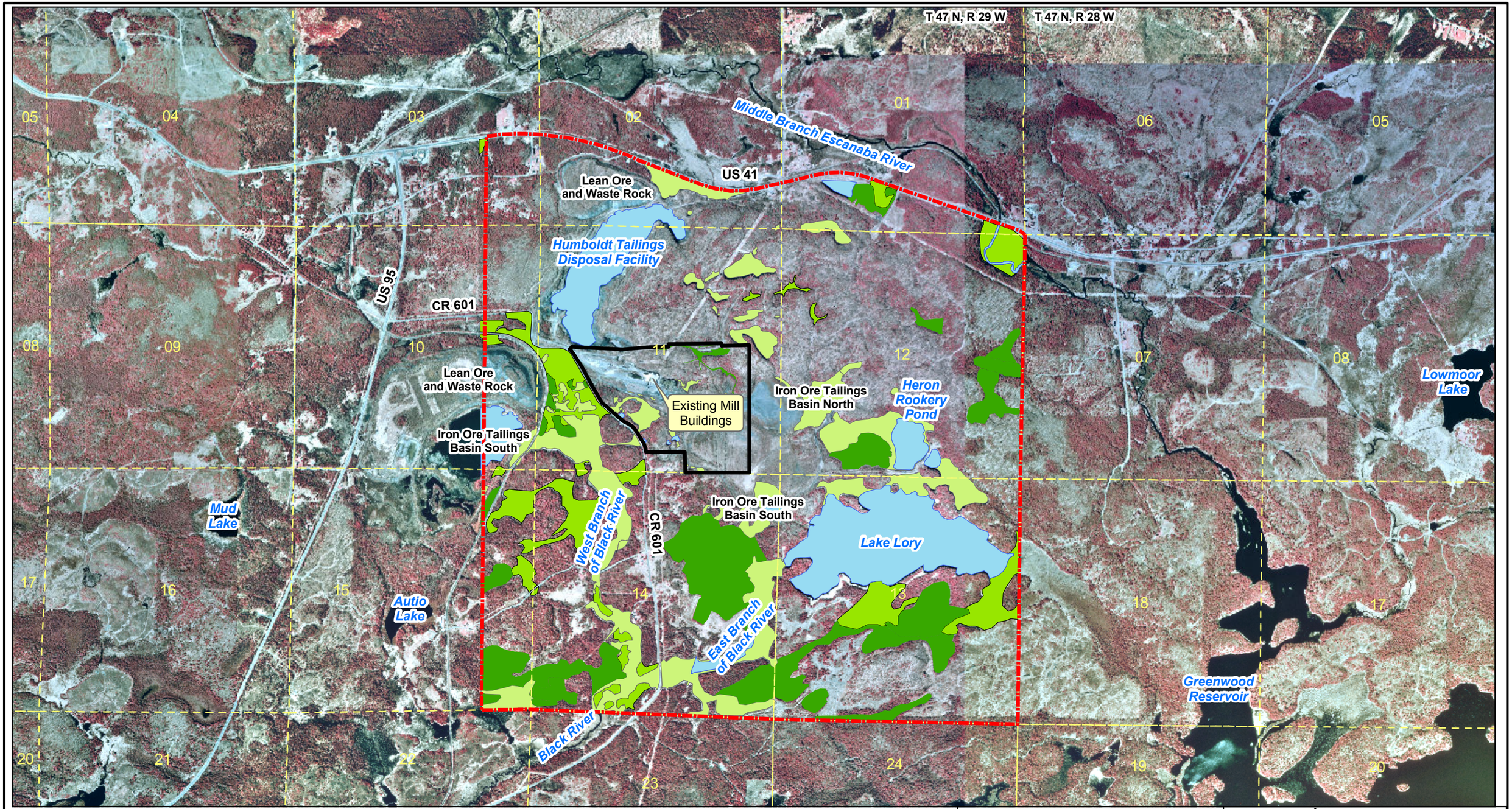
FIGURE 4-2
HUMBOLDT MILL PROJECT
MARQUETTE COUNTY SSURGO SOILS

Scale: 0 750 1,500 Feet
Date: APRIL 2007
Prepared by: DAT
Project No: 06W003



NOTES

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2. Horizontal datum based on NAD 83/94. Horizontal coordinates based on UTM Zone 16.
3. Site Location - Project Site within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.

LEGEND

Overall Study Area for 2006 Biological Survey

Detailed Wetland Study Area, Wetlands in this area not shown

PLSS Sections

	Area (Acres)
Emergent	289.5
Scrub-Shrub	166.9
Forested	281.4
Open Water/Unknown Bottom	270.3

N

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REVISED	DATE	BY	DESCRIPTION

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APPROVED BY:	SVD1	DATE: APR. '07
APPROVED BY:		DATE:

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FIGURE 4-3
HUMBOLDT MILL PROJECT
PRELIMINARY WETLAND EVALUATION MAP

Scale: 0 1,000 2,000 Feet

Date: APRIL 2007

Prepared by: DAT

Project No: 06W003

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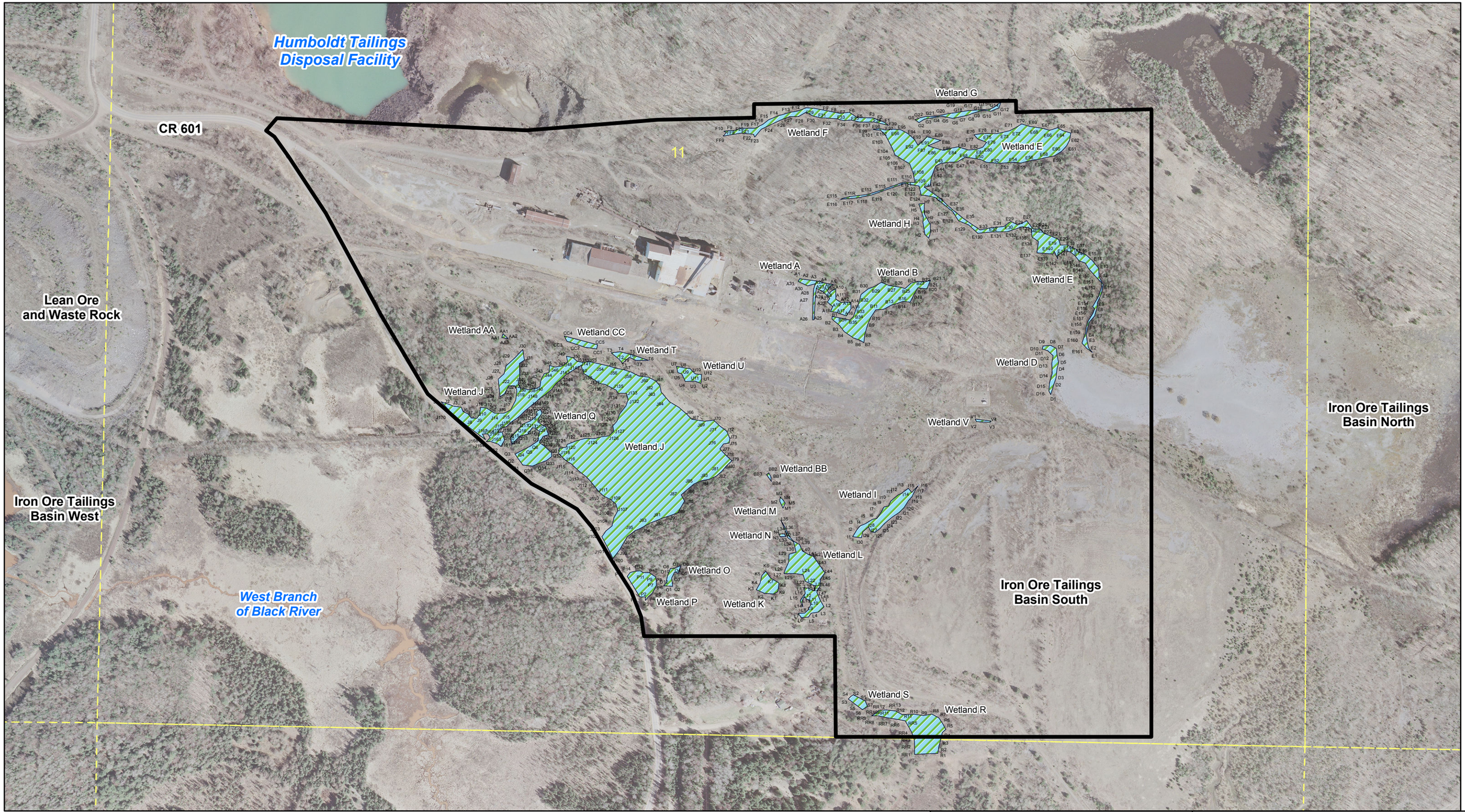

NOTES

1. Orthophotography supplied by Aero-Metric Engineering, Sheboygan, Wisconsin. Date of photography: April 27, 2006.
2. Horizontal datum based on NAD 83/96. Horizontal coordinates based on Michigan State Plane North.
3. Site Location - Project Site within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.
4. Wetland Boundary GPS data supplied by King & MacGregor Environmental, Inc. via email on 01/03/2007.

LEGEND

- Overall Study Area for 2006 Biological Survey
- Detailed Wetland Study Area for 2006 Biological Survey
- PLSS Sections
- R7 — Wetland Boundary Flagging
- Wetlands
- Detailed Wetland Study Area

N

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CHECKED BY: AKM			DATE: APR. '07
APPROVED BY: SVD1			DATE: APR. '07
APPROVED BY:			DATE:

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FIGURE 4-4

HUMBOLDT MILL PROJECT
WETLAND BOUNDARY FLAGGING

Scale: 0 200 400 Feet

Date: APRIL 2007

Prepared by: DAT

Project No: 06W003

M:\06w003\mxd\KME\kmc_humboldt_WetlandsFlagging_11x17.mxd October 24, 2007

TABLES

Table 2-1: Overall Plant Species List for the Humboldt Mill Site

June, August, and September 2006

SCIENTIFIC NAME	ENGLISH NAME	NATIVE?	WETLAND INDICATOR CODE[1]	WETLAND INDICATOR NO.[2]	GROWTH HABIT[3]	COEFFICIENT OF CONSERVATISM[4]
Abies balsamea	Balsam Fir	Yes	FACW	-3	Tree	3
Acer rubrum	Red Maple	Yes	FAC	0	Tree	1
Acer saccharum	Sugar Maple	Yes	FACU	3	Tree	5
Acer spicatum	Mountain Maple	Yes	FACU	3	Tree	5
Actaea rubra	Red Baneberry	Yes	[UPL]	5	Herb	7
Alnus incana ssp. rugosa	Speckled Alder	Yes	OBL	-5	Shrub	5
Anaphalis margaritacea	Pearly Everlasting	Yes	[UPL]	5	Herb	3
Anemone quinquefolia	Wood Anemone	Yes	FAC	0	Herb	5
Antennaria parlinii (A. plantaginifolia)	Plantain Pussy-toes	Yes	[UPL]	5	Herb	2
Apocynum androsaemifolium	Spreading Dogbane	Yes	[UPL]	5	Herb	3
Aquilegia canadensis	Columbine	Yes	FAC-	1	Herb	5
Aralia nudicaulis	Wild Sarsaparilla	Yes	FACU	3	Herb	5
Athyrium filix-femina	Lady Fern	Yes	FAC	0	Herb	4
Betula alleghaniensis	Yellow Birch	Yes	FAC	0	Tree	7
Betula papyrifera	Paper Birch	Yes	FACU+	2	Tree	2
Botrychium virginianum	Rattlesnake Fern	Yes	FACU	3	Herb	5
Brachyelytrum erectum	Short-glume Grass	Yes	[FACU]	3	Herb	7
Calla palustris	Wild Calla	Yes	OBL	-5	Herb	10
Caltha palustris	Marsh-marigold	Yes	OBL	-5	Herb	6
Carex aenea	Sedge	Yes	UPL	5	Herb	

Table 2-1: Overall Plant Species List for the Humboldt Mill Site

June, August, and September 2006

SCIENTIFIC NAME	ENGLISH NAME	NATIVE?	WETLAND INDICATOR CODE[1]	WETLAND INDICATOR NO.[2]	GROWTH HABIT[3]	COEFFICIENT OF CONSERVATISM[4]
Carex arctata	Bear Sedge	Yes	[UPL]	5	Herb	3
Carex aurea	Golden Sedge	Yes	FACW+	-4	Herb	3
Carex brunnescens	Brownish Sedge	Yes	FACW	-3	Herb	5
Carex canescens	Hoary Sedge	Yes	OBL	-5	Herb	8
Carex castanea	Chestnut Sedge	Yes	FACW+	-4	Herb	6
Carex communis	Common Sedge	Yes	[UPL]	5	Herb	2
Carex crinita	Maned Sedge	Yes	FACW+	-4	Herb	4
Carex debilis	Weak Sedge	Yes	FACW	-3	Herb	6
Carex deweyana	Dewey's Sedge	Yes	FACU-	4	Herb	3
Carex echinata (C. cephalantha, C. angustior)	Echinate Sedge	Yes	OBL	-5	Herb	6
Carex gracillima	Graceful Sedge	Yes	FACU	3	Herb	4
Carex intumescens	Tumid Sedge	Yes	FACW+	-4	Herb	3
Carex laxiculmis	Lax-stemmed Sedge	Yes	[UPL]	5	Herb	8
Carex laxiflora	Loose-flowered Sedge	Yes	UPL	5	Herb	8
Carex radiata (C. rosea)	Radiate Sedge	Yes	[FAC-]	1	Herb	2
Carex scabrata	Scabrous Sedge	Yes	OBL	-5	Herb	4
Carex scoparia	Broom Sedge	Yes	FACW	-3	Herb	4
Carex stipata	Stalk-grain Sedge	Yes	[OBL]	-5	Herb	1
Carex tenera	Slender Sedge	Yes	FAC+	-1	Herb	4

Table 2-1: Overall Plant Species List for the Humboldt Mill Site

June, August, and September 2006

SCIENTIFIC NAME	ENGLISH NAME	NATIVE?	WETLAND INDICATOR CODE[1]	WETLAND INDICATOR NO.[2]	GROWTH HABIT[3]	COEFFICIENT OF CONSERVATISM[4]
Carex trisperma	Three-seeded Sedge	Yes	OBL	-5	Herb	9
Centaurea maculosa	Spotted Knapweed	No	[UPL]	5	Herb	0
Chimaphila umbellata	Umbellate Wintergreen	Yes	[UPL]	5	Herb	8
Cicuta bulbifera	Bulbiferous Water-hemlock	Yes	OBL	-5	Herb	5
Cirsium palustre	European Swamp Thistle	No	[FACW+]	-4	Herb	0
Coptis trifolia	Goldthread	Yes	FACW	-3	Herb	5
Corallorhiza maculata	Spotted Coral-root	Yes	FACU-	4	Herb	5
Cornus alternifolia	Alternate-leaved Dogwood	Yes	[FACU-]	4	Tree	5
Cornus canadensis	Bunchberry; Dwarf Cornel	Yes	FAC	0	Herb	6
Corydalis sempervirens	Pink Corydalis	Yes	UPL	5	Herb	5
Corylus cornuta	Beaked Hazelnut	Yes	UPL	5	Shrub	5
Cypripedium acaule	Pink Lady-slipper	Yes	FACW	-3	Herb	5
Cystopteris fragilis	Fragile Fern	Yes	FACU	3	Herb	4
Diervilla lonicera	Bush-Honeysuckle	Yes	[UPL]	5	Shrub	4
Dirca palustris	Leatherwood	Yes	FAC	0	Shrub	8
Dryopteris intermedia	Intermediate Fern	Yes	FAC	0	Herb	5
Eleocharis erythropoda	Red-foot Spikerush	Yes	OBL	-5	Herb	4
Equisetum sylvaticum	Woodland Horsetail	Yes	FACW	-3	Herb	5
Eupatorium maculatum (Eupatoriadelphus m.)	Spotted Joe-pye-weed	Yes	OBL	-5	Herb	4

Table 2-1: Overall Plant Species List for the Humboldt Mill Site

June, August, and September 2006

SCIENTIFIC NAME	ENGLISH NAME	NATIVE?	WETLAND INDICATOR CODE[1]	WETLAND INDICATOR NO.[2]	GROWTH HABIT[3]	COEFFICIENT OF CONSERVATISM[4]
Fraxinus nigra	Black Ash	Yes	FACW+	-4	Tree	6
Gymnocarpium dryopteris	Oak Fern	Yes	FAC	0	Herb	5
Heracleum maximum (H. lanatum)	Cow-parsnip	Yes	FACW	-3	Herb	3
Hieracium caespitosum (H. pratense)	Common Yellow Hawkweed	No	[UPL]	5	Herb	0
Hieracium kalmii	Kalm's Hawkweed	Yes	[UPL]	5	Herb	3
Huperzia lucidulum (Lycopodium l.)	Shining Clubmoss	Yes	FAC+	-1	Herb	5
Hypericum perforatum	Common St. John's-Wort	No	[UPL]	5	Herb	0
Impatiens capensis	Orange Touch-me-not	Yes	FACW	-3	Herb	2
Iris versicolor	Varicolored Iris	Yes	OBL	-5	Herb	5
Larix laricina	Tamarack	Yes	FACW	-3	Tree	5
Ledum groenlandicum	Labrador-Tea	Yes	OBL	-5	Shrub	8
Lonicera canadensis	Canada Honeysuckle	Yes	FACU	3	Shrub	5
Luzula acuminata	Acuminate Woodrush	Yes	FAC-	1	Herb	5
Luzula multiflora	Common Woodrush	Yes	FACU	3	Herb	5
Lycopodium annotinum	Stiff Clubmoss	Yes	FAC	0	Herb	5
Lycopodium obscurum	Tree Clubmoss	Yes	FACU	3	Herb	5
Lycopodium tristachyum (Diphasiastrum)	Clubmoss	Yes	[UPL]	5	Herb	5
Lysimachia thyrsiflora	Thyrse Loosestrife	Yes	OBL	-5	Herb	6
Maianthemum canadense	Canada Mayflower	Yes	FAC	0	Herb	4

Table 2-1: Overall Plant Species List for the Humboldt Mill Site

June, August, and September 2006

SCIENTIFIC NAME	ENGLISH NAME	NATIVE?	WETLAND INDICATOR CODE[1]	WETLAND INDICATOR NO.[2]	GROWTH HABIT[3]	COEFFICIENT OF CONSERVATISM[4]
Matteucia struthiopteris	Ostrich Fern	Yes	FACW	-3	Herb	3
Milium effusum	Milium-grass	Yes	[FACU-]	4	Herb	8
Moneses uniflora (Pyrola u.)	One-flowered Wintergreen	Yes	[FAC]	0	Herb	8
Myosotis arvensis	Field Forget-me-not	No	FAC	0	Herb	0
Myrica gale	Sweet Gale	Yes	OBL	-5	Shrub	6
Nuphar variegata (N. lutea ssp. variegata)	Yellow Waterlily	Yes	OBL	-5	Herb	7
Onoclea sensibilis	Sensitive Fern	Yes	FACW	-3	Herb	2
Oryzopsis asperifolia	Rough-leaved Ricegrass	Yes	UPL	5	Herb	6
Osmorhiza chilensis	Western Sweet-cicely	Yes	[UPL]	5	Herb	5
Osmorhiza claytonii	Clayton's Sweet-cicely	Yes	FACU-	4	Herb	4
Ostrya virginiana	Hop-hornbeam	Yes	FACU-	4	Tree	5
Oxalis acetosella	Northern Wood-sorrel	Yes	[FACU]	3	Herb	7
Panax trifolius	Dwarf Ginseng	Yes	[UPL]	5	Herb	8
Panicum implicatum	Folded Panicum-grass	Yes	[FAC]	0	Herb	3
Parthenocissus quinquefolia	Virginia Creeper	Yes	FAC-	1	Vine	5
Phalaris arundinacea	Reed Canary Grass	No	FACW+	-4	Herb	0
Picea glauca	White Spruce	Yes	FACU	3	Tree	3
Picea mariana	Black Spruce	Yes	FACW	-3	Tree	6
Pinus banksiana	Jack Pine	Yes	FACU	3	Tree	5

Table 2-1: Overall Plant Species List for the Humboldt Mill Site

June, August, and September 2006

SCIENTIFIC NAME	ENGLISH NAME	NATIVE?	WETLAND INDICATOR CODE[1]	WETLAND INDICATOR NO.[2]	GROWTH HABIT[3]	COEFFICIENT OF CONSERVATISM[4]
Pinus resinosa	Red Pine	Yes	FACU	3	Tree	6
Pinus strobus	White Pine	Yes	FACU	3	Tree	3
Platanthera hyperborea	Tall Northern Bog Orchid	Yes	FACW+	-4	Herb	5
Poa compressa	Canada Bluegrass	No	FACU+	2	Herb	0
Poa pratensis	Kentucky Bluegrass	No	FAC-	1	Herb	0
Poa saltuensis	Bluegrass	Yes	[FACU]	3	Herb	5
Polygonatum pubescens	Downy Solomon's-seal	Yes	[UPL]	5	Herb	5
Polygonum cilinode	Hairy-node Smartweed	Yes	[UPL]	5	Herb	3
Polygonum convolvulus	Black-Bindweed	No	FAC-	1	Herb	0
Polygonum virginianum (Tovara v.)	Jumpseed	Yes	FAC	0	Herb	4
Polypodium virginianum	Virginia Polypody	Yes	UPL	5	Herb	8
Populus balsamifera	Balsam Poplar	Yes	FACW	-3	Tree	2
Populus grandidentata	Big-tooth Aspen	Yes	FACU	3	Tree	4
Populus tremuloides	Quaking Aspen	Yes	FAC	0	Tree	1
Prunus virginiana	Choke Cherry	Yes	FAC-	1	Shrub	2
Pteridium aquilinum	Bracken Fern	Yes	FACU	3	Herb	0
Quercus rubra	Red Oak	Yes	FACU	3	Tree	5
Ranunculus acris	Tall Buttercup	No	FACW-	-2	Herb	0
Ranunculus recurvatus	Recurved Buttercup	Yes	FACW	-3	Herb	5
Rubus parviflorus	Thimbleberry	Yes	FACU+	2	Herb	6

Table 2-1: Overall Plant Species List for the Humboldt Mill Site

June, August, and September 2006

SCIENTIFIC NAME	ENGLISH NAME	NATIVE?	WETLAND INDICATOR CODE[1]	WETLAND INDICATOR NO.[2]	GROWTH HABIT[3]	COEFFICIENT OF CONSERVATISM[4]
Rubus pubescens	Dwarf Raspberry	Yes	FACW+	-4	Herb	4
Rubus strigosus (R. idaeus ssp. strigosus)	Wild Red Raspberry	Yes	FACW-	-2	Herb	2
Salix humilis	Prairie Willow	Yes	FACU	3	Shrub	4
Sambucus racemosa ssp. pubens	Red-berried Elder	Yes	FACU+	2	Shrub	3
Scleranthus annuus	Knawel	No	FACU	3	Herb	0
Silene vulgaris (S. cucuballus)	Bladder-Campion	No	[UPL]	5	Herb	0
Smilacina racemosa	False Solomon's-seal	Yes	FACU	3	Herb	5
Solidago caesia	Blue-stem Goldenrod	Yes	FACU	3	Herb	7
Sorbus decora	Showy Mountain-ash	Yes	UPL	5	Tree	4
Sparganium chlorocarpum	Green-fruit Bur-reed	Yes	OBL	-5	Herb	6
Spiraea alba	White Meadow-sweet	Yes	FACW+	-4	Shrub	4
Stellaria graminea	Grass-Leaved Stellaria	No	UPL	5	Herb	0
Streptopus roseus	Rosy Twisted-stalk	Yes	FAC	0	Herb	5
Tanacetum vulgare	Common Tansy	No	[UPL]	5	Herb	0
Taraxacum erythrospermum	Red-Seeded Dandelion	No	[UPL]	5	Herb	0
Taxus canadensis	Canada Yew	Yes	FACU	3	Shrub	5
Thelypteris palustris (T. thelypteroides)	Marsh Fern	Yes	FACW+	-4	Herb	2
Thelypteris phegopteris	Northern Beech-fern	Yes	[UPL]	5	Herb	5
Thuja occidentalis	White Cedar	Yes	FACW	-3	Tree	4

Table 2-1: Overall Plant Species List for the Humboldt Mill Site

June, August, and September 2006

SCIENTIFIC NAME	ENGLISH NAME	NATIVE?	WETLAND INDICATOR CODE[1]	WETLAND INDICATOR NO.[2]	GROWTH HABIT[3]	COEFFICIENT OF CONSERVATISM[4]
Tilia americana	Basswood	Yes	FACU	3	Tree	5
Trientalis borealis	Starflower	Yes	FAC+	-1	Herb	5
Trillium cernuum	Nodding Trillium	Yes	FAC	0	Herb	5
Tsuga canadensis	Hemlock	Yes	FACU	3	Tree	5
Vaccinium angustifolium	Low Sweet Blueberry	Yes	FACU	3	Shrub	4
Vaccinium myrtilloides	Myrtle Blueberry	Yes	FACW-	2	Herb	4
Veronica chamaedrys	Germander Speedwell	No	[UPL]	5	Herb	0
Veronica officinalis	Apothecary's Speedwell	No	UPL	5	Herb	0
Viola canadensis	Canada Violet	Yes	[UPL]	5	Herb	5
Viola cucullata	Tall Marsh Violet	Yes	OBL	-5	Herb	5
Viola pubescens	Yellow Violet	Yes	FACU-	4	Herb	4
Viola renifolia	White Kidney-leaf Violet	Yes	FACW	-3	Herb	6
Woodsia ilvensis	Rusty Woodsia	Yes	[UPL]	5	Herb	10
Count 148		**Mean Coefficient of Wetness[5]:**		**0.70**	**Average:**	**4.2**

TABLE 2-1 NOTES

1. Wetland Indicator Codes

Wetland indicator codes are three-letter codes that indicate a plant's tolerance of wetland conditions. Each plant that occurs in Michigan has been assigned by a panel of botanists one of five wetland indicator codes. The Michigan Department of Natural Resources published these codes in 2001 as *Floristic Quality Assessment with Wetland Categories and Examples of Computer Applications for the State of Michigan* (Herman et al., 2001). The five codes are OBL (obligate wetland) species, FACW (facultative wetland) species, FAC (facultative) species, FACU (facultative upland) species, and UPL (upland) species. By definition, OBL species occur in wetlands 99% of the time; FACW species occur in wetlands greater than 66% of the time; FAC species occur in wetlands 50% of the time; FACU species occur in wetlands less than 33% of the time; UPL species occur in wetlands less than 1% of the time. The plus and minus signs that accompany some of the codes indicate a greater (+) or lesser (-) affinity for wetlands.

2. Wetland Indicator Numbers

To quantitatively determine the degree to which the vegetation is dominated by wetland species, each wetland indicator code has been assigned a wetness coefficient: UPL = 5, FACU- = 4, FACU = 3, FACU+ = 2, FAC- = 1, FAC = 0, FAC+ = -1, FACW- = -2, FACW = -3, FACW+ = -4, OBL = -5. The average of these numbers serves as an index for evaluating the "wetness" of the vegetation at a site. When the average is greater than zero, the vegetation consists predominantly of non-wetland species (ranging from FAC- to UPL), whereas a negative average indicates a prevalence of wetland species (ranging from FAC+ to OBL).

3. Growth Habit

The growth habit of a species refers to whether it is a tree, a shrub, or an herbaceous plant.

4. Coefficient of Conservatism

Coefficients of conservatism are numbers ranging from zero to ten which have been assigned to Michigan plant species by a panel of botanists. These numbers are intended to represent the "conservatism" of the species, which is defined as "an estimated probability that a plant is likely to occur in a landscape relatively unaltered from what is believed to be pre-European settlement condition" (Herman, et al., 2001). In this system, non-native species and weedy native species are assigned zeroes, while species known to be highly intolerant of habitat alteration are assigned tens. The process of assigning numbers involved considerable subjectivity, so the system lacks scientific rigor. Nevertheless, it is useful since species with high numbers are indicative of high quality natural habitats. A high number is also an indication that a species may be uncommon or even rare.

5. Mean Coefficient of Wetness

The mean coefficient of wetness is the average of the wetland indicator numbers of the plant species growing in a particular place. This mean value has proven to be a sensitive indirect indicator of the hydrology of a site.

Table 2-2 Plant Community/Habitat Type Summary – Humboldt Mill Site

Plant Community/Habitat Type	Classification System	Approximate Acreage
Mesic Northern Forest (1a – coniferous; 1b – broadleaved deciduous)	MNFI	1a – 1,023 1b – 854
Hardwood-Conifer Swamp/ Northern Swamp	MNFI	108
Northern Shrub Thicket	MNFI	167
Emergent Marsh	MNFI	294
Muskeg / Poor Conifer Swamp	MNFI	112
Open Water / Submergent Marsh	MNFI	265
Cliff	MNFI	N/A
Herbaceous Openland	MIRIS	68
Shrubland	MIRIS	27
Single Family/Duplex	MIRIS	20
Extractive	MIRIS	187
Streams and Waterways	MIRIS	2
Road Transportation	MIRIS	42

Table 2-3: Overall List of Plant Species Organized by Plant Community -- Humboldt Mill Site

June, August, and September 2006

PLANT COMMUNITY	SCIENTIFIC NAME	ENGLISH NAME	NATIVE?	WETLAND INDICATOR NUMBER[1]	WETLAND INDICATOR NUMBER[2]	GROWTH HABIT[3]	COEFFICIENT OF CONSERVATISM[4]
Broad-leaved Deciduous Mesic Northern Forest	Acer saccharum	Sugar Maple	Yes	FACU	3	Tree	5
	Actaea rubra	Red Baneberry	Yes	[UPL]	5	Herb	7
	Aralia nudicaulis	Wild Sarsaparilla	Yes	FACU	3	Herb	5
	Athyrium filix-femina	Lady Fern	Yes	FAC	0	Herb	4
	Betula papyrifera	Paper Birch	Yes	FACU+	2	Tree	2
	Botrychium virginianum	Rattlesnake Fern	Yes	FACU	3	Herb	5
	Brachyelytrum erectum	Short-glume Grass	Yes	[FACU]	3	Herb	7
	Carex arctata	Bear Sedge	Yes	[UPL]	5	Herb	3
	Carex communis	Common Sedge	Yes	[UPL]	5	Herb	2
	Carex debilis	Weak Sedge	Yes	FACW	-3	Herb	6
	Carex deweyana	Dewey's Sedge	Yes	FACU-	4	Herb	3
	Carex gracillima	Graceful Sedge	Yes	FACU	3	Herb	4
	Carex laxiculmis	Lax-stemmed Sedge	Yes	[UPL]	5	Herb	8
	Carex laxiflora	Loose-flowered Sedge	Yes	UPL	5	Herb	8
	Chimaphila umbellata	Umbellate Wintergreen	Yes	[UPL]	5	Herb	8
	Corallorhiza maculata	Spotted Coral-root	Yes	FACU-	4	Herb	5
	Cornus alternifolia	Alternate-leaved Dogwood	Yes	[FACU-]	4	Tree	5
	Corylus cornuta	Beaked Hazelnut	Yes	UPL	5	Shrub	5
	Cypripedium acaule	Pink Lady-slipper	Yes	FACW	-3	Herb	5

Table 2-3: Overall List of Plant Species Organized by Plant Community -- Humboldt Mill Site

June, August, and September 2006

PLANT COMMUNITY	SCIENTIFIC NAME	ENGLISH NAME	NATIVE?	WETLAND INDICATOR NUMBER[1]	WETLAND INDICATOR NUMBER[2]	GROWTH HABIT[3]	COEFFICIENT OF CONSERVATISM[4]
Broad-leaved Deciduous Mesic Northern Forest	Dirca palustris	Leatherwood	Yes	FAC	0	Shrub	8
	Dryopteris intermedia	Intermediate Fern	Yes	FAC	0	Herb	5
	Gymnocarpium dryopteris	Oak Fern	Yes	FAC	0	Herb	5
	Hieracium kalmii	Kalm's Hawkweed	Yes	[UPL]	5	Herb	3
	Huperzia lucidulum (Lycopodium l.)	Shining Clubmoss	Yes	FAC+	-1	Herb	5
	Lonicera canadensis	Canada Honeysuckle	Yes	FACU	3	Shrub	5
	Lycopodium annotinum	Stiff Clubmoss	Yes	FAC	0	Herb	5
	Lycopodium obscurum	Tree Clubmoss	Yes	FACU	3	Herb	5
	Maianthemum canadense	Canada Mayflower	Yes	FAC	0	Herb	4
	Milium effusum	Milium-grass	Yes	[FACU-]	4	Herb	8
	Moneses uniflora (Pyrola u.)	One-flowered Wintergreen	Yes	[FAC]	0	Herb	8
	Oryzopsis asperifolia	Rough-leaved Ricegrass	Yes	UPL	5	Herb	6
	Osmorhiza chilensis	Western Sweet-cicely	Yes	[UPL]	5	Herb	5
	Osmorhiza claytonii	Clayton's Sweet-cicely	Yes	FACU-	4	Herb	4
	Ostrya virginiana	Hop-hornbeam	Yes	FACU-	4	Tree	5
	Oxalis acetosella	Northern Wood-sorrel	Yes	[FACU]	3	Herb	7
	Panax trifolius	Dwarf Ginseng	Yes	[UPL]	5	Herb	8
	Parthenocissus quinquefolia	Virginia Creeper	Yes	FAC-	1	Vine	5
	Poa saltuensis	Bluegrass	Yes	[FACU]	3	Herb	5

Table 2-3: Overall List of Plant Species Organized by Plant Community -- Humboldt Mill Site

June, August, and September 2006

PLANT COMMUNITY	SCIENTIFIC NAME	ENGLISH NAME	NATIVE?	WETLAND INDICATOR NUMBER[1]	WETLAND INDICATOR NUMBER[2]	GROWTH HABIT[3]	COEFFICIENT OF CONSERVATISM[4]
Broad-leaved Deciduous Mesic Northern Forest	Polygonatum pubescens	Downy Solomon's-seal	Yes	[UPL]	5	Herb	5
	Polygonum virginianum (Tovara v.)	Jumpseed	Yes	FAC	0	Herb	4
	Polypodium virginianum	Virginia Polypody	Yes	UPL	5	Herb	8
	Populus balsamifera	Balsam Poplar	Yes	FACW	-3	Tree	2
	Populus grandidentata	Big-tooth Aspen	Yes	FACU	3	Tree	4
	Populus tremuloides	Quaking Aspen	Yes	FAC	0	Tree	1
	Prunus virginiana	Choke Cherry	Yes	FAC-	1	Shrub	2
	Quercus rubra	Red Oak	Yes	FACU	3	Tree	5
	Ranunculus recurvatus	Recurved Buttercup	Yes	FACW	-3	Herb	5
	Rubus parviflorus	Thimbleberry	Yes	FACU+	2	Herb	6
	Rubus pubescens	Dwarf Raspberry	Yes	FACW+	-4	Herb	4
	Sambucus racemosa ssp. pubens	Red-berried Elder	Yes	FACU+	2	Shrub	3
	Smilacina racemosa	False Solomon's-seal	Yes	FACU	3	Herb	5
	Solidago caesia	Blue-stem Goldenrod	Yes	FACU	3	Herb	7
	Sorbus decora	Showy Mountain-ash	Yes	UPL	5	Tree	4
	Thelypteris phegopteris	Northern Beech-fern	Yes	[UPL]	5	Herb	5
	Tilia americana	Basswood	Yes	FACU	3	Tree	5
	Trientalis borealis	Starflower	Yes	FAC+	-1	Herb	5
	Vaccinium angustifolium	Low Sweet Blueberry	Yes	FACU	3	Shrub	4
	Vaccinium myrtilloides	Myrtle Blueberry	Yes	FACW-	2	Herb	4

Table 2-3: Overall List of Plant Species Organized by Plant Community -- Humboldt Mill Site

June, August, and September 2006

PLANT COMMUNITY	SCIENTIFIC NAME	ENGLISH NAME	NATIVE?	WETLAND INDICATOR NUMBER[1]	WETLAND INDICATOR NUMBER[2]	GROWTH HABIT[3]	COEFFICIENT OF CONSERVATISM[4]
Broad-leaved Deciduous Mesic Northern Forest	Veronica officinalis	Apothecary's	No	UPL	5	Herb	0
	Viola canadensis	Canada Violet	Yes	[UPL]	5	Herb	5
	Viola pubescens	Yellow Violet	Yes	FACU-	4	Herb	4
Cliff	Acer spicatum	Mountain Maple	Yes	FACU	3	Tree	5
	Cystopteris fragilis	Fragile Fern	Yes	FACU	3	Herb	4
	Diervilla lonicera	Bush-Honeysuckle	Yes	[UPL]	5	Shrub	4
	Woodsia ilvensis	Rusty Woodsia	Yes	[UPL]	5	Herb	10
Coniferous Mesic Northern Forest	Abies balsamea	Balsam Fir	Yes	FACW	-3	Tree	3
	Anemone quinquefolia	Wood Anemone	Yes	FAC	0	Herb	5
	Picea glauca	White Spruce	Yes	FACU	3	Tree	3
	Pinus banksiana	Jack Pine	Yes	FACU	3	Tree	5
	Pinus resinosa	Red Pine	Yes	FACU	3	Tree	6
	Pinus strobus	White Pine	Yes	FACU	3	Tree	3
	Taxus canadensis	Canada Yew	Yes	FACU	3	Shrub	5
	Thuja occidentalis	White Cedar	Yes	FACW	-3	Tree	4
	Trillium cernuum	Nodding Trillium	Yes	FAC	0	Herb	5
	Tsuga canadensis	Hemlock	Yes	FACU	3	Tree	5
Emergent Marsh	Carex scoparia	Broom Sedge	Yes	FACW	-3	Herb	4
	Eleocharis erythropoda	Red-foot Spikerush	Yes	OBL	-5	Herb	4

Table 2-3: Overall List of Plant Species Organized by Plant Community -- Humboldt Mill Site

June, August, and September 2006

PLANT COMMUNITY	SCIENTIFIC NAME	ENGLISH NAME	NATIVE?	WETLAND INDICATOR NUMBER[1]	WETLAND INDICATOR NUMBER[2]	GROWTH HABIT[3]	COEFFICIENT OF CONSERVATISM[4]
Emergent Marsh	Eupatorium maculatum (Eupatoriadelphus m.)	Spotted Joe-pye-weed	Yes	OBL	-5	Herb	4
	Heracleum maximum (H. lanatum)	Cow-parsnip	Yes	FACW	-3	Herb	3
	Impatiens capensis	Orange Touch-me-not	Yes	FACW	-3	Herb	2
	Onoclea sensibilis	Sensitive Fern	Yes	FACW	-3	Herb	2
	Phalaris arundinacea	Reed Canary Grass	No	FACW+	-4	Herb	0
	Sparganium chlorocarpum	Green-fruit Bur-reed	Yes	OBL	-5	Herb	6
	Thelypteris palustris (T. thelypteroides)	Marsh Fern	Yes	FACW+	-4	Herb	2
	Viola cucullata	Tall Marsh Violet	Yes	OBL	-5	Herb	5
Hardwood Conifer Swamp / Northern Swamp	Acer rubrum	Red Maple	Yes	FAC	0	Tree	1
	Betula alleghaniensis	Yellow Birch	Yes	FAC	0	Tree	7
	Calla palustris	Wild Calla	Yes	OBL	-5	Herb	10
	Caltha palustris	Marsh-marigold	Yes	OBL	-5	Herb	6
	Carex brunnescens	Brownish Sedge	Yes	FACW	-3	Herb	5
	Carex canescens	Hoary Sedge	Yes	OBL	-5	Herb	8
	Carex castanea	Chestnut Sedge	Yes	FACW+	-4	Herb	6
	Carex crinita	Maned Sedge	Yes	FACW+	-4	Herb	4
	Carex echinata (C. cephalantha, C. angustior)	Echinate Sedge	Yes	OBL	-5	Herb	6
	Carex intumescens	Tumid Sedge	Yes	FACW+	-4	Herb	3

Table 2-3: Overall List of Plant Species Organized by Plant Community -- Humboldt Mill Site

June, August, and September 2006

PLANT COMMUNITY	SCIENTIFIC NAME	ENGLISH NAME	NATIVE?	WETLAND INDICATOR NUMBER[1]	WETLAND INDICATOR NUMBER[2]	GROWTH HABIT[3]	COEFFICIENT OF CONSERVATISM[4]
Hardwood Conifer Swamp / Northern Swamp	Carex radiata (C. rosea)	Radiate Sedge	Yes	[FAC-]	1	Herb	2
	Carex scabrata	Scabrous Sedge	Yes	OBL	-5	Herb	4
	Carex stipata	Stalk-grain Sedge	Yes	[OBL]	-5	Herb	1
	Carex tenera	Slender Sedge	Yes	FAC+	-1	Herb	4
	Carex trisperma	Three-seeded Sedge	Yes	OBL	-5	Herb	9
	Cicuta bulbifera	Bulbiferous Water-hemlock	Yes	OBL	-5	Herb	5
	Cirsium palustre	European Swamp Thistle	No	[FACW+]	-4	Herb	0
	Coptis trifolia	Goldthread	Yes	FACW	-3	Herb	5
	Cornus canadensis	Bunchberry; Dwarf Cornel	Yes	FAC	0	Herb	6
	Equisetum sylvaticum	Woodland Horsetail	Yes	FACW	-3	Herb	5
	Fraxinus nigra	Black Ash	Yes	FACW+	-4	Tree	6
	Iris versicolor	Varicolored Iris	Yes	OBL	-5	Herb	5
	Larix laricina	Tamarack	Yes	FACW	-3	Tree	5
	Luzula acuminata	Acuminate Woodrush	Yes	FAC-	1	Herb	5
	Lysimachia thyrsiflora	Thyrse Loosestrife	Yes	OBL	-5	Herb	6
	Matteucia struthiopteris	Ostrich Fern	Yes	FACW	-3	Herb	3
	Myosotis arvensis	Field Forget-me-not	No	FAC	0	Herb	0
	Platanthera hyperborea	Tall Northern Bog Orchid	Yes	FACW+	-4	Herb	5

Table 2-3: Overall List of Plant Species Organized by Plant Community -- Humboldt Mill Site

June, August, and September 2006

PLANT COMMUNITY	SCIENTIFIC NAME	ENGLISH NAME	NATIVE?	WETLAND INDICATOR NUMBER[1]	WETLAND INDICATOR NUMBER[2]	GROWTH HABIT[3]	COEFFICIENT OF CONSERVATISM[4]
Hardwood Conifer Swamp / Northern Swamp	Ranunculus acris	Tall Buttercup	No	FACW-	-2	Herb	0
	Rubus strigosus (R. idaeus ssp. strigosus)	Wild Red Raspberry	Yes	FACW-	-2	Herb	2
	Viola renifolia	White Kidney-leaf Violet	Yes	FACW	-3	Herb	6
Herbaceous Openland	Anaphalis margaritacea	Pearly Everlasting	Yes	[UPL]	5	Herb	3
	Antennaria parlinii (A. plantaginifolia)	Plantain Pussy-toes	Yes	[UPL]	5	Herb	2
	Apocynum androsaemifolium	Spreading Dogbane	Yes	[UPL]	5	Herb	3
	Aquilegia canadensis	Columbine	Yes	FAC-	1	Herb	5
	Carex aenea	Sedge	Yes	UPL	5	Herb	
	Carex aurea	Golden Sedge	Yes	FACW+	-4	Herb	3
	Centaurea maculosa	Spotted Knapweed	No	[UPL]	5	Herb	0
	Corydalis sempervirens	Pink Corydalis	Yes	UPL	5	Herb	5
	Hieracium caespitosum (H. pratense)	Common Yellow Hawkweed	No	[UPL]	5	Herb	0
	Hypericum perforatum	Common St. John's-Wort	No	[UPL]	5	Herb	0
	Luzula multiflora	Common Woodrush	Yes	FACU	3	Herb	5
	Lycopodium tristachyum (Diphasiastrum)	Clubmoss	Yes	[UPL]	5	Herb	5
	Panicum implicatum	Folded Panicum-grass	Yes	[FAC]	0	Herb	3
	Poa compressa	Canada Bluegrass	No	FACU+	2	Herb	0

Table 2-3: Overall List of Plant Species Organized by Plant Community -- Humboldt Mill Site

June, August, and September 2006

PLANT COMMUNITY	SCIENTIFIC NAME	ENGLISH NAME	NATIVE?	WETLAND INDICATOR NUMBER[1]	WETLAND INDICATOR NUMBER[2]	GROWTH HABIT[3]	COEFFICIENT OF CONSERVATISM[4]
Herbaceous Openland	Poa pratensis	Kentucky Bluegrass	No	FAC-	1	Herb	0
	Polygonum cilinode	Hairy-node Smartweed	Yes	[UPL]	5	Herb	3
	Polygonum convolvulus	Black-Bindweed	No	FAC-	1	Herb	0
	Pteridium aquilinum	Bracken Fern	Yes	FACU	3	Herb	0
	Salix humilis	Prairie Willow	Yes	FACU	3	Shrub	4
	Scleranthus annuus	Knawel	No	FACU	3	Herb	0
	Silene vulgaris (S. cucuballus)	Bladder-Campion	No	[UPL]	5	Herb	0
	Stellaria graminea	Grass-Leaved Stellaria	No	UPL	5	Herb	0
	Tanacetum vulgare	Common Tansy	No	[UPL]	5	Herb	0
	Taraxacum erythrospermum	Red-Seeded Dandelion	No	[UPL]	5	Herb	0
	Veronica chamaedrys	Germander Speedwell	No	[UPL]	5	Herb	0
Muskeg / Poor Conifer Swamp	Ledum groenlandicum	Labrador-Tea	Yes	OBL	-5	Shrub	8
	Picea mariana	Black Spruce	Yes	FACW	-3	Tree	6
Northern Shrub Thicket	Alnus incana ssp. rugosa	Speckled Alder	Yes	OBL	-5	Shrub	5
	Myrica gale	Sweet Gale	Yes	OBL	-5	Shrub	6
	Spiraea alba	White Meadow-sweet	Yes	FACW+	-4	Shrub	4
Open Water / Submergent Marsh	Nuphar variegata (N. lutea ssp. variegata)	Yellow Waterlily	Yes	OBL	-5	Herb	7
Shubland	Betula papyrifera	Paper Birch	Yes	FACU+	2	Tree	2
	Populus grandidentata	Big-tooth Aspen	Yes	FACU	3	Tree	4
	Populus tremuloides	Quaking Aspen	Yes	FAC	0	Tree	1

TABLE 2-3 NOTES

1. Wetland Indicator Codes

Wetland indicator codes are three-letter codes that indicate a plant's tolerance of wetland conditions. Each plant that occurs in Michigan has been assigned by a panel of botanists one of five wetland indicator codes. The Michigan Department of Natural Resources published these codes in 2001 as *Floristic Quality Assessment with Wetland Categories and Examples of Computer Applications for the State of Michigan* (Herman et al., 2001). The five codes are OBL (obligate wetland) species, FACW (facultative wetland) species, FAC (facultative) species, FACU (facultative upland) species, and UPL (upland) species. By definition, OBL species occur in wetlands 99% of the time; FACW species occur in wetlands greater than 66% of the time; FAC species occur in wetlands 50% of the time; FACU species occur in wetlands less than 33% of the time; UPL species occur in wetlands less than 1% of the time. The plus and minus signs that accompany some of the codes indicate a greater (+) or lesser (-) affinity for wetlands.

2. Wetland Indicator Numbers

To quantitatively determine the degree to which the vegetation is dominated by wetland species, each wetland indicator code has been assigned a wetness coefficient: UPL = 5, FACU- = 4, FACU = 3, FACU+ = 2, FAC- = 1, FAC = 0, FAC+ = -1, FACW- = -2, FACW = -3, FACW+ = -4, OBL = -5. The average of these numbers serves as an index for evaluating the "wetness" of the vegetation at a site. When the average is greater than zero, the vegetation consists predominantly of non-wetland species (ranging from FAC- to UPL), whereas a negative average indicates a prevalence of wetland species (ranging from FAC+ to OBL).

3. Growth Habit

The growth habit of a species refers to whether it is a tree, a shrub, or an herbaceous plant.

4. Coefficient of Conservatism

Coefficients of conservatism are numbers ranging from zero to ten which have been assigned to Michigan plant species by a panel of botanists. These numbers are intended to represent the "conservatism" of the species, which is defined as "an estimated probability that a plant is likely to occur in a landscape relatively unaltered from what is believed to be pre-European settlement condition" (Herman, et al., 2001). In this system, non-native species and weedy native species are assigned zeroes, while species known to be highly intolerant of habitat alteration are assigned tens. The process of assigning numbers involved considerable subjectivity, so the system lacks scientific rigor. Nevertheless, it is useful since species with high numbers are indicative of high quality natural habitats. A high number is also an indication that a species may be uncommon or even rare.

Table 3-1: June 2006 Bird Sampling Point Data - Humboldt Mill Site

Sampling Point	Date	Common Name	Scientific Name	Numer of Occurrences	Type of Detection
1	6/11/06	American Crow	*Corvus brachyrhynchos*	1	Auditory
1	6/12/06	Blue Jay	*Cyanocitta cristata*	2	Auditory
1	6/12/06	Red-eyed Vireo	*Vireo olivaceus*	1	Auditory
1	6/12/06	Nashville Warbler	*Vermivora ruficapilla*	1	Visual
1	6/12/06	Magnolia Warbler	*Dendroica magnolia*	1	Visual
2	6/11/06	Red-eyed Vireo	*Vireo olivaceus*	1	Auditory
2	6/11/06	American Crow	*Corvus brachyrhynchos*	2	Auditory
2	6/11/06	Northern Flicker	*Colaptes auratus*	1	Auditory
2	6/11/06	Black-and-white Warbler	*Mniotilta varia*	1	Auditory
2	6/11/06	American Goldfinch	*Carduelis tristis*	2	Visual/Auditory
2	6/11/06	Swamp Sparrow	*Melospiza georgiana*	1	Visual/Auditory
2	6/11/06	White-throated Sparrow	*Zonotrichia albicollis*	2	Auditory
2	6/12/06	Common Snipe	*Gallinago gallinago*	1	Auditory
2	6/12/06	Winter Wren	*Troglodytes troglodytes*	1	Auditory
2	6/12/06	Black-throated Green Warbler	*Dendroica virens*	1	Auditory
2	6/12/06	Chestnut-sided Warbler	*Dendroica pensylvanica*	1	Auditory
2	6/12/06	Philadelphia Vireo	*Vireo philadelphicus*	1	Auditory
2	6/12/06	Alder Flycatcher	*Empidonax alnorum*	4	Auditory
2	6/12/06	Double-crested Cormorant	*Phalacrocorax auritus*	1	Visual
2	6/12/06	American Crow	*Corvus brachyrhynchos*	2	Auditory
2	6/12/06	Great Blue Heron	Ardea herodias	1	Visual
2	6/12/06	Killdeer	*Charadrius vociferus*	1	Auditory
2	6/12/06	Sandhill Crane	*Grus canadensis*	1	Auditory
2	6/12/06	Black-capped Chickadee	*Poecile atricapillus*	1	Auditory
2	6/12/06	White-throated Sparrow	*Zonotrichia albicollis*	1	Auditory
3	6/12/06	American Robin	*Turdus migratorius*	1	Auditory
3	6/12/06	Ring-billed Gull	*Larus delawarensis*	1	Auditory
3	6/12/06	Black-throated Green Warbler	*Dendroica virens*	1	Auditory
3	6/12/06	Chestnut-sided Warbler	*Dendroica pensylvanica*	1	Visual/Auditory
3	6/12/06	Red-eyed Vireo	*Vireo olivaceus*	1	Auditory
3	6/12/06	Great Crested Flycatcher	*Myiarchus crinitus*	1	Auditory
3	6/12/06	American Crow	*Corvus brachyrhynchos*	1	Auditory
4	6/11/06	Turkey Vulture	*Cathartes aura*	1	Visual
4	6/11/06	Red-winged Blackbird	*Agelaius phoeniceus*	2	Visual
4	6/11/06	American Robin	*Turdus migratorius*	2	Visual
4	6/11/06	Swamp Sparrow	*Melospiza georgiana*	1	Auditory
4	6/11/06	Cedar Waxwing	*Bombycilla cedrorum*	9	Visual
4	6/11/06	Brown-headed Cowbird	*Molothrus ater*	1	Visual
4	6/11/06	Green-winged Teal	*Anas crecca*	1	Visual
4	6/11/06	Red-breasted Merganser	*Mergus serrator*	1	Visual
4	6/11/06	European Starling	*Sturnus vulgaris*	1	Visual
4	6/11/06	Song Sparrow	*Melospiza melodia*	1	Visual
4	6/11/06	Cliff Swallow	*Petrochelidon pyrrhonota*	1	Visual
4	6/11/06	Tree Swallow	*Tachycineta bicolor*	1	Visual
4	6/11/06	Common Grackle	*Quiscalus quiscula*	2	Visual
4	6/12/06	Brown Thrasher	*Toxostoma rufum*	2	Visual/Auditory
4	6/12/06	American Robin	*Turdus migratorius*	1	Auditory

Table 3-1: June 2006 Bird Sampling Point Data - Humboldt Mill Site

Sampling Point	Date	Common Name	Scientific Name	Numer of Occurrences	Type of Detection
4	6/12/06	Red-winged Blackbird	*Agelaius phoeniceus*	1	Auditory
4	6/12/06	Belted Kingfisher	*Ceryle alcyon*	1	Auditory
4	6/12/06	Mourning Dove	*Zenaida macroura*	1	Auditory
4	6/12/06	Tree Swallow	*Tachycineta bicolor*	4	Visual
4	6/12/06	Common Grackle	*Quiscalus quiscula*	1	Visual
4	6/12/06	Common Yellowthroat	*Geothlypis trichas*	1	Auditory
4	6/12/06	Eastern Kingbird	*Tyrannus tyrannus*	1	Auditory
4	6/12/06	Song Sparrow	*Melospiza melodia*	1	Auditory
4	6/12/06	Rock Pigeon	*Columba livia*	5	Visual
5	6/11/06	Belted Kingfisher	*Ceryle alcyon*	1	Auditory
5	6/11/06	American Robin	*Turdus migratorius*	1	Auditory
5	6/11/06	Sandhill Crane	*Grus canadensis*	1	Auditory
5	6/11/06	Blue Jay	*Cyanocitta cristata*	1	Auditory
5	6/11/06	Hermit Thrush	*Catharus guttatus*	1	Auditory
5	6/11/06	White-throated Sparrow	*Zonotrichia albicollis*	1	Auditory
5	6/11/06	Song Sparrow	*Melospiza melodia*	1	Auditory
5	6/11/06	American Bittern	*Botaurus lentiginosus*	2	Auditory
5	6/11/06	Northern Flicker	*Colaptes auratus*	1	Auditory
5	6/11/06	Song Sparrow	*Melospiza melodia*	1	Auditory
5	6/11/06	Mourning Dove	*Zenaida macroura*	1	Visual
5	6/11/06	Black-backed Woodpecker	*Picoides arcticus*	2	Visual
5	6/12/06	American Crow	*Corvus brachyrhynchos*	1	Auditory
5	6/12/06	American Bittern	*Botaurus lentiginosus*	2	Auditory
5	6/12/06	Eastern Phoebe	*Sayornis phoebe*	1	Auditory
5	6/12/06	White-throated Sparrow	*Zonotrichia albicollis*	2	Auditory
5	6/12/06	Alder Flycatcher	*Empidonax alnorum*	1	Auditory
5	6/12/06	Hermit Thrush	*Catharus guttatus*	1	Auditory
5	6/12/06	American Robin	*Turdus migratorius*	1	Auditory
5	6/12/06	Red-breasted Nuthatch	*Sitta canadensis*	1	Auditory
5	6/12/06	Bald Eagle	*Haliaeetus leucocephalus*	1	Visual
5	6/12/06	Canada Goose	*Branta canadensis*	4	Visual
6	6/11/06	Eastern Phoebe	*Sayornis phoebe*	1	Auditory
6	6/11/06	Ovenbird	*Seiurus aurocapilla*	1	Auditory
6	6/11/06	Black-throated Green Warbler	*Dendroica virens*	1	Auditory
6	6/11/06	Black-and-white Warbler	*Mniotilta varia*	1	Auditory
6	6/11/06	Tree Swallow	*Tachycineta bicolor*	1	Visual
6	6/12/06	Great Crested Flycatcher	*Myiarchus crinitus*	1	Auditory
6	6/12/06	Yellow-bellied Sapsucker	*Sphyrapicus varius*	1	Visual
6	6/12/06	Black-throated Green Warbler	*Dendroica virens*	2	Auditory
6	6/12/06	Eastern Wood-Pewee	*Contopus virens*	1	Auditory
6	6/12/06	Common Grackle	*Quiscalus quiscula*	2	Visual/Auditory
6	6/12/06	Black-and-white Warbler	*Mniotilta varia*	1	Auditory
6	6/12/06	Red-breasted Nuthatch	*Sitta canadensis*	1	Auditory
7	6/11/06	Northern Flicker	*Colaptes auratus*	1	Auditory
7	6/11/06	White-breasted Nuthatch	*Sitta carolinensis*	2	Auditory
7	6/11/06	American Crow	*Corvus brachyrhynchos*	2	Auditory
7	6/11/06	American Robin	*Turdus migratorius*	1	Auditory
7	6/11/06	Red-eyed Vireo	*Vireo olivaceus*	1	Auditory
7	6/11/06	Blue-winged Teal	*Anas discors*	1	Visual

Table 3-1: June 2006 Bird Sampling Point Data - Humboldt Mill Site

Sampling Point	Date	Common Name	Scientific Name	Numer of Occurrences	Type of Detection
7	6/11/06	Ovenbird	*Seiurus aurocapilla*	1	Auditory
7	6/12/06	Great Crested Flycatcher	*Myiarchus crinitus*	1	Auditory
7	6/12/06	Black-capped Chickadee	*Poecile atricapillus*	1	Auditory
7	6/12/06	White-throated Sparrow	*Zonotrichia albicollis*	1	Auditory
7	6/12/06	Ovenbird	*Seiurus aurocapilla*	1	Auditory
7	6/12/06	Chestnut-sided Warbler	*Dendroica pensylvanica*	1	Visual
7	6/12/06	Blue Jay	*Cyanocitta cristata*	1	Auditory
8	6/11/06	American Robin	*Turdus migratorius*	1	Auditory
8	6/11/06	Ovenbird	*Seiurus aurocapilla*	2	Auditory
8	6/11/06	Black-capped Chickadee	*Poecile atricapillus*	1	Auditory
8	6/11/06	Blue Jay	*Cyanocitta cristata*	1	Visual/Auditory
8	6/12/06	Song Sparrow	*Melospiza melodia*	1	Auditory
8	6/12/06	Blue Jay	*Cyanocitta cristata*	1	Auditory
8	6/12/06	American Robin	*Turdus migratorius*	1	Auditory
8	6/12/06	Tree Swallow	*Tachycineta bicolor*	1	Auditory
9	6/11/06	Turkey Vulture	*Cathartes aura*	1	Visual
9	6/11/06	Alder Flycatcher	*Empidonax alnorum*	1	Visual
9	6/11/06	Common Loon	*Gavia immer*	1	Visual
9	6/11/06	Ovenbird	*Seiurus aurocapilla*	1	Auditory
9	6/11/06	Song Sparrow	*Melospiza melodia*	1	Visual
9	6/11/06	Blue Jay	*Cyanocitta cristata*	1	Auditory
9	6/11/06	Hermit Thrush	Catharus guttatus	1	Visual
9	6/11/06	Black-throated Green Warbler	*Dendroica virens*	1	Visual
9	6/11/06	Eastern Phoebe	*Sayornis phoebe*	1	Visual
9	6/12/06	Bald Eagle	*Haliaeetus leucocephalus*	1	Visual
9	6/12/06	Blue Jay	*Cyanocitta cristata*	2	Auditory
9	6/12/06	Common Loon	*Gavia immer*	1	Auditory
9	6/12/06	Alder Flycatcher	*Empidonax alnorum*	1	Auditory
9	6/12/06	Chestnut-sided Warbler	*Dendroica pensylvanica*	1	Auditory
10	6/11/06	Northern Parula	*Parula americana*	1	Auditory
10	6/11/06	Hairy Woodpecker	*Picoides villosus*	1	Visual
10	6/11/06	Black-throated Green Warbler	*Dendroica virens*	1	Auditory
10	6/11/06	Ovenbird	*Seiurus aurocapilla*	1	Auditory
10	6/11/06	Blue Jay	*Cyanocitta cristata*	1	Auditory
10	6/12/06	Northern Parula	*Parula americana*	2	Auditory
10	6/12/06	Black-throated Green Warbler	*Dendroica virens*	1	Auditory
10	6/12/06	Blue Jay	*Cyanocitta cristata*	1	Auditory
10	6/12/06	Chestnut-sided Warbler	*Dendroica pensylvanica*	2	Auditory
11	6/11/06	Great Crested Flycatcher	*Myiarchus crinitus*	1	Auditory
11	6/11/06	American Crow	*Corvus brachyrhynchos*	1	Auditory
11	6/11/06	Bald Eagle	*Haliaeetus leucocephalus*	4	Visual/Auditory
11	6/11/06	Song Sparrow	*Melospiza melodia*	1	Auditory
11	6/11/06	Great Blue Heron	*Ardea herodias*	1	Visual
11	6/11/06	Tree Swallow	*Tachycineta bicolor*	3	Visual
11	6/11/06	American Robin	*Turdus migratorius*	1	Visual
11	6/11/06	Black-and-white Warbler	*Mniotilta varia*	1	Auditory
11	6/11/06	Double-crested Cormorant	*Phalacrocorax auritus*	5	Visual
11	6/11/06	Sandhill Crane	*Grus canadensis*	1	Auditory
11	6/11/06	Common Raven	*Corvus corax*	1	Auditory

Table 3-1: June 2006 Bird Sampling Point Data - Humboldt Mill Site

Sampling Point	Date	Common Name	Scientific Name	Numer of Occurrences	Type of Detection
11	6/12/06	Red-winged Blackbird	*Agelaius phoeniceus*	2	Visual
11	6/12/06	Alder Flycatcher	*Empidonax alnorum*	1	Auditory
11	6/12/06	Red-eyed Vireo	*Vireo olivaceus*	1	Auditory
11	6/12/06	Belted Kingfisher	*Ceryle alcyon*	1	Auditory
11	6/12/06	American Robin	*Turdus migratorius*	1	Visual
**	6/11/06	Northern Harrier	*Circus cyaneus*	1	Visual
***	6/11/06	Merlin	*Falco columbarius*	1	Visual
**	6/11/06	Mourning Dove	*Zenaida macroura*	1	Visual
**	6/11/06	Belted Kingfisher	*Ceryle alcyon*	1	Visual
**	6/11/06	Common Loon	*Gavia immer*	1	Visual
			Total Number of Bird Occurances	**207**	

** = Species identified in the Overall Study Area, but not associated with sampling point locations

*** = Species identified in the Study Area, but not associated with sampling point locations

Table 3-2: June 2006 Bird Species Summary - Humboldt Mill Site

Species Count	Common Name	Total # of Birds Observed
1	Alder Flycatcher	8
2	American Bittern	4
3	American Crow	10
4	American Goldfinch	2
5	American Robin	11
6	Bald Eagle	6
7	Belted Kingfisher	4
8	Black-and-white Warbler	4
9	Black-backed Woodpecker	2
10	Black-capped Chickadee	3
11	Black-throated Green Warbler	8
12	Blue Jay	11
13	Blue-winged Teal	1
14	Brown Thrasher	2
15	Canada Goose	4
16	Cedar Waxwing	9
17	Chestnut-sided Warbler	6
18	Cliff Swallow	1
19	Common Grackle	5
20	Common Loon	3
21	Common Raven	1
22	Common Snipe	1
23	Common Yellowthroat	1
24	Brown-headed Cowbird	1
25	Double-crested Cormorant	6
26	Eastern Kingbird	1
27	Eastern Phoebe	3
28	Eastern Wood-Pewee	1
29	European Starling	1
30	Great Blue Heron	2
31	Great Crested Flycatcher	4
32	Green-winged Teal	1
33	Hairy Woodpecker	1
34	Hermit Thrush	3
35	Killdeer	1
36	Magnolia Warbler	1
37	Merlin	1
38	Mourning Dove	3
39	Nashville Warbler	1
40	Northern Flicker	3
41	Northern Harrier	1
42	Northern Parula	3
43	Ovenbird	7
44	Philadelphia Vireo	1
45	Red-breasted Merganser	1
46	Red-breasted Nuthatch	2
47	Red-eyed Vireo	5
48	Red-winged Blackbird	5

Table 3-2: June 2006 Bird Species Summary - Humboldt Mill Site

Species Count	Common Name	Total # of Birds Observed
49	Ring-billed Gull	1
50	Rock Pigeon	5
51	Sandhill Crane	3
52	Song Sparrow	7
53	Swamp Sparrow	2
54	Tree Swallow	10
55	Turkey Vulture	2
56	White-breasted Nuthatch	2
57	White-throated Sparrow	7
58	Winter Wren	1
59	Yellow-bellied Sapsucker	1

KEY:

Observed only 1-3 total birds

Table 3-3: September 2006 Bird Sampling Point Data - Humboldt Mill Site

Sampling Point	Date	Common Name	Scientific Name	Numer of Occurrences	Type of Detection
1	9/25/06	Blue Jay	*Cyanocitta cristata*	1	Visual
1	9/25/06	White-breasted Nuthatch	*Sitta carolinensis*	1	Auditory
1	9/25/06	Common Raven	*Corvus corax*	1	Visual
1	9/25/06	Ring-billed Gull	*Larus delawarensis*	2	Visual
1	9/25/06	House Finch	*Carpodacus mexicanus*	2	Visual
1	9/26/06	American Robin	*Turdus migratorius*	1	Auditory
1	9/26/06	American Crow	*Corvus brachyrhynchos*	1	Visual
1	9/26/06	Pine Siskin	*Carduelis pinus*	6	Visual/Auditory
2	9/25/06	Blue Jay	*Cyanocitta cristata*	1	Visual
2	9/26/06	Red-breasted Nuthatch	*Sitta canadensis*	4	Visual
2	9/26/06	Black-capped Chickadee	*Poecile atricapillus*	3	Auditory
2	9/26/06	American Robin	*Turdus migratorius*	1	Auditory
2	9/26/06	American Crow	*Corvus brachyrhynchos*	2	Auditory
2	9/26/06	Yellow-rumped Warbler	*Dendroica coronata*	1	Visual
3	9/25/06	Common Raven	*Corvus corax*	1	Visual
3	9/25/06	Red-breasted Nuthatch	*Sitta canadensis*	1	Visual
3	9/26/06	Bald Eagle	*Haliaeetus leucocephalus*	1	Visual
3	9/26/06	Pine Siskin	*Carduelis pinus*	1	Auditory
4	9/25/06	Turkey Vulture	*Cathartes aura*	1	Visual
4	9/25/06	Pine Siskin	*Carduelis pinus*	1	Auditory
4	9/25/06	Bald Eagle	*Haliaeetus leucocephalus*	1	Visual
4	9/26/06	Dark-eyed Junco	*Junco hyemalis*	2	Visual
4	9/26/06	Bald Eagle	*Haliaeetus leucocephalus*	1	Visual
5	9/25/06	Blue Jay	*Cyanocitta cristata*	1	Visual
5	9/25/06	American Crow	*Corvus brachyrhynchos*	1	Auditory
5	9/25/06	Turkey Vulture	*Cathartes aura*	1	Auditory
5	9/26/06	American Crow	*Corvus brachyrhynchos*	3	Auditory
5	9/26/06	Red-breasted Nuthatch	*Sitta canadensis*	2	Auditory
5	9/26/06	Common Loon	*Gavia immer*	1	Visual
5	9/26/06	Blue Jay	*Cyanocitta cristata*	1	Auditory
5	9/26/06	Yellow-rumped Warbler	*Dendroica coronata*	1	Auditory
5	9/26/06	American Robin	*Turdus migratorius*	1	Visual
6	9/25/06	Hooded Merganser	*Lophodytes cucullatus*	1	Visual
6	9/25/06	White-breasted Nuthatch	*Sitta carolinensis*	1	Auditory
6	9/26/06	Red-breasted Nuthatch	*Sitta canadensis*	1	Visual
7	9/25/06	Pine Siskin	*Carduelis pinus*	20	Visual/Auditory
7	9/25/06	White-breasted Nuthatch	*Sitta carolinensis*	1	Auditory
7	9/25/06	Red-breasted Nuthatch	*Sitta canadensis*	1	Visual
7	9/25/06	White-throated Sparrow	*Zonotrichia albicollis*	1	Visual
7	9/25/06	Black-capped Chickadee	*Poecile atricapillus*	1	Visual
7	9/26/06	Red-breasted Nuthatch	*Sitta canadensis*	2	Visual/Auditory
7	9/26/06	Pine Siskin	*Carduelis pinus*	1	Visual/Auditory
7	9/26/06	Belted Kingfisher	*Ceryle alcyon*	1	Visual
8	9/25/06	None detected			
8	9/26/06	Black-capped Chickadee	*Poecile atricapillus*	1	Auditory
8	9/26/06	Common Raven	*Corvus corax*	1	Auditory
8	9/26/06	Blue Jay	*Cyanocitta cristata*	2	Visual

Table 3-3: September 2006 Bird Sampling Point Data - Humboldt Mill Site

Sampling Point	Date	Common Name	Scientific Name	Numer of Occurrences	Type of Detection
9	9/25/06	Blue Jay	*Cyanocitta cristata*	2	Auditory
9	9/26/06	American Crow	*Corvus brachyrhynchos*	1	Auditory
9	9/26/06	Common Raven	*Corvus corax*	1	Auditory
9	9/26/06	Pine Siskin	*Carduelis pinus*	3	Visual
10	9/25/06	None detected			
10	9/26/06	Black-capped Chickadee	*Poecile atricapillus*	1	Auditory
10	9/26/06	Pileated Woodpecker	*Dryocopus pileatus*	1	Visual
11	9/25/06	Bald Eagle	*Haliaeetus leucocephalus*	2	Visual
11	9/26/06	Bald Eagle	*Haliaeetus leucocephalus*	1	Visual
11	9/26/06	Black-capped Chickadee	*Poecile atricapillus*	4	Visual/Auditory
11	9/26/06	Yellow-rumped Warbler	*Dendroica coronata*	1	Visual
11	9/26/06	Canada Goose	*Branta canadensis*	2	Auditory
**	9/25/06	Turkey Vulture	*Cathartes aura*	1	Visual
**	9/25/06	Pine Siskin	*Carduelis pinus*	6	Visual
**	9/25/06	Ruffed Grouse	*Bonasa umbellus*	1	Visual
**	9/25/06	Rock Pigeon	*Columba livia*	13	Visual
**	9/25/06	Pileated Woodpecker	*Dryocopus pileatus*	1	Auditory
**	9/25/06	Belted Kingfisher	*Ceryle alcyon*	1	Visual
**	9/25/06	Mallard	*Anas platyrhynchos*	3	Visual
**	9/25/06	Wood Duck	*Aix sponsa*	1	Visual
**	9/25/06	Black-capped Chickadee	*Poecile atricapillus*	2	Visual
**	9/26/06	Brewer's Blackbird	*Euphagus cyanocephalus*	5	Visual
**	9/26/06	Downy Woodpecker	*Picoides pubescens*	1	Visual
**	9/26/06	Ruffed Grouse	*Bonasa umbellus*	1	Visual
			Total Number of Bird Occurances	**139**	

****** = Species identified in the Overall Study Area, but not associated with sampling point locations

Table 3-4: September 2006 Bird Species Summary - Humboldt Mill Site

Species Count	Common Name	Total # of Birds Observed
1	American Crow	8
2	American Robin	3
3	Bald Eagle	6
4	Belted Kingfisher	2
5	Black-capped Chickadee	12
6	Blue Jay	8
7	Brewer's Blackbird	5
8	Canada Goose	2
9	Common Loon	1
10	Common Raven	4
11	Dark-eyed Junco	2
12	Downy Woodpecker	1
13	Hooded Merganser	1
14	House Finch	2
15	Mallard	3
16	Pileated Woodpecker	2
17	Pine Siskin	38
18	Red-breasted Nuthatch	11
19	Ring-billed Gull	2
20	Rock Pigeon	13
21	Ruffed Grouse	2
22	Turkey Vulture	3
23	White-breasted Nuthatch	3
24	White-throated Sparrow	1
25	Wood Duck	1
26	Yellow-rumped Warbler	3

KEY:

Observed only 1-3 total birds

Table 3-5a: Small Mammal Survey September 25, 2006 - Humboldt Mill Site

SAMPLE POINT	September 25, 2006							
	SMALL SNAP TRAP 1		SMALL SNAP TRAP 2		LARGE SNAP TRAP		LIVE TRAP	
	COMMON NAME	SCIENTIFIC NAME	COMMON NAME	SCIENTIFIC NAME	COMMON NAME	SCIENTIFIC NAME	COMMON NAME	SCIENTIFIC NAME
1	snapped; bait gone		snapped; bait gone		snapped; bait gone (Raccoon hair on trap)		Eastern Chipmunk	*Tamias striatus*
2	0		0		0		0	
3	0		0		0		0	
4	0		0		0		0	
5	0		0		0		Pygmy Shrew	*Sorex hoyi*
6	0		snapped		0		0	
7	0		0		0		0	
8	bait gone		0		0		0	
9	0		Southern Red-backed Vole	*Clethrionomys gapperi*	0		0	
10	bait gone		bait gone		snapped; bait gone		tripped	
11	0		0		0		0	

0 = no activity

Table 3-5b: Small Mammal Survey September 26, 2006 - Humboldt Mill Site

SAMPLE POINT	September 26, 2006							
	SMALL SNAP TRAP 1		SMALL SNAP TRAP 2		LARGE SNAP TRAP		LIVE TRAP	
	COMMON NAME	SCIENTIFIC NAME	COMMON NAME	SCIENTIFIC NAME	COMMON NAME	SCIENTIFIC NAME	COMMON NAME	SCIENTIFIC NAME
1	snapped; bait gone		White-footed Mouse	*Peromyscus leucopus*	snapped; bait gone		Eastern Chipmunk	*Tamias striatus*
2	0		0		0		0	
3	0		0		snapped		0	
4	0		0		0		0	
5	0		0		0		0	
6	0		snapped		snapped		0	
7	0		0		0		0	
8	0		0		0		0	
9	0		0		0		Eastern Chipmunk	*Tamias striatus*
10	bait gone		White-footed Mouse	*Peromyscus leucopus*	snapped; bait gone		0	
11	0		bait gone		bait gone		0	

0 = no activity

Table 3-5c: Small Mammal Survey September 27, 2006 - Humboldt Mill Site

SAMPLE POINT	September 27, 2006							
	SMALL SNAP TRAP 1		SMALL SNAP TRAP 2		LARGE SNAP TRAP		LIVE TRAP	
	COMMON NAME	SCIENTIFIC NAME	COMMON NAME	SCIENTIFIC NAME	COMMON NAME	SCIENTIFIC NAME	COMMON NAME	SCIENTIFIC NAME
1	snapped		snapped		Eastern Chipmunk	*Tamias striatus*	0	
2	0		0		bait gone		0	
3	0		snapped		0		0	
4	snapped		snapped		0		Meadow Vole	*Microtus pennsylvanicus*
5	0		0		0		0	
6	0		0		0		0	
7	Deer Mouse	*Peromyscus maniculatus*	0		bait gone		tripped	
8	0		bait gone		snapped; bait gone		0	
9	0		0		0		0	
10	0		0		Red Squirrel	*Tamiasciurus hudsonicus*	0	
11	0		0		Least Chipmunk	*Tamias minimus*	0	

0 = no activity

Table 3-6a: Frog and Toad Survey June 8, 2006 - Humboldt Mill Site

SAMPLE POINT	CATEGORY	SPECIES		WEATHER CONDITIONS	SITE DESCRIPTION
		COMMON NAME	SCIENTIFIC NAME		
1	1	northern spring peeper	*Pseudacris crucifer*	06/08/2006; 55° F (13°C); calm, mostly cloudy	scrub-shrub/emergent wetland
	1	eastern gray tree frog	*Hyla versicolor*		
	1	green frog	*Rana clamitans*		
2	_	No response	_	06/08/2006; 55° F (13°C); calm, mostly cloudy	open water; former pit
3	1	northern spring peeper	*Pseudacris crucifer*	06/08/2006; 55° F (13°C); calm, mostly cloudy	emergent wetland
	2	green frog	*Rana clamitans*		
	1	mink frog	*Rana septentrionalis*		
4	1	eastern gray tree frog	*Hyla versicolor*	06/08/2006; 55° F (13°C); calm, mostly cloudy	scrub-shrub/emergent wetland
	1	green frog	*Rana clamitans*		
	1	mink frog	*Rana septentrionalis*		
5	1	northern spring peeper	*Pseudacris crucifer*	06/08/2006; 55° F (13°C); calm, mostly cloudy	scrub-shrub/emergent wetland
	1	green frog	*Rana clamitans*		
	1	mink frog	*Rana septentrionalis*		

Table 3-6b: Frog and Toad Survey September 26, 2006 - Humboldt Mill Site

SAMPLE POINT	CATEGORY	SPECIES		WEATHER CONDITIONS	SITE DESCRIPTION
		COMMON NAME	SCIENTIFIC NAME		
1	1	eastern gray tree frog	*Hyla versicolor*	70° F (21°C); calm, partly cloudy	scrub-shrub/emergent wetland
	2	green frog	*Rana clamitans*		
2	1	green frog	*Rana clamitans*	70° F (21°C); calm, partly cloudy	open water; former pit
3*	–	–	–	–	emergent wetland
4*	–	–	–	–	scrub-shrub/emergent wetland
5	2	green frog	*Rana clamitans*	70° F (21°C); calm, partly cloudy	scrub-shrub/emergent wetland
	1	mink frog	*Rana septentrionalis*		

* Stations 3 and 4 were not surveyed on this date due to security issues

Table 4-1: Wetland Description Summary for the Detailed Wetland Study Area - Humboldt Mill Site

Wetland	Wetland Type	Area (in acres)	Flag Labels
A	Emergent	0.250	A1-A31
B	Emergent	0.820	B1-B36
D	Scrub-shrub	0.120	D1-D16
E	Forested, scrub-shrub	2.840	E1-E161
F	Emergent, scrub-shrub	0.400	F1-F39
G	Emergent, scrub-shrub	0.100	G1-G22
H	Emergent, scrub-shrub	0.070	H1-H11
I	Emergent	0.330	I1-I30
J	Emergent	8.000	J1-J171
K	Emergent	0.140	K1-K9
L	Emergent, scrub-shrub	0.570	L1-L48
M	Emergent	0.010	M1-M5
N	Emergent	0.006	N1-N4
O	Emergent, scrub-shrub	0.060	O1-O12
P	Emergent	0.240	P1-P15
Q	Emergent	0.430	Q1-Q35
R	Scrub-shrub	0.600	R1-R12/RR1-RR13
S	Emergent, scrub-shrub	0.060	S1-S8
T	Emergent	0.070	T1-T9
U	Emergent, scrub-shrub	0.100	U1-U12
V	Emergent	0.010	V1-V4
AA	Emergent	0.004	AA1-AA3
BB	Emergent	0.006	BB1-BB4
CC	Emergent	0.070	CC1-CC5

PHOTOGRAPHS

Photos 1 and 2: Bird and Small Mammal Sampling Point Photos – Sampling Point 1

North View

South View

Sampling Point 1. An open area disturbed from historical mining. Generally consists of a field bordering immature white spruce and quaking aspen stands. Also near the edge of a water-filled mining pit with steep rocky faces. Common herbaceous plants include late goldenrod and grasses.

Photos 3 and 4: Bird and Small Mammal Sampling Point Photos – Sampling Point 2

East View

West View

Sampling Point 2. An abandoned railroad grade with hummock sedge emergent wetlands on both sides. The emergent wetlands contain patches of scrub-shrub/forested wetland dominated by tag alder. Common herbaceous species include sedges and reed canary grass.

Photos 5 and 6: Bird and Small Mammal Sampling Point Photos – Sampling Point 3

North View

South View

Sampling Point 3. Existing power line with maintained right-of-way dominated by bracken fern and scrub hazelnut. Both sides of the right-of-way are dominated by quaking and big tooth aspen, white birch, and sugar maple in varying topography. Site is elevated above the Humboldt mining buildings with an open view to the south.

Photos 7 and 8: Bird and Small Mammal Sampling Point Photos – Sampling Point 4

North View

South View

Sampling Point 4. Edge of an existing trail with a generally open view of mixed emergent and scrub-shrub wetlands dominated by cattail, tag alder and scattered conifers, with scrub aspen growth to the north.

Photos 9 and 10: Bird and Small Mammal Sampling Point Photos – Sampling Point 5

North View

South View

Sampling Point 5. Paved road crossing of extensive open hummock sedge- dominated emergent wetland with a stream corridor and a fringe of black spruce and tag alder scrub wetland. There is an open view in all directions. Mixed hardwood and conifer uplands are adjacent.

Photos 11 and 12: Bird and Small Mammal Sampling Point Photos – Sampling Point 6

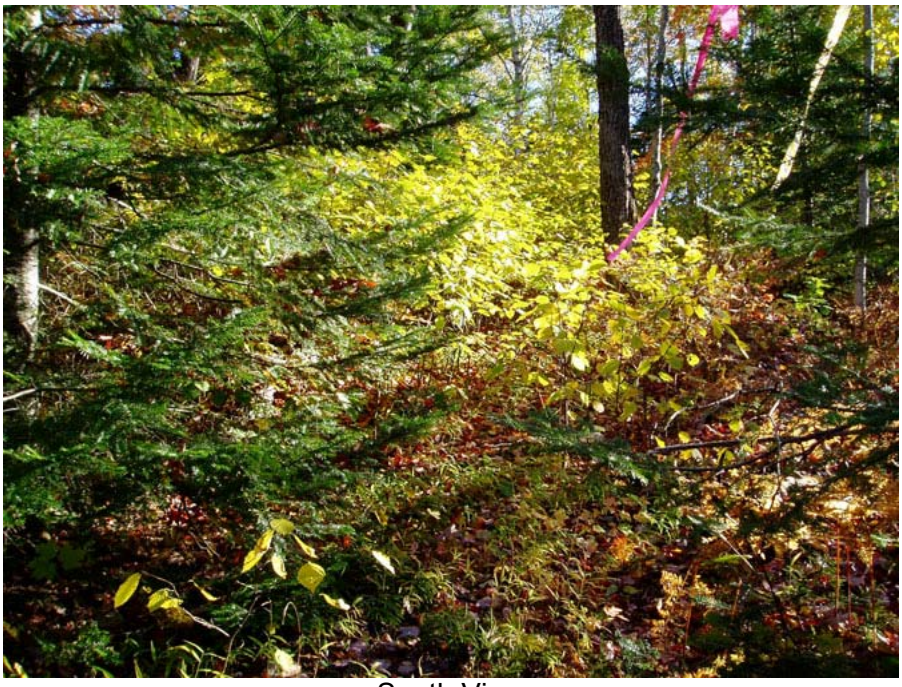
North View

South View

Sampling Point 6. Edge of emergent wetland with a beaver impoundment and open water areas surrounded by black spruce and tag alder. Adjacent surrounding upland habitat is comprised of dense, mature closed-canopy white spruce, hemlock, sugar maple, and white birch on steep terrain. View is open over the wetland.

Photos 13 and 14: Bird and Small Mammal Sampling Point Photos – Sampling Point 7

North View



South View

Sampling Point 7. Edge of a saturated emergent wetland comprised of sedges and rushes, with patches of open water area and dead standing timber. The surrounding upland habitat bordering the wetland is comprised of dense, mature, closed-canopy white spruce, hemlock, sugar maple, and white birch on rolling terrain. The view over the wetland is open.

Photos 15 and 16: Bird and Small Mammal Sampling Point Photos – Sampling Point 8

North View

South View

Sampling Point 8. Edge of an extensive historic tailings basin. Some portions are dominated by herbaceous upland species such as tall goldenrod and orange hawkweed. Other portions are covered by scrub willow, quaking aspen, and emergent wetland plants. Adjacent upland habitats are dominated by a mix of scattered white spruce, balsam fir and big tooth aspen.

Photos 17 and 18: Bird and Small Mammal Sampling Point Photos – Sampling Point 9

North View

South View

Sampling Point 9. Outlet of Lake Lory. There is a view of an emergent/scrub-shrub/forested wetland riparian zone along the outlet stream, where a beaver dam is present. Common wetland species include black spruce, balsam fir, and tag alder. Adjacent upland habitat is comprised of mixed spruce, sugar maple and big tooth aspen.

Photos 19 and 20: Bird and Small Mammal Sampling Point Photos – Sampling Point 10

North View

South View

Sampling Point 10. Remote upland habitat of mixed deciduous and coniferous forest. Common tree species include red maple, sugar maple, and red oak, with a ground cover of thimbleberry and bracken fern. Terrain is rolling, with rocky ridges, a dense canopy, and evidence of historic logging.

Photos 21 and 22: Bird and Small Mammal Sampling Point Photos – Sampling Point 11

North View

South View

Sampling Point 11. Causeway between Lake Lory and open water body. Dead standing timber and submergent wetlands are present north of causeway. The heron nesting colony and eagle nest are visible from this location. South of the causeway is forested and scrub shrub wetland. Common plant species include balsam fir and tag alder.

Photos 23 and 24: Wetland Location Photos – Wetlands A and B

Wetland A View West

Wetland B View Northeast

Photos 25 and 26: Wetland Location Photos – Wetlands D and E

Wetland D View Northwest

Wetland E View Northwest

Photo 27: Wetland Location Photos – Wetland F

Wetland F View Northwest

Photo 28: Wetland Location Photos – Wetland G

Wetland G View East

Photos 29 and 30: Wetland Location Photos – Wetlands H and I

Wetland H View North

Wetland I View Northeast

Photos 31 and 32: Wetland Location Photos – Wetlands J and K

Wetland J View East

Wetland K View East

Photos 33 and 34: Wetland Location Photos – Wetlands L and M

Wetland L View Southeast

Wetland M View North

Photos 35 and 36: Wetland Location Photos – Wetlands N and O

Wetland N View West

Wetland O View Southeast

Photos 37 and 38: Wetland Location Photos – Wetlands P and Q

Wetland P View Northeast

Wetland Q View West

Photos 39 and 40: Wetland Location Photos – Wetlands R and S

Wetland R View North

Wetland S View North

Photos 41 and 42: Wetland Location Photos – Wetlands T and U

Wetland T View West

Wetland U View West

Photos 43 and 44: Wetland Location Photos – Wetlands V and CC

Wetland V View West

Wetland CC View West

APPENDIX

SAMPLE DATA FORMS

Form A-1: KME Humboldt Mill Bird Sampling Data Form June 2006

KME Staff_____

(*get digital pix of sampling point, one view north and one view south if possible, with label in photo*)

Transect No._____ Date_____ Time_____

Weather (wind, calm, rain, sun, temperature): _____

Describe Vegetation and Habitat surrounding Sampling Point on just the first visit:
(ie clear cut area, w/wo regeneration, mature upland conifers, mature conifer/deciduous overstory, spruce bog)

Vegetation:

BIRDS

Common Name	# Individuals	(Seen, heard, flyover)
1.		
2.		
3.		
4		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		

Form A-2: KME Humboldt Mill Mammal Sampling Data Form June 2006

Transect No._____ Date_____ Time_____ KME Staff_____

	Common Name	**Notes: trap snapped, bait gone, etc**.
1st. Snap Trap		
2nd. Snap Trap		
Large Snap		
Live Trap		

Form A-3: KME Humboldt Mill Frog and Toad Sampling Data Form June 2006

(*get digital pix of sampling point, view north if possible, with label in photo*)

Transect No._____ Date/temperature_____Time_____ Staff_____

Site Description (should match WCR): _____

Common Name	**No. of Individuals heard**	**Notes: (wind, snow, etc)**
1.		
2.		
3.		
4.		
5.		
6.		

Figure A-4 Sample Wetland Data Form

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY, LAND AND WATER MANAGEMENT DIVISION

PART 303 – WETLAND DATA FORM

This information is collected pursuant to Part 303, Wetlands Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended.

Applicant: _____

For DEQ Use:
File: __ __-__ __-__ __ __ __ -__

County: _____T _____ R _____ S _____ Date: __ __/__ __/__ __ __ __

Form Completed By: _____ Wetland Area: _____

INSTRUCTIONS:

Fill out all pertinent information on the following worksheets to substantiate your review. All methods should be in accordance with the *MDEQ Wetland Identification Manual: A Technical Manual for Identifying Wetlands in Michigan* and Part 303. Nomenclature shall follow Voss (1972, 1985, and 1996) or Gleason and Cronquist (2004).

SITE REVIEW:

_____(Y/N) Is the site significantly disturbed? If yes, describe: _____

_____

_____(Y/N) Is there a potential Problem Area as described in the MDEQ Wetland Identification Manual?

If yes, describe: _____

VEGETATION AND AQUATIC LIFE:

Dominant Vegetation *on Wetland Side* of the Boundary (use additional sheets if necessary)

Genus/Species	Common Name	Stratum*	Indicator Status

Aquatic Life Observed _____

_____

Dominant Vegetation *on Upland Side* of the Boundary
(use additional sheets if necessary)

Genus/Species	Common Name	Stratum*	Indicator Status

*Stratum: H = Herbaceous (woody and herbaceous plants <3.2 ft. tall); S = Sapling/Shrub (≥3.2 ft. tall AND <3" DBH); O = Overstory (≥3" DBH)

HYDROLOGY (Requires One Primary or Two Secondary Indicators):

Primary Indicators:

_____ (√) Visible observation of inundation (Depth ____ in.)
_____ (√) Visible observation of soil saturation (Depth ____ in.)
_____ (√) Hydric soils (√ below)
_____ (√) Watermarks
_____ (√) Drift lines
_____ (√) Sediment deposits
_____ (√) Drainage patterns within wetlands

Secondary Indicators:

_____ (√) Oxidized rhizospheres in upper 12"
_____ (√) Water stained leaves
_____ (√) Confirm soil profile matches hydric soil list
_____ (√) FAC-Neutral test
_____ (√) Bare soil areas
_____ (√) Morphological plant adaptations (√ below)

Other: _____

Hydric Indicators for <u>Non-Sandy</u> Soils

_____(√) Organic soils (Histosols)
_____(√) Histic epipedon
_____(√) Sulfidic material (H_2S odor)
_____(√) Soil color (immediately below A-horizon or within 10 inches of the surface, whichever is shallower)
  _____(√) Gleyed (gray) soil (i.e. matches Gley page)
  _____(√) Matrix chroma of 2 or less in mottled soils
  _____(√) Matrix chroma of 1 or less in unmottled soils
  _____(√) Black mineral soil with gray mottles at ≤ 10 inches
_____(√) Confirm soil profile matches local hydric soil list
_____(√) Iron and manganese concretions
_____(√) Reducing soil conditions (ferrous iron test)
_____(√) Aquic or peraquic moisture regime

Additional Hydric Indicators for <u>Sandy</u> Soils

_____(√) High organic matter in the surface horizon
_____(√) Streaking of subsurface horizons by organic matter
_____(√) Organic pans: at depth of _____ inches

Supplemental Indicators of Hydric Soils:
(e.g., NRCS Field Indicators of Hydric Soils):

_____

_____

_____

Morphological Plant Adaptations Observed(√): ____Adventitious roots ____Shallow root system ____Floating leaves ____Inflated leaves, stems, or root ____Polymorphic leaves ____Oxygen pathway to roots ____Floating stem ____Hypertrophied lenticels ____Multiple trunks or stooling ____Buttressed tree trunks ____Pneumatophores

SOIL PROFILE NOTES:

Soil Profile on *Wetland Side* of the Boundary

Map Unit from Soil Survey:

Depth (inches)	Matrix color (hue/value/chroma)	Mottle Color (if present)	Texture (e.g., sandy loam, etc.)	Notes

Soil Profile on *Upland Side* of the Boundary

Map Unit from Soil Survey (if different than above):

Depth (inches)	Matrix color (hue/value/chroma)	Mottle Color (if present)	Texture (e.g., sandy loam, etc.)	Notes

<u>WETLAND DETERMINATION</u>

____ (√) Predominance of wetland vegetation (Fac, Fac+, FacW-, FacW, FacW+, OBL) or aquatic life
____ (√) Wetland hydrology and/or hydric soil present

____ (Y/N)Is the area wetland (both wetland hydrology/soils and a predominance of wetland vegetation present)?
____ (Y/N) Is the area REGULATED wetland (refer to *<u>Part 303 - Wetland Jurisdictional Determination Form</u>*)?

Wetland Types (√ all that are present):

_____ (√) Emergent Marsh _____ (√) Deciduous Swamp _____ (√) Fen _____ (√) Shrub Swamp
_____ (√) Wet Meadow _____ (√) Coniferous Swamp _____ (√) Bog/Muskeg _____ (√) Floodplain Forest
_____ (√) Wet Prairie _____ (√) Deciduous Forest _____ (√) Great Lakes Marsh _____ (√) Submergent Marsh

Other (e.g. rare and imperiled community, reed canary grass dominated, highly disturbed): _____

Comments:_____

C-2

Humboldt Mill Project, Wetland Evaluation - Black River Wetland and Wetland EE

October 17, 2007

Ms. Andrea Martin
Foth Infrastructure & Environment, LLC
2737 South Ridge Road
P.O. Box 19012
Green Bay, Wisconsin 54307-9012

Re: Humboldt Mill Project, Humboldt Township, Marquette County
Wetland Evaluation – Black River Wetland and Wetland EE

Dear Ms. Martin:

Pursuant to your request, on June 7 and July 7, 2007, King & MacGregor Environmental, Inc. (KME) conducted wetland evaluations for the above-referenced sites. The project is located west of Marquette Michigan as shown in Figure 1. The wetlands are located adjacent to the Humboldt Mill site, Humboldt Township, Marquette County, Michigan (Section 2 and Section 11, T47N, R29W). KME most recently performed a full survey at this site for Foth Infrastructure & Environment, LLC which is documented in *Biological Survey: Plant Communities, Wildlife, and Wetland Evaluation*, April 5, 2007. Figure 2 shows the survey locations for the 2006 and 2007 surveys.

For purposes of this report, the areas of investigation include only the areas encompassing two wetlands: Wetland EE and the Black River Wetland (Figure 2). The general locations of these wetlands were previously identified through the 2006 survey and both wetlands fall within the overall study area as documented in that report (KME 2007). On June 7, 2007, KME biologists conducted a preliminary wetland evaluation of the Black River Wetland. The purpose of this evaluation was to determine the general character of the Black River Wetland. The wetland boundary was not flagged. On July 7, 2007, KME biologists conducted a wetland boundary determination for Wetland EE. The purpose of this determination was to determine the general character of the wetland as well as to flag its boundaries. The flagging was then located with a mapping-grade Global Positioning System (GPS). These surveys compliment the wetlands evaluated in the 2006 survey (KME 2007).

The methods used to conduct these wetland evaluations are consistent with KME's understanding of the procedures and general practices used by the MDEQ as outlined in the 2006 survey (KME 2007). In addition to the work conducted on-site, the wetland evaluations included review of in-office information including aerial photography obtained from the Michigan Department of Natural Resources, National Wetlands Inventory (NWI) mapping, a topographic map from the United States Geological Survey (USGS) and the Soil Survey Geographic (SSURGO) Database for Marquette County. The results of these reviews are included in the KME 2006 survey report (KME 2007).

<u>Black River Wetland</u>
The Black River Wetland is an emergent/scrub-shrub wetland complex located west of the existing mill buildings and contiguous to the Black River, in Section 11, T47N, R29W, Marquette County, Michigan. Figure 3 shows the Preliminary Wetland Evaluation map of the Black River Wetland. Figure 4 shows the upland and wetland areas of the Black River Wetland.

The vegetation identified in the Black River Wetland includes speckled alder (*Alnus incana* spp*. rugosa*), blue-joint (*Calamagrostis canadensis*), aquatic sedge (*Carex aquatilis*), red-osier dogwood (*Cornus stolonifera*), sweet gale (*Myrica gale*), reed canary grass (*Phalaris arundinacea*), and willow (*Salix* sp.). See Table 1 for a complete list of plant species observed in this wetland.

The soils in the Black River Wetland are described in the SSURGO database as Histosols and Aquents – ponded, and Carbondale and Tawas soils, both very poorly drained soil types. Onsite observations were consistent with these soil descriptions.

This wetland complex comprises a portion of the headwaters of the West Branch of the Black River. There is some historical evidence of mining activities associated with the wetland such as an old railroad grade passing through the north portion of the wetland (Figure 3). The Black River Wetland plant community is typical of wetlands found throughout the Escanaba River watershed.

A sampling point for small mammals, birds, and frogs and toads (Sampling Point 2) was established on the western side of the Black River Wetland in 2006 as part of the Biological Survey KME conducted for the Humboldt Mill project. Table 2 is a summary of the wildlife species observed at this sampling point in 2006 and in and ongoing 2007 survey. A common loon (*Gavia immer*), which is classified as threatened in Michigan, was heard during the 2007 spring bird survey at Sampling Point 2; however, no other threatened or endangered species or their habitats were observed during 2006 or 2007 at this sampling point to date.

Upland Areas of Black River Wetland Complex

The Black River Wetland complex includes some upland forested areas on higher ground interspersed throughout the wetland complex. The plant species found in these upland areas are similar to those found around the periphery of the wetland complex and include balsam fir (*Abies balsamea*), wild sarsaparilla (*Aralia nudicaulis*), alpine enchanter's nightshade (*Circaea alpina*), intermediate fern (*Dryopteris intermedia*), oak fern (*Gymnocarpium dryopteris*), northern wood-sorrel (*Oxalis acetosella*), and dwarf raspberry (*Rubus pubescens*). See Table 1 for a complete list of plant species observed in these areas. There was no evidence of standing water or saturated soils in the upland areas.

Wetland EE

Wetland EE is an emergent/scrub-shrub wetland located along the northern boundary of the Overall Study Area for the Humboldt Mill Biological Survey. Figure 5 shows the location of Wetland EE in relation to the NWI wetlands and the Middle Branch Escanaba River to the north. The northern boundary of the Overall Study Area corresponds to U.S. Highway 41.

The on-site portion of Wetland EE is approximately 11.8 acres in size and is located in Section 2, T47N, R29W, Marquette County, Michigan. Figure 6 depicts the approximate wetland boundaries as they were located in the field by KME utilizing a mapping-grade Global Positioning System. The boundaries of this wetland were identified using flagging labeled EE1 through EE100.

Wetland EE is part of a wetland complex extending offsite and consisting of emergent, scrub-shrub, and forested components. This wetland complex is bisected by U.S. Highway

41 (Figure 5). Wetland EE is located downstream from the confluences of the Middle Branch of the Escanaba River and the Second River, and the Middle Branch Escanaba River and Halfway Creek, both of which are north of U.S. Highway 41 (Figure 7). Based on a review of in-office materials, it appears that this wetland complex is hydrologically connected to the Middle Branch of the Escanaba River through surface water drainage connections.

The vegetation identified in Wetland EE includes blue-joint (*Calamagrostis canadensis*), aquatic sedge (*Carex aquatilis*), strict sedge (*Carex stricta*), European swamp thistle (*Cirsium palustre*), bunchberry (*Cornus canadensis*), woodland horsetail (*Equisetum sylvaticum*), soft rush (*Juncus effusus*), American water-horehound (*Lycopus americanus*), petioled willow (*Salix petiolaris*), balsam willow (*Salix pyrifolia*), wool-grass (*Scirpus cyperinus*), white meadow-sweet (*Spraea alba*), and broad-leaved cattail (*Typha latifolia*). For a complete list of plant species observed in this wetland, see Table 1.

The soils in Wetland EE are described in the SSURGO database as Histosols and Aquents – ponded, a very poorly drained soil type, and Kinross muck, a poorly drained soil type. The standing water present over the entire wetland during the on-site evaluation appears to indicate that soil conditions are consistent with this description.

Wetland EE serves as a buffer for wildlife between the previously mined areas to the south and the constant traffic along U.S. Highway 41 to the north. The open water within the wetland is limited to a few small pockets that could provide habitat for waterfowl and aquatic mammals such as beaver (*Castor canadensis*) or muskrat (*Ondatra zibethica*), although none were observed during our investigation. The emergent marsh, with vegetation dominated by cattails, could provide habitat for songbirds such as marsh wrens (*Cistothorus palustris*), red-winged blackbirds (*Agelaius phoeniceus*), and black-capped chickadees (*Poecile atricapillus*). These bird species also use scrub-shrub thickets like those growing along the upland/wetland edge of Wetland EE. Although comprehensive wildlife surveys have not taken place within this wetland, it is likely that its location would diminish its habitat value for all but the most tolerant wildlife species. No listed species were observed during field activities.

Upland Areas Surrounding Wetland EE

The upland areas around the periphery of Wetland EE have historically been disturbed by mining activity and generally consist of vegetation such as sugar maple (*Acer saccharum*), spotted knapweed (*Centaurea maculosa*), Queen Anne's lace (*Daucus carota*), Canada mayflower (*Maianthemum canadense*), white pine (*Pinus strobus*), quaking aspen (*Populus tremuloides*), black cherry (*Prunus serotina*), and brackenfern (*Pteridium aquilinum*). See Table 1 for a complete list of plant species observed in these areas. There was no evidence of standing water or saturated soils in the upland areas.

MDEQ Jurisdiction/Regulatory Discussion

In order for the MDEQ to have regulatory authority over a wetland the wetland must be contiguous to a lake, pond and/or stream or be five acres or greater in size. The Black River Wetland is regulated by the MDEQ because it is contiguous to the Black River system and larger than five acres in size. Wetland EE is regulated by the MDEQ because it is contiguous to the Middle Branch of the Escanaba River and it is larger than five acres in size. A permit must be obtained from the MDEQ prior to conducting most filling, dredging and/or draining activities or maintaining a use of a regulated wetland.

Please be advised the information provided in this report is a professional opinion. The ultimate decision on wetland boundary locations and jurisdiction thereof rests with the MDEQ and, in some cases, the Federal government.

Thank you for the opportunity to provide this wetland determination. If you have any questions, please contact me at your convenience.

Sincerely,

King & MacGregor Environmental, Inc.
Matthew J. MacGregor

References:

King & MacGregor Environmental, Inc. 2007. *Biological Survey: Plant Communities, Wildlife and Wetland Evaluation*. April 5, 2007. Unpublished.

TABLE 1. PLANT SPECIES LIST FOR BLACK RIVER WETLAND AND WETLAND EE AT HUMBOLDT MILL SITE

Black River Wetland

SCIENTIFIC NAME	ENGLISH NAME	NATIVE?	WETL. IND. CODE	WETL. IND. NO.	RELATIVE ABUNDANCE	GROWTH HABITAT	COEFF. OF CONSERV.
Scrub –shrub-portion (east of overburden hill and former RR)							
Alnus incana ssp. rugosa	speckled alder	Yes	OBL	-5	Abundant	Shrub	5
Myrica gale	sweet gale	Yes	OBL	-5	Very Common	Shrub	6
Onoclea sensibilis	sensitive fern	Yes	FACW	-3	Uncommon	Herb	2
Picea mariana	black spruce	Yes	FACW	-3	Uncommon	Tree	6
Salix bebbiana	Bebb's willow	Yes	FACW+	-4	Occasional	Shrub	1
Salix sp.	willow	No	[FACW]	-3	Very Common	Shrub	3
Spiraea alba	white meadow-sweet	Yes	FACW+	-4	Occasional	Shrub	4
Count: 7			**Average:**	**-3.86**		**Average:**	**3.9**
Emergent portion (east of overburden hill and former RR)							
Calamagrostis canadensis	blue-joint	Yes	OBL	-5	Locally Common	Herb	3
Carex aquatilis	aquatic sedge	Yes	OBL	-5	Common	Herb	7
Cirsium palustre	European swamp thistle	No	[FACW+]	-4	Uncommon	Herb	0
Comus stolonifera	red-osier dogwood	Yes	FACW	-3	Locally Common	Shrub	2
Phalaris arundinacea	reed canary grass	No	FACW+	-4	Locally Common	Herb	0
Picea mariana	black spruce	Yes	FACW	-3	Uncommon	Tree	6
Rubus strigosus (R. idaeus ssp.strigosus)	wild red raspberry	Yes	FACW-	-2	Occasional	Herb	2
Rumex orbiculatus	great water dock	Yes	OBL	-5	Uncommon	Herb	9
Sagittaria latfolia	broad-leaved arrowhead	Yes	OBL	-5	Local	Herb	1
Sparganium eurycarpum	broad-fruit bur-reed	Yes	OBL	-5	Local	Herb	5
Spiraea alba	white meadow-sweet	Yes	FACW+	-4	Occasional	Shrub	4
Typha latifolia	broad-leaved cattail	Yes	OBL	-5	Locally Common	Herb	1
Count: 12			**Average:**	**-4.17**		**Average**	**3.3**

Black River Wetland (con't.)

SCIENTIFIC NAME	ENGLISH NAME	NATIVE?	WETL. IND. CODE	WETL. IND. NO.	RELATIVE ABUNDANCE	GROWTH HABITAT	COEFF. OF CONSERV.
Forested areas on higher ground interspersed throughout Black River Wetland							
Abies balsamea	balsam fir	Yes	FACW	-3	Common	Tree	3
Aralia nudicaulis	wild sarsaparilla	Yes	FACU	3	Occasional	Herb	5
Acer rubrum	red maple	Yes	FAC	0	Occasional	Tree	1
Acer saccharum	sugar maple	Yes	FACU	3	Occasional	Tree	5
Arctium minus	bur-dock	No	[UPL]	5	Uncommon	Herb	0
Betula papyrifera	paper birch	Yes	FACU+	2	Occasional	Tree	2
Carex intumescens	tumid sedge	Yes	FACW+	-4	Uncommon	Herb	3
Circaea alpine	alpine enchanter's-nightshade	Yes	FACW	-3	Local	Herb	4
Cirsium palustre	European swamp thistle	No	[FACW+]	-4	Uncommon	Herb	0
Corylus americana	hazelnut	Yes	FACU-	4	Uncommon	Shrub	5
Dryopteris intermedia	intermediate fern	Yes	FAC	0	Occasional	Herb	5
Gymnocarpium dryopteris	oak fern	Yes	FAC	0	Very Common	Herb	5
Oxalis acetosella	northern wood-sorrel	Yes	[FACU]	3	Local	Herb	7
Picea glauca	white spruce	Yes	FACU	3	Uncommon	Tree	3
Prunella vulgaris	self-heal	No	FAC	0	Uncommon	Herb	0
Prunus serotina	black cherry	Yes	FACU	3	Occasional	Tree	2
Prunus virginiana	choke cherry	Yes	FAC-	1	Uncommon	Shrub	2
Pteridium aquilinum	brackenfern	Yes	FACU	3	Common	Fern	0
Rubus allegheniensis	common blackberry	Yes	FACU+	2	Uncommon	Shrub	1
Rubus pubescens	dwarf raspberry	Yes	FACW+	-4	Occasional	Herb	4
Rubus strigosus (r. idaeus ssp.strigosus)	wild red raspberry	Yes	FACW-	-2	Uncommon	Herb	2
Trientalis borealis	starflower	Yes	FAC+	-1	Uncommon	Herb	5
Trillium cernuum	nodding trillium	Yes	FAC	0	Uncommon	Herb	5
Vaccinium angustifolium	lowbush blueberry	Yes	FACU	3	Occasional	Shrub	4
Count: 24			**Average:**	**0.58**		**Average:**	**3.3**

Wetland EE

SCIENTIFIC NAME	ENGLISH NAME	NATIVE?	WETL. IND. CODE	WETL. IND. NO.	RELATIVE ABUNDANCE	GROWTH HABITAT	COEFF. OF CONSERV.
Emergent interior of cattails with scrub-shrub border of willow, scattered dead conifers. Overburen pile on south side							
Anemone quinquefolia	wood anemone	Yes	FAC	0	Uncommon	Herb	5
Aster puniceus (incl. A. firmus)	swamp aster	Yes	OBL	-5	Uncommon	Herb	5
Betula papyrifera	paper birch	Yes	FACU+	2	Uncommon	Tree	2
Calamagrostis canadensis	blue-joint	Yes	OBL	-5	Common	Herb	3
Carex aquatilis	aquatic sedge	Yes	OBL	-5	Locally Common	Herb	7
Carex canescens	hoary sedge	Yes	OBL	-5	Uncommon	Herb	8
Carex stipata	stipitate sedge	Yes	[OBL]	-5	Uncommon	Herb	1
Carex stricta	strict sedge	Yes	OBL	-5	Locally Common	Herb	4
Cirsium palustre	European swamp thistle	No	[FACW+]	-4	Common	Herb	0
Cornus canadensis	bunchberry	Yes	FAC	0	Local	Herb	6
Cornus stolonifera	red-osier dogwood	Yes	FACW	-3	Uncommon	Shrub	2
Equisetum sylvaticum	woodland horsetail	Yes	FACW	-3	Local	Herb	5
Fragaria virginiana	wild strawberry	Yes	FAC-	1	Uncommon	Herb	2
Iris versicolor	varicolored iris	Yes	OBL	-5	Uncommon	Herb	5
Juncus effusus	soft rush	Yes	OBL	-5	Occasional	Herb	3
Ledum groenlandicum	Labrador-tea	Yes	OBL	-5	Uncommon	Shrub	8
Lycopus americanus	American water-horehound	Yes	OBL	-5	Local	Herb	2
Mentha arvensis	field mint	Yes	FACW	-3	Uncommon	Herb	3
Picea mariana	black spruce	Yes	FACW	-3	Uncommon	Tree	6
Pinus banksiana	jack pine	Yes	FACU	3	Uncommon	Tree	5
Populus balsamifera	balsam poplar	Yes	FACW	-3	Uncommon	Tree	2
Populus tremuloides	quaking aspen	Yes	FAC	0	Uncommon	Tree	1
Pyrola elliptica	elliptic wintergreen	Yes	[UPL]	5	Uncommon	Herb	6
Ribes glandulosum	skunk currant	Yes	FACW	-3	Uncommon	Shrub	5
Rubus strigosus (R. idaeus ssp. strigosus)	wild red raspberry	Yes	FACW-	-2	Uncommon	Herb	2
Rumex orbiculatus	great water dock	Yes	OBL	-5	Uncommon	Herb	9
Salix bebbiana	Bebb's willow	Yes	FACW+	-4	Uncommon	Shrub	1
Salix petiolaris	petioled willow	Yes	FACW+	-4	Common	Shrub	1
Salix pyrifolia	balsam willow	Yes	FACW+	-4	Frequent	Shrub	8

Wetland EE (con't)

SCIENTIFIC NAME	ENGLISH NAME	NATIVE?	WETL. IND. CODE	WETL. IND. NO.	RELATIVE ABUNDANCE	GROWTH HABITAT	COEFF. OF CONSERV.
Scirpus cyperinus	wool-grass	Yes	OBL	-5	Occasional	Herb	5
Solidago altissima	tall goldenrod	Yes	FACU	3	Uncommon	Herb	1
Solidago gigantea	giant goldenrod	Yes	FACW	-3	Uncommon	Herb	3
Spartina pectinata	prairie cordgrass	Yes	FACW+	-4	Uncommon	Herb	5
Spiraea alba	white meadow-sweet	Yes	FACW+	-4	Occasional	Shrub	4
Tanacetum vulgare	common tansy	No	[UPL]	5	Uncommon	Herb	0
Taraxacum officinale	common dandelion	No	FACU	3	Uncommon	Herb	0
Typha latifolia	broad-leaved cattail	Yes	OBL	-5	Abundant	Herb	1
Count: 37			**Average:**	**-2.43**		**Average:**	**3.7**

Table Abbreviations:

Wetl. Ind. Code – Wetland Indicator Code
Wetl. Ind. No. – Wetland Indicator Number
Coeff. Of Conserv. – Coefficient of Conservatism

See Table 1 Notes for further explanation

TABLE 2. WILDLIFE SPECIES LIST FOR BLACK RIVER WETLAND
Sampling Point 2 Data for 2006 and 2007

Bird Species	
Ardea herodias	great blue heron
Butorides virescens	green heron
Carduelis tristis	American goldfinch
Catharus fuscescens	veery
Catharus guttatus	hermit thrush
Charadrius vociferus	killdeer
Colaptes auratus	northern flicker
Corvus brachyrhynchos	American crow
Cyanocitta cristata	blue jay
Dendroica coronata	yellow-rumped warbler
Dendroica pensylvanica	chestnut-sided warbler
Dendroica virens	black-throated green warbler
Empidonax alnorum	alder flycatcher
Gallinago gallinago	common snipe
Gavia immer	common loon
Geothlypis trichas	common yellowthroat
Grus canadensis	sandhill crane
Melospiza georgiana	swamp sparrow
Melospiza melodia	song sparrow
Mniotilta varia	black-and-white warbler
Phalacrocorax auritus	double-crested cormorant
Picoides pubescens	downy woodpecker
Poecile atricapillus	black-capped chickadee
Quiscalus quiscula	common grackle
Sitta canadensis	red-breasted nuthatch
Spizella passerina	chipping sparrow
Troglodytes troglodytes	winter wren
Turdus migratorius	American robin
Vermivora chrysoptera	golden-winged warbler
Vermivora ruficapilla	Nashville warbler
Vireo olivaceus	red-eyed vireo
Vireo philadelphicus	Philadelphia vireo
Zonotrichia albicollis	white-throated sparrow
Frog and Toad Species	
Bufo americanus	eastern American toad
Pseudacris crucifer	northern spring peeper
Rana clamitans	green frog
Small Mammal Species	
No small mammals observed in 2006 or 2007	

Baraga

Michigamme Twp

Champion Twp

Powell Twp

Ishpeming Twp

Marquette Twp

Negaunee Twp

Ely Twp

Van Riper State Park

Marquette

Champion Mine Site

Ropes Mine Site

~24 Miles

US 41

Marquette

Lake Superior

Ishpeming

Negaunee

Humboldt Mill
Project Location

US 95

CR 601

Republic Twp

Sands Twp

Chocolay Twp

Tilden Mine Site

Empire Mine Site

Tilden Twp

Richmond Twp

Humboldt Twp

West Branch Twp

Skandia Twp

NOTES

1. Horizontal datum based on NAD 83/94.
   Horizontal coordinates based on UTM Zone 16.
2. All base information downloaded from Michigan Center of Geographic Information (http://www.michigan.gov/cgi).
3. Site Location - Project Site within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.

LEGEND

- Counties
- Minor Civil Divisions
- Lakes and Rivers
- KEMC Project Location
- Highways
- Major Roads
- Minor Roads
- Railroads

N

King & MacGregor Environmental, Inc.

Foth Infrastructure & Environment, LLC

Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	AKM	DATE: SEP. '07	
APPROVED BY:	SVD1	DATE: SEP. '07	
APPROVED BY:		DATE:	

Kennecott Eagle Minerals

FIGURE 1

HUMBOLDT MILL PROJECT
PROJECT LOCATION

Scale: 0 1.5 3 Miles

Date: SEPTEMBER 2007

Prepared by: DAT

Project No: 06W003

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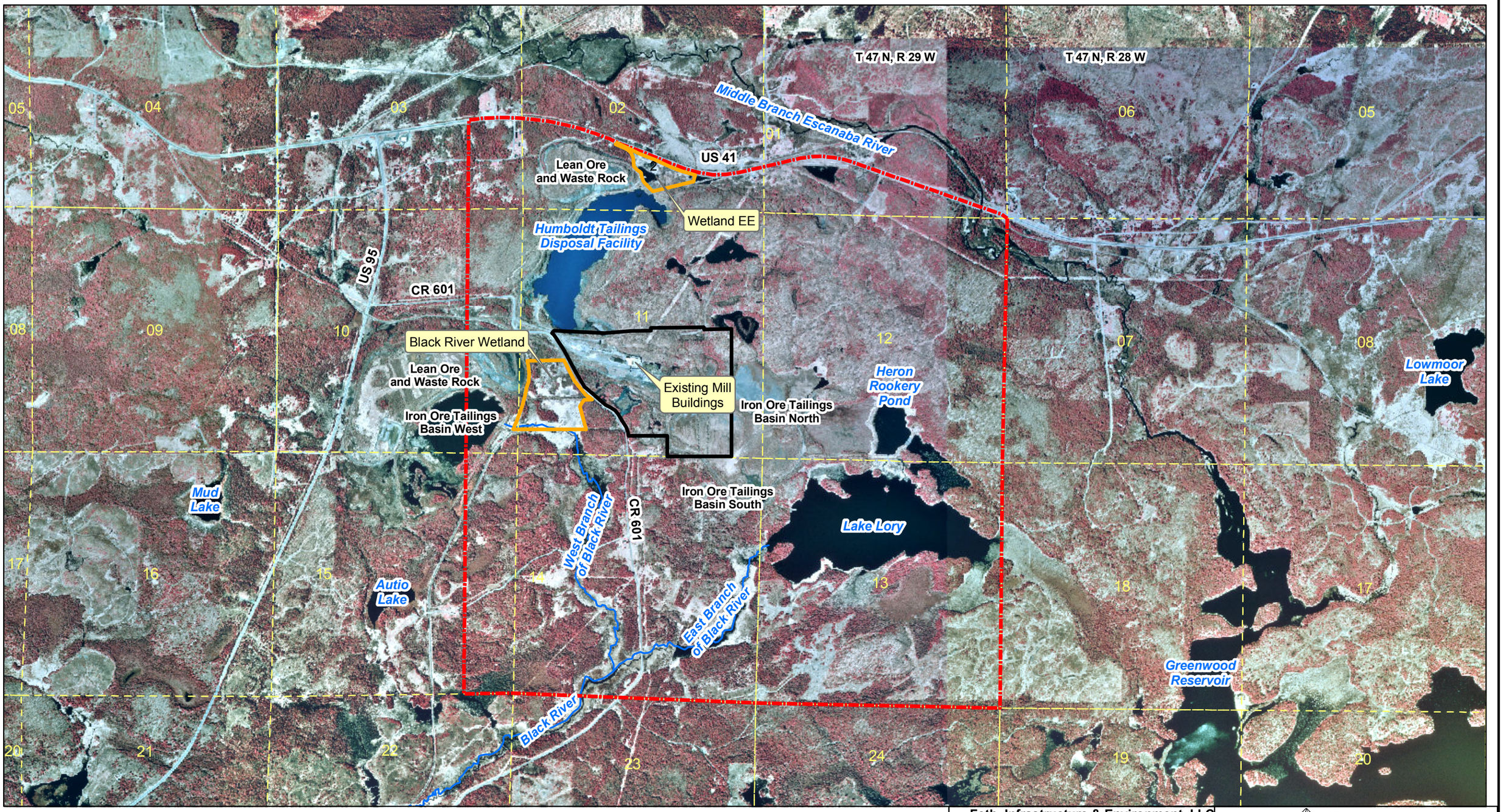

NOTES

1. Base Information, USGS georeferenced Digital Raster Graphics (DRG) and 1998 Digital Orthophoto Quads are from Michigan Center of Geographic Information (http://www.michigan.gov/cgi/)
2. Horizontal datum based on NAD 83/94. Horizontal coordinates based on UTM Zone 16.
3. Site Location - Project Site within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.

LEGEND

- 2007 Wetland Survey Locations
- Overall Study Area for 2006 Biological Survey
- Detailed Wetland Study Area for 2006 Biological Survey
- PLSS Sections

N

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Foth Infrastructure & Environment, LLC

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REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	AKM	DATE: SEP. '07	
APPROVED BY:	SVD1	DATE: SEP. '07	
APPROVED BY:		DATE:	

Kennecott
Eagle Minerals

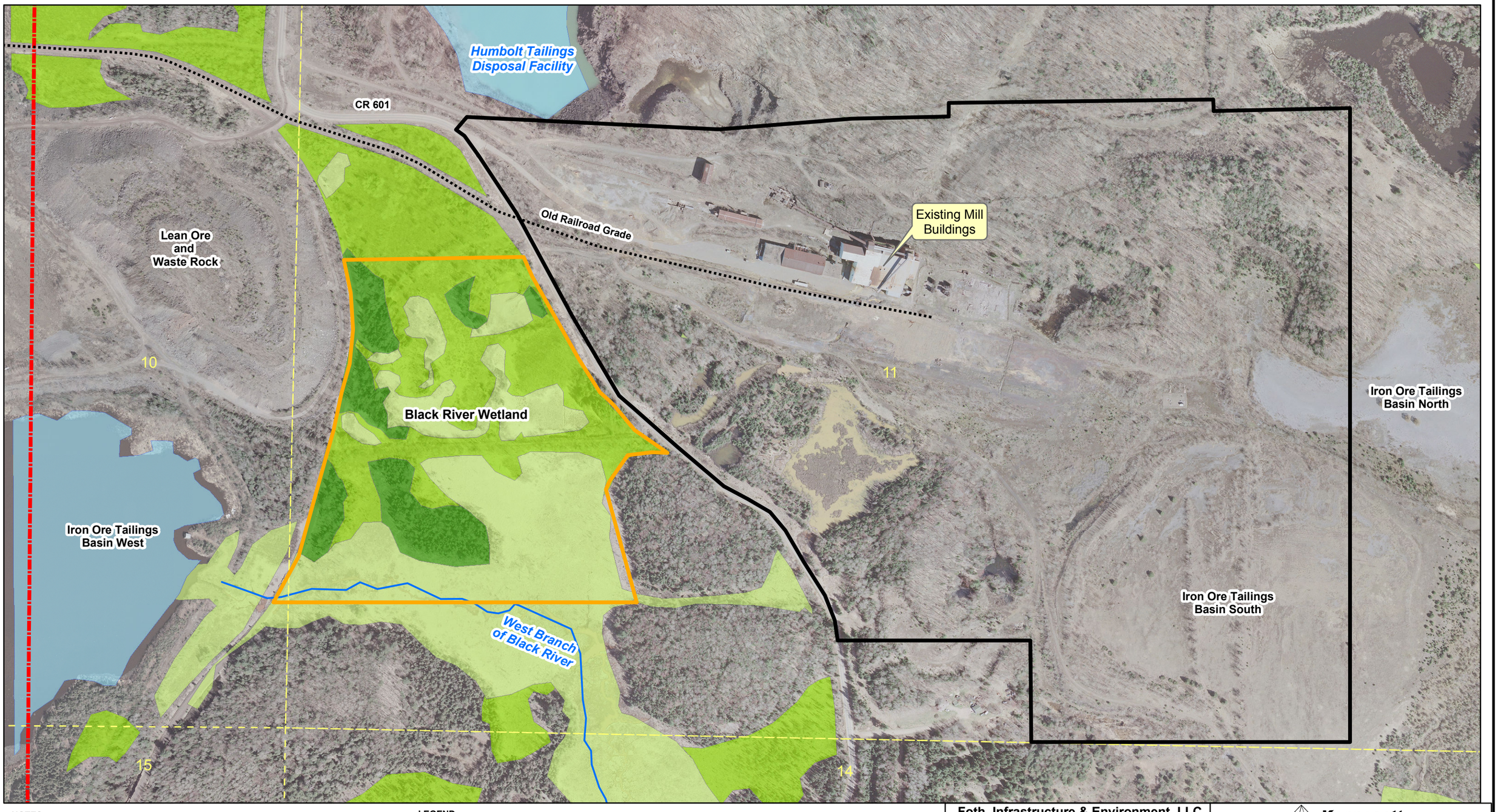
FIGURE 2
HUMBOLDT MILL PROJECT
SURVEY LOCATIONS FOR 2006 & 2007
WETLAND SURVEYS

Scale: 0 1,000 2,000 Feet

Date: SEPTEMBER 2007

Prepared by: DAT

Project No: 06W003



NOTES

1. Base Information, USGS georeferenced Digital Raster Graphics (DRG) and 1998 Digital Orthophoto Quads are from Michigan Center of Geographic Information (http://www.michigan.gov/cgi/)
2. Horizontal datum based on NAD 83/94. Horizontal coordinates based on UTM Zone 16.
3. Site Location - Project Site within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.
4. Wetland boundary adjusted for presence of rail bed

LEGEND

- Black River Wetland
- Overall Study Area for 2006 Biological Survey
- Detailed Wetland Study Area, Wetlands in this area not shown
- PLSS Sections
- Old Railroad Grade

Marquette County NWI

- Emergent
- Scrub-Shrub
- Forested
- Open Water/Unknown Bottom

N

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APPROVED BY:	SVD1	DATE: SEP. '07	
APPROVED BY:		DATE:	

Kennecott
Eagle Minerals

FIGURE 3
HUMBOLDT MILL PROJECT
NWI IDENTIFIED WETLANDS
BLACK RIVER WETLAND

Scale: 0 200 400 Feet

Date: SEPTEMBER 2007

Prepared by: DAT

Project No: 06W003

Humbolt Tailings Disposal Facility

CR 601

Old Railroad Grade

Existing Mill Buildings

Lean Ore and Waste Rock

Black River Wetland

Iron Ore Tailings Basin West

Iron Ore Tailings Basin North

Iron Ore Tailings Basin South

West Branch of Black River

10

11

15

14

NOTES

1. Base Information, USGS georeferenced Digital Raster Graphics (DRG) and 1998 Digital Orthophoto Quads are from Michigan Center of Geographic Information (http://www.michigan.gov/cgi/)
2. Horizontal datum based on NAD 83/94. Horizontal coordinates based on UTM Zone 16.
3. Site Location - Project Site within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.

LEGEND

- Black River Wetland
- Overall Study Area for 2006 Biological Survey
- Detailed Wetland Study Area, Wetlands in this area not shown
- PLSS Sections
- Old Railroad Grade
- Approximate Upland Areas
- Approximate Wetland Areas

N

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REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	AKM	DATE: SEP. '07	
APPROVED BY:	SVD1	DATE: SEP. '07	
APPROVED BY:		DATE:	

Kennecott Eagle Minerals

FIGURE 4

HUMBOLDT MILL PROJECT
UPLAND/WETLAND AREAS
BLACK RIVER WETLAND

Scale: 0 200 400 Feet

Date: SEPTEMBER 2007

Prepared by: DAT

Project No: 06W003

Middle Branch Escanaba River

03

02

01

Lean Ore
and Waste Rock

US 41

Humboldt Tailings
Disposal Facility

10

11

12

NOTES

1. Base Information, USGS georeferenced Digital Raster Graphics (DRG) and 1998 Digital Orthophoto Quads are from Michigan Center of Geographic Information (http://www.michigan.gov/cgi/)
2. Horizontal datum based on NAD 83/94. Horizontal coordinates based on UTM Zone 16.
3. Site Location - Project Site within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.

LEGEND

- 2007 Wetland Survey Location of Wetland EE
- Overall Study Area Boundary for 2006 Biological Survey
- KEMC Project Location
- PLSS Sections

Marquette County NWI

- Emergent
- Scrub-Shrub
- Forested

N

King & MacGregor Environmental, Inc.

Foth Infrastructure & Environment, LLC

Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	AKM	DATE: SEP. '07	
APPROVED BY:	SVD1	DATE: SEP. '07	
APPROVED BY:		DATE:	

Kennecott
Eagle Minerals

FIGURE 5

HUMBOLDT MILL PROJECT
WETLAND EE & ADJACENT LAND TO THE NORTH
NWI IDENTIFIED WETLANDS

Scale: 0 250 500 Feet	Date: SEPTEMBER 2007
Prepared by: DAT	Project No: 06W003

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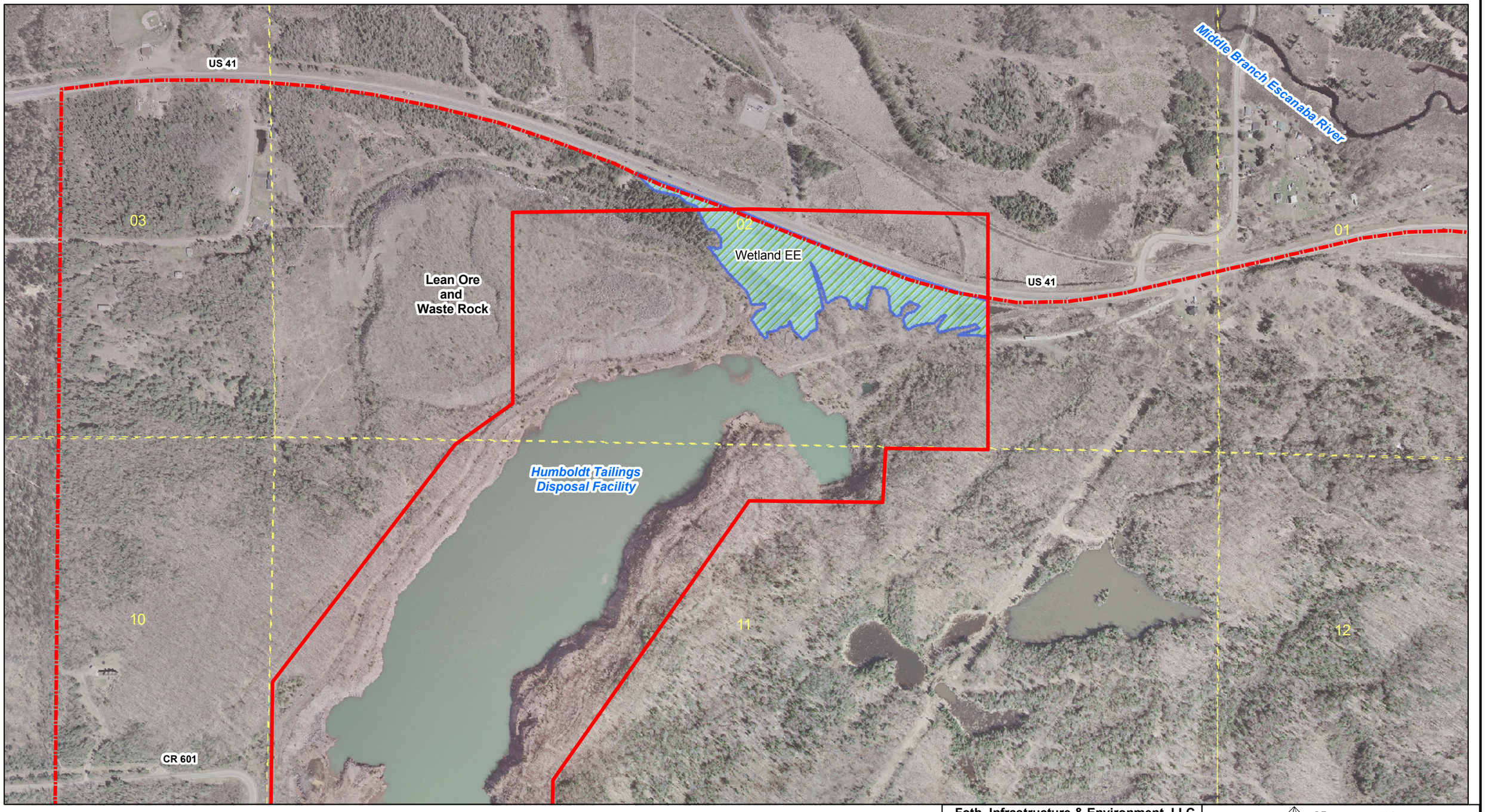

NOTES

1. Orthophotography supplied by Aero-Metric Engineering, Sheboygan, Wisconsin. Date of Photography: April 27, 2006.
2. Horizontal datum based on NAD 83/94. Horizontal coordinates based on UTM Zone 16.
3. Site Location - Project Site within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.

LEGEND

- Overall Study Area Boundary for 2006 Biological Survey
- PLSS Sections
- KEMC Project Location
- Flagged Wetland Boundary (Area approximately 11.8 acres)

N

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REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	AKM	DATE: SEP. '07
APPROVED BY:	SVD1	DATE: SEP. '07
APPROVED BY:		DATE:

Kennecott
Eagle Minerals

FIGURE 6
HUMBOLDT MILL PROJECT
WETLAND EE
WETLAND BOUNDARY

Scale: 0 250 500 Feet	Date: SEPTEMBER 2007
Prepared by: DAT	Project No: 06W003

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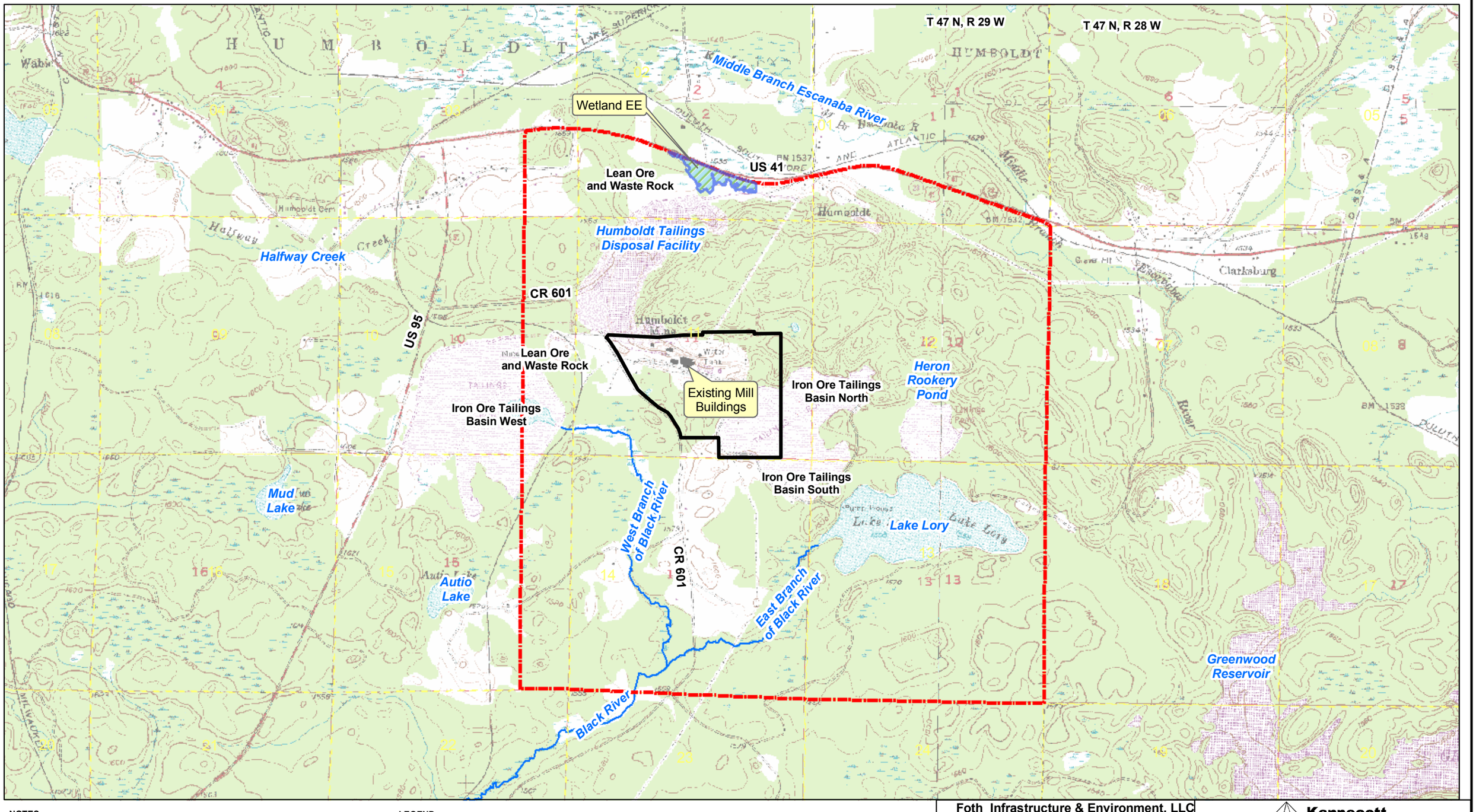

NOTES

1. Base Information, USGS georeferenced Digital Raster Graphics (DRG) and 1998 Digital Orthophoto Quads are from Michigan Center of Geographic Information (http://www.michigan.gov/cgi/)
2. Horizontal datum based on NAD 83/94. Horizontal coordinates based on UTM Zone 16.
3. Site Location - Project Site within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.

LEGEND

- Overall Study Area for 2006 Biological Survey
- Detailed Wetland Study Area for 2006 Biological Survey
- Wetland EE
- PLSS Sections

N

King & MacGregor Environmental, Inc.

Foth Infrastructure & Environment, LLC

Foth Infrastructure & Environment, LLC			
REVISED	DATE	BY	DESCRIPTION
CHECKED BY: AKM			DATE: SEP. '07
APPROVED BY: SVD1			DATE: SEP. '07
APPROVED BY:			DATE:

Kennecott
Eagle Minerals

FIGURE 7
HUMBOLDT MILL PROJECT
USGS TOPOGRAPHIC MAP

Scale: 0 1,000 2,000 Feet
Date: SEPTEMBER 2007
Prepared by: DAT
Project No: 06W003

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C-3

Michigan Department of Environmental Quality
Level 3 Wetland Evaluation Report

JENNIFER M. GRANHOLM
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
UPPER PENINSULA DISTRICT OFFICE

STEVEN E. CHESTER
DIRECTOR

November 20, 2007

Mr. Matt MacGregor
King & MacGregor Environmental, Inc.
2520 Woodmeadow Drive SE
Grand Rapids, Michigan 49546

Dear Mr. MacGregor:

SUBJECT: Wetland Identification Report
Wetland Identification File Number: 07-52-0001-WA

The Department of Environmental Quality (DEQ) conducted a Level 3 Wetland Identification Review on 192 acres of property (Property Tax Identification Number 52-06-211-001-20) located in Town 47N, Range 29W, Section 11, Humboldt Township, Marquette County on August 22 and September 12, 2007. The wetland review was conducted in accordance with Part 303, Wetland Protection of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA); and Rule 4 (1), Wetland Identification and Assessment (R 281.924) of the Administrative Rules for Part 303. This is a report of our findings in response to your Wetland Identification Application.

The DEQ staff walked the flagged boundaries with the consultant as requested in your wetland identification application. Based on our on-site investigation, which included review of plant communities, hydrologic indicators and soils, and an in-office review of other pertinent information, the DEQ accepts the boundaries as modified on September 12, 2007. Enclosed is a site map of the identified area that was provided by your consultant and annotated by the DEQ. It will be noted that the modified map shows a reduced assessment area, these reductions are accepted by the DEQ. It is also noted there is a non-wetland ditch running westerly, just south of the old mine buildings, which empties into a wetland area via a culvert under highway 601 which is not shown on this wetland map. This map identifies both regulated and unregulated wetland and non-wetland (upland) areas within the identification area.

For those areas identified as regulated wetland on the site map, specifically wetlands A, B, D, E/F, G, H, J, K, L, M, N, O, P, Q, R, CC/T/U, AA, and BB, please be advised that any of the following activities require a permit under Part 303:

a) Deposit or permit the placing of fill material in a regulated wetland.
b) Dredge, remove, or permit the removal of soil or minerals from regulated wetland.
c) Construct, operate, or maintain any use or development in a regulated wetland.
d) Drain surface water from a regulated wetland.

For those areas identified as non-wetland (upland) and non-regulated wetland, specifically wetlands I, S and V on the site map, the DEQ lacks jurisdiction under Part 303 for activities occurring in those areas. The non-regulated wetland(s) is (are) not regulated since they are not contiguous to the Great Lakes, an inland lake or pond, or a river or stream.

You may request the DEQ reassess the subject review area, or any portion of the review area, should you disagree with the findings, within 60 days of the date of this report. A written request to reassess the Wetland Identification Review area must be accompanied by supporting evidence with regard to wetland vegetation, soils or hydrology different from, or in addition to, the information relied upon by DEQ staff in preparing this report. The request should be submitted to:

Wetland Identification Program
Land and Water Management Division
Department of Environmental Quality
P.O. Box 30458
Lansing, Michigan 48909-7756

Please be aware that this identification report does not constitute a determination of the presence of wetland that may be regulated under local ordinances or federal law. The U.S. Army Corps of Engineers (USACE) retains regulatory authority over certain wetlands pursuant to Section 404 of the Clean Water Act (CWA), and specifically those wetlands associated with traditionally navigable waters of the state. Navigable waters are generally the Great Lakes, their connecting waters, and river systems and lakes connected to these waters. In other areas of the state, the DEQ is responsible for identification of wetland boundaries for purposes of compliance with the CWA under an agreement with the U.S. Environmental Protection Agency. Your assessment area does not appear to be within those areas also regulated by the USACE. However, should you desire more information, please contact the USACE at 313-226-2218.

This Wetland Identification Report is limited to findings pursuant to Part 303 and does not constitute a determination of jurisdiction under other DEQ administered programs. Any land use activities undertaken on the assessed parcel may be subject to regulation pursuant to the NREPA under the following programs:

Part 91, Soil Erosion and Sedimentation Control
Part 301, Inland Lakes and Streams

The findings contained in this report are binding on the DEQ until November 20, 2010, a period of three years from the date of this Wetland Identification Report unless a

reassessment is conducted. Please contact me if you have any questions regarding this report.

Sincerely,

Mark Feldhauser
District Supervisor
Land and Water Management Division
906-346-8525

ams
Enclosure

cc: Ms. Wendy Veltman, DEQ
Mr. Thomas Quigley, Minerals Processing Corp.
Mr. Peter O'Dovero, O'Dovero Properties
Marquette County CEA
Marquette County Health Department
Humboldt Township Clerk

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
Land and Water Management Division

November 6, 2007

King & MacGregor Environmental, Inc.
2520 Woodmeadow Drive SE
Grand Rapids, MI 49546

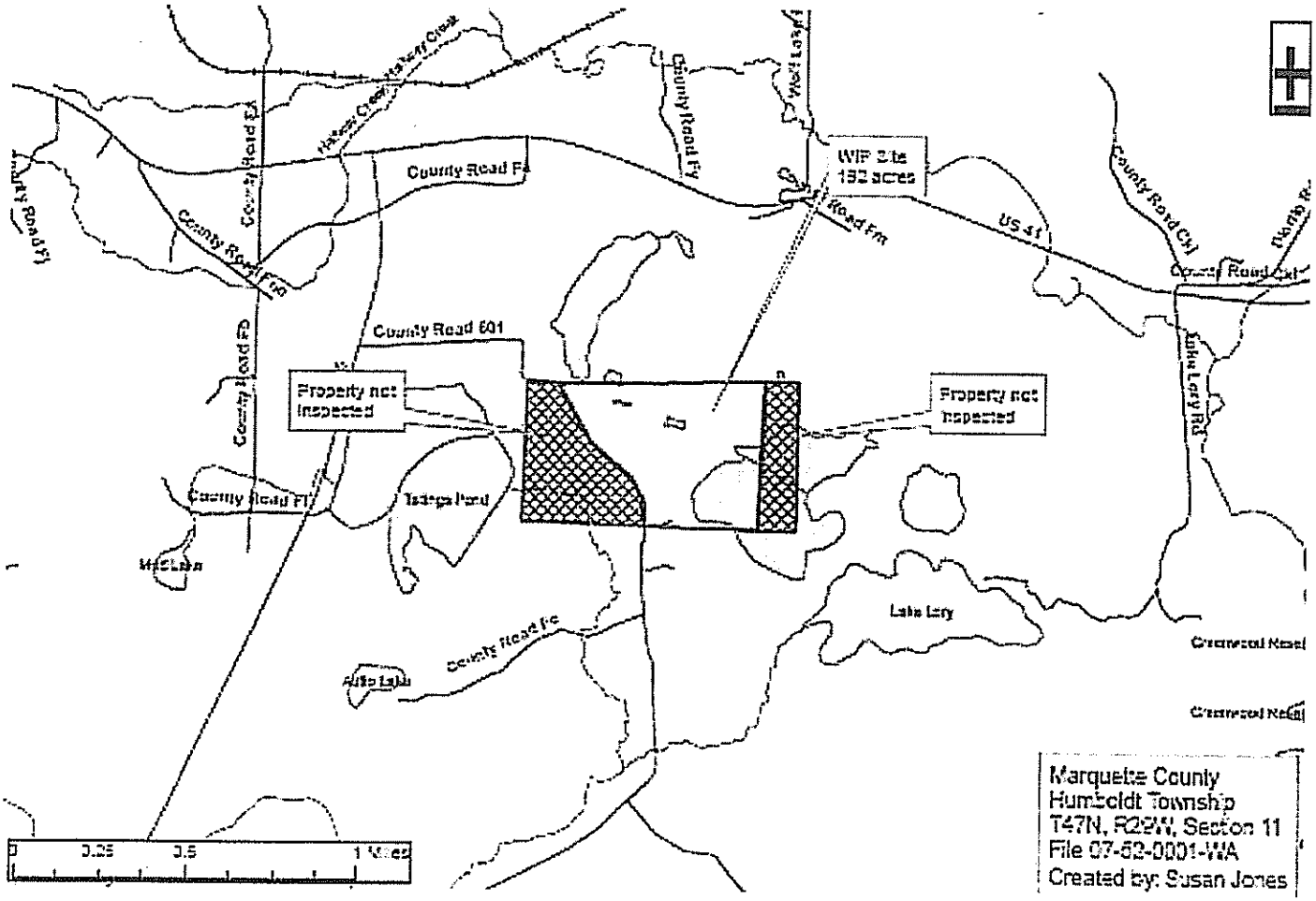
King & MacGregor Environmental, Inc. Photo Album

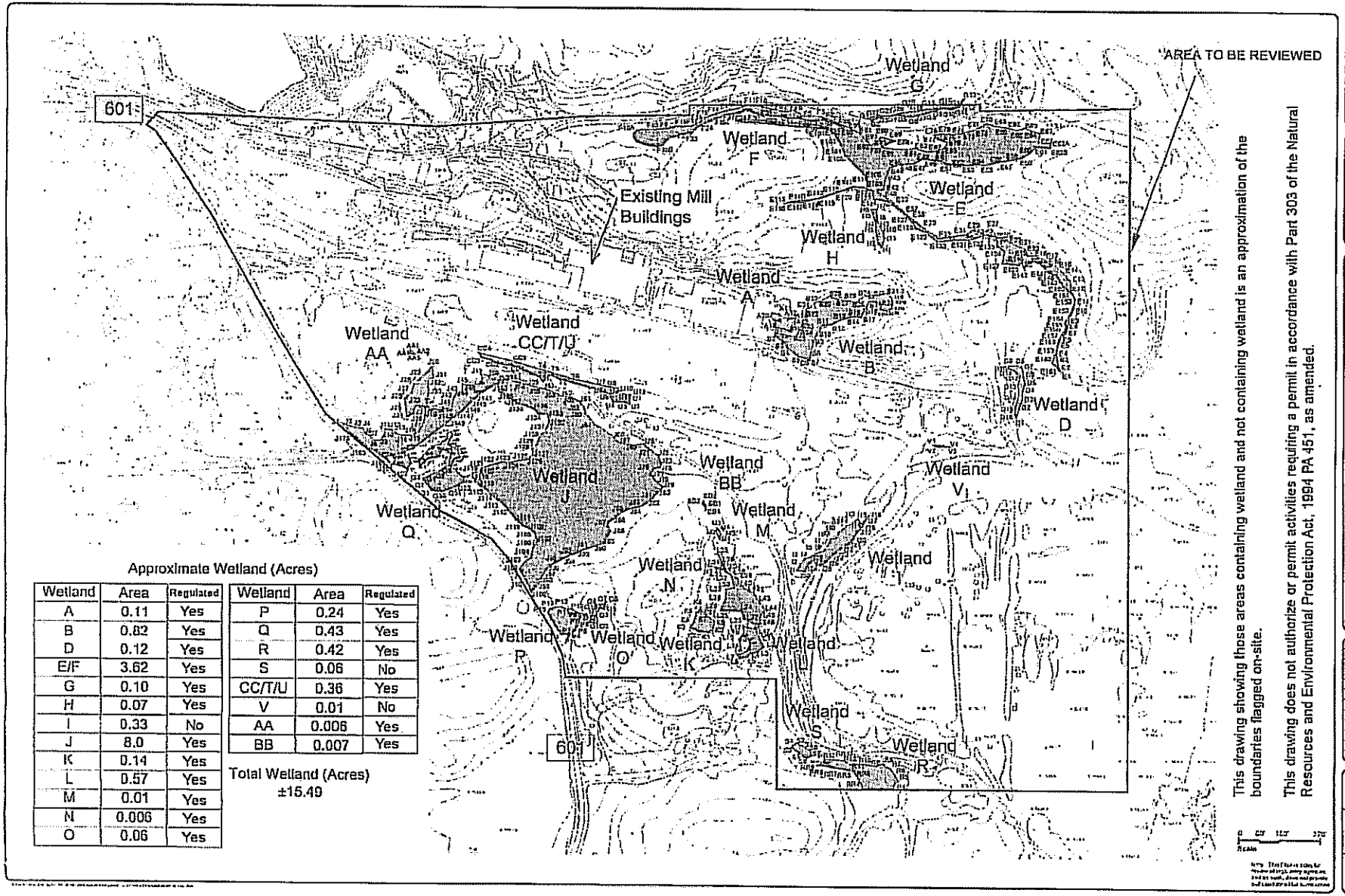
SUBJECT: Wetland Identification Report
Wetland Identification File Number 07-52-0001-WA

The Department of Environmental Quality (DEQ) captured images on property (property tax identification number 52-06-211-001-20) located in Town 47N, Range 29W, Section 11, Humboldt Township, Marquette County on September 12, 2007.

Photo Album

Photo's taken by: Brian Anderson





Approximate Wetland (Acres)

Wetland	Area	Regulated
A	0.11	Yes
B	0.82	Yes
D	0.12	Yes
E/F	3.62	Yes
G	0.10	Yes
H	0.07	Yes
I	0.33	No
J	8.0	Yes
K	0.14	Yes
L	0.57	Yes
M	0.01	Yes
N	0.006	Yes
O	0.06	Yes

Wetland	Area	Regulated
P	0.24	Yes
Q	0.43	Yes
R	0.42	Yes
S	0.06	No
CC/T/U	0.36	Yes
V	0.01	No
AA	0.006	Yes
BB	0.007	Yes

Total Wetland (Acres)
±15.49

This drawing showing those areas containing wetland and not containing wetland is an approximation of the boundaries flagged on-site.

This drawing does not authorize or permit activities requiring a permit in accordance with Part 303 of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended.

King & MacGregor Environmental Inc.

NORTH

Wetland Determination For:
Humboldt Mill Site
Marquette County, Michigan
Humboldt Township

PROJECT NUMBER	06259
SHEET NAME	WIP PLAN
SHEET NUMBER	FIG-1

Appendix D

Aquatic Surveys

D-1

Biological Studies Documented by Callahan Mining Corporation in the 1995 Report Entitled Ropes Closure Document

ROPES CLOSURE DOCUMENT

Prepared by
Callahan Mining Corporation

Submitted to
Michigan Department of Natural Resources

November 3, 1995

Attachment 2
MDNR 1990 Biological Survey

Post-it® Fax Note 7671	Date	# of pages ▶
To RANDY	From Bill	
Co./Dept.	Co.	
Phone #	Phone #	
Fax #	Fax #	

MI/DNR/SWQ-91/049

MICHIGAN DEPARTMENT OF NATURAL RESOURCES
SURFACE WATER QUALITY DIVISION
DECEMBER, 1991

STAFF REPORT

A BIOLOGICAL SURVEY OF THE MIDDLE BRANCH ESCANABA RIVER AND A CATTAIL MARSH IN THE VICINITY OF THE CALLAHAN MINING CORPORATION-HUMBOLDT PIT NPDES #MI 0044393 MARQUETTE COUNTY, MICHIGAN JUNE 25-26, 1990 AND JULY 31, 1990

As part of the point source surveillance activity, staff of the Great Lakes and Environmental Assessment Section (GLEAS) and Marquette District Office conducted a qualitative biological survey of the Middle Branch Escanaba River and a cattail (Typha) marsh in the vicinity of the Humboldt Pit. A limnological investigation of the Humboldt Pit was also performed.

The Humboldt Pit is owned by the Callahan Mining Corporation. Prior to Spring, 1990, Callahan Mining used the Humboldt Pit as a disposal site for tailings and process wastewater generated from it's gold ore processing operations. When water levels in the Humboldt Pit reach a specific height, overflow water discharges to a cattail (Typha) marsh connected hydrologically to the Middle Branch Escanaba River (hereafter referred to as the Escanaba River). Concerns have been expressed by the public and local governmental officials with regard to effects of the Humboldt Pit drainage on local surface and ground waters.

The objectives of this biological survey were to characterize the Humboldt Pit's limnology and to qualitatively evaluate whether the Humboldt Pit discharge has adversely impacted the fish and aquatic macroinvertebrate communities, physical habitat and water/sediment chemical quality of the Escanaba River or adjacent marsh.

SUMMARY

1) The locations of the biological and chemical sampling stations are shown in Figure 1.

2) Fish and aquatic macroinvertebrate community, habitat evaluation and chemical data generated during the June 25-26, 1990 field sampling effort are presented in Tables 1-6 and Figure 2. The results of the July 31, 1990 macroinvertebrate sampling performed in the adjacent marsh are summarized in Table 7.

3) Effluent from the Humboldt Pit has adversely impacted the benthic macroinvertebrate community of the marsh in the immediate vicinity of Outfall 001. Evidence of partial recovery of the benthic macroinvertebrate community was observed in the marsh approximately 50 yards from the outfall.

4) The biological integrity of the Escanaba River upstream and downstream of the marsh was categorized as "fair" (moderately impaired), based upon the quality of the fish community. However, the degree of impairment may have been overestimated because high water color in the river reduced fish collection capability. The benthic macroinvertebrate community at both sampling stations was classified as "good" (slightly impaired). The similar biological integrity ratings at Stations 1 and 2 suggest that the Humboldt Pit discharge has not adversely impacted the Escanaba River.

5) Although the chemical characteristics of the Escanaba River water were similar above and below the marsh confluence, the river sediments downstream of the marsh contained higher concentrations of copper, nickel and cyanide than were found in the upstream sediments. These chemicals were also found at elevated concentrations in the Humboldt Pit effluent and water/sediment samples from select locations in the marsh.

6) The Humboldt Pit effluent and marsh water also contained higher concentrations of antimony, zinc, cobalt, potassium, calcium, chlorides, magnesium, manganese, sulfate, ammonia-nitrogen, nitrates/nitrites and sodium than were found in the Escanaba River.

7) The Humboldt Pit tailings basin showed no evidence of primary production (i.e. algae). The Pit was thermally stratified below the 20 foot depth level and dissolved oxygen exceeded 6.0 mg/l above the 40 foot depth level. Copper, nickel, lead, ammonia and cyanide levels were elevated in the water column of the Pit.

8) Vascular aquatic plants, blue-green algal mats, 9 species of benthic invertebrates and 2 species of fish were found in the Humboldt Pit in 1984 (Callahan, 1984). Only the vascular aquatic plants were observed during our 1990 study.

BACKGROUND

Callahan Mining Corporation owns and operates the Ropes gold mine located west of Deer Lake, Marquette County. Prior to the Spring of 1990, ore from this mine was transported to the company's Humboldt processing plant near Humboldt, Michigan. The Humboldt Pit is approximately 64 acres with an estimated storage volume of 300 million cubic feet of water (i.e. 2.2 billion gallons). This site is an abandoned open pit iron ore mine. Large piles of overburden and broken rocks line the sides of the pit. Discharges from the pit do occur through this loose material on the north wall (outfall 001) when the pit water levels reach a specific height.

At the facility, gold ore was ground, concentrated and leached with cyanide. Mine tailings and process water were usually routed to a cyanide destruction system (CDS). However, one waste stream was discovered by Marquette District staff to have completely bypassed the CDS. This situation allowed untreated water to enter the Pit and elevated cyanide levels. All milling operations were suspended in the Spring of 1990, due to reductions in gold prices.

Prior to using the Humboldt Pit as a treatment facility, the Company reported (Callahan, 1984) the presence of vascular aquatic plants, blue-green algal mats, 9 taxa of benthic invertebrates and 2 species of fish within the pit.

METHODS

On June 25-26, 1990, GLEAS and Marquette District Office staff conducted a qualitative biological survey of the Escanaba River and the adjacent cattail marsh along M-41 (Marquette County) according to GLEAS Procedure #51 (available upon request). The survey consisted of an assessment of fish and macroinvertebrate communities, physical habitat and water/ sediment chemistry analysis at Stations 1,2, and 4. No ecoregional reference sites were available for the freshwater cattail (Typha sp.) marsh station (Station 6).

Stations 3, 5, 6 and 7 were assessed for water and sediment chemistry only. Temperature, dissolved oxygen, secchi disc measurements, and algae tolls were also taken in the Humboldt Pit (Station 7) on June 26, 1990. The MDNR- Environmental Laboratory was responsible for all chemical analyses performed on the water and sediment samples.

On July 31, 1990, an additional abbreviated assessment of the macroinvertebrate community in the marsh, adjacent to the wellpad and in the immediate vicinity of outfall 001, was performed by GLEAS staff. These observations supplemented information gathered during the June survey.

RESULTS AND DISCUSSION

Fish and macroinvertebrate community structure, habitat evaluation and chemical data generated during the biological survey are presented in Tables 1-7, respectively.

The fish communities were categorized as "fair" (moderately impaired); at both sampling stations on the Escanaba River. The river water was deep and heavily stained with organic acids (tannins) which reduced our fish capture capability. As a result, the rating given may underestimate the actual fish densities

present at the stations. The macroinvertebrate community was rated as "good"(slightly impaired) at both Stations on the Escanaba River. Mayflies (Ephemeroptera) and caddisflies (Trichoptera) were the dominant taxa. The macroinvertebrate and fish community data collected at stations 1 and 2 indicate that the Humboldt Pit discharge has not adversely impacted the biological integrity of the Escanaba River.

The fish community in the marsh at station 4 (culvert B) had no ecoregional reference station available for comparison. This site contained 3 taxa of fish including the central mudminnow (Umbra limi) which thrives in stagnant marshy habitat.

At station 4, the benthic community was comprised of typical marsh and pond taxa, such as dragonflies (Odonata), true bugs (Hemiptera), beetles (Coleoptera), and flies (Diptera) in large numbers. These taxa have adapted to live in warm stagnant dynamic habitats and are generally less sensitive to water quality extremes such as elevated metals or low dissolved oxygen (DO).

On July 31, 1990 , a site visit was made to the Humboldt Pit outfall area in order to supplement information gathered during the June sampling trip. Benthos was sampled using an aquatic sampling net in the area adjacent to the wellpad and directly in front of the outfall (Figure 1). We observed numerous organisms similar to those at station #4 near the wellpad. In contrast, few organisms of any type where observed in the outfall area. Only very sparse numbers of true bugs (Hempitera), midges (Chironomidae) and dragonflies (Odonata) were observed after 15 minutes of collecting in similar habitats at this station (Table 7). Our findings strongly indicate that the effluent from outfall 001 is adversely impacting the benthic community of the marsh in the immediate vicinity of the discharge.

Although the chemical characteristics of the Escanaba River water were similar at stations 1 and 2, the river sediments downstream of the marsh confluence at station 2 contained higher concentrations of copper, nickel and cyanide. These same metals were found at elevated levels in the Humboldt Pit effluent and in water and sediment samples from selected locations within the marsh.

On June 26, 1990 limnological measurements were made in the Humboldt Pit using the Callahan pontoon boat. Water samples for dissolved metals and other parameters were taken from different depths to evaluate the potential of continued toxic discharges (Table 5). Since chlorophyll levels were below detection and no algal cells were captured using a plankton net, no primary producers or other planktonic life forms probably exist in the pit. Ammonia levels ranged between 9.3 mg/l to 12.0 mg/l with the lowest values existing at the surface. These high concentrations adds support to our contention that this pit is toxic to phytoplankton

since ammonia levels under normal lake conditions would be much reduced. Total nickel, copper, zinc and cyanide concentrations were all well above normal ambient lake metals levels. Metals such as copper have historically been used to control algae problems in lakes, which may explain the sterile conditions.

The pit was thermally stratified at 20 feet but dissolved oxygen levels remained high at all depths sampled (Figure 2). Secchi disc reading taken near the pit center measured 14 feet due to refractive materials in the water column. No evidence currently exists concerning whether seasonal turnover (i.e. spring/fall) occurs in the pit. This event would bring increased heavy metal concentrations to the surface which may be discharged from Outfall 001.

References

Callahan Mining Corporation, 1984. Plan of operation for a proposed project to construct and operate an ore processing plant and tailing disposal facility at the Ropes Gold Project, Marquette County, Michigan. pp.34.

Field Work by: William H. Taft, Aquatic Biologist
Elwin Evans Ph.D., Aquatic Biologist
Ron Raisanen, Environmental Quality Analyst
Steve Casey, Environmental Engineer

Report by: William H. Taft, Aquatic Biologist
Water Quality Appraisal Unit
Great Lakes and Environmental Assessment Section

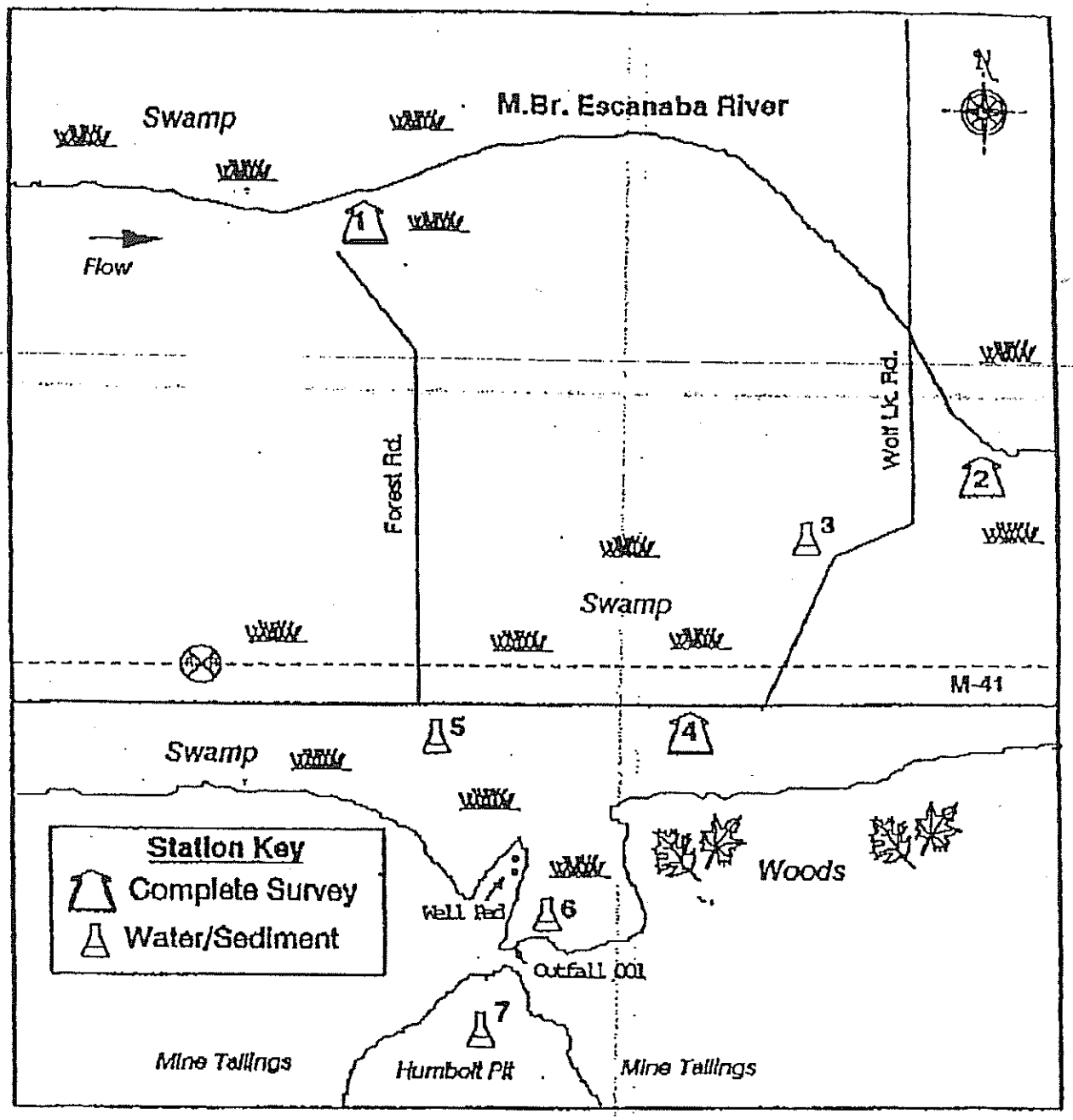


Figure 1. Sampling stations on the Middle Branch Escanaba River and the Humbolt Pit drainage area, June 25-27, 1990, Marquette Co. Michigan.

Table 1A. Qualitative fish sampling results for Middle Branch Escanaba River, including Culvert B, M-41 Marsh as station 4, June 25-26, 1990.

TAXA	STATION 1	STATION 2	STATION 4
Salmonidae (Trout)			
Salvelinus fontinalis (Brook tr.)	2		
Umbridae (Mudminnows)			
Umbra limi (Central mudminnow)	4	14	2
Cyprinidae (Minnows and Carp)			
N. cornutus (Common shiner)	2		
N. heterolepis (Blacknose shiner)			2
P. notatus (Bluntnose minnow)	1		
Rhinichthys atratulus (Blacknose)	22	3	
Cottidae (Sculpins)			
Cottus bairdi (Mottled sculpin)	4	3	
Gasterosteidae (Sticklebacks)			
Culaea inconstans (Brook)			32
TOTAL INDIVIDUALS	35	20	36
NUMBER OF ANOMALIES	0	0	0
SQUARE FOOT SAMPLED	11200	9000	1200
DENSITY OF INDIVIDUALS (#/SF)	0.003	0.002	0.030

Table 1B. Fish metric evaluation of Middle Branch Escanaba River, June 25-26, 1990.*

METRIC	STATION 1 Value	STATION 1 Score	STATION 2 Value	STATION 2 Score
TOTAL NUMBER OF TAXA	6	3	3	3
NUMBER OF DARTER SPECIES	0	1	0	1
NUMBER OF SUNFISH SPECIES	0	1	0	1
NUMBER OF SUCKER SPECIES	0	1	0	1
PERCENT CARP, G.SUNFISH, W.SUCKER	0.0	5	0.0	5
PERCENT OMNIVORES	2.9	5	0.0	5
PERCENT INSECTIVO. CYPRINIDS	5.7	1	0.0	1
PERCENT PISCIVORES	0.0	1	0.0	1
DENSITY OF INDIVIDUALS	0.003	3	0.002	3
PERCENT ANOMALIES	0.0	5	0.0	5
TOTAL SCORE		26		26
FISH COMMUNITY CATEGORY		FAIR (MODERATELY IMPAIRED)		FAIR (MODERATELY IMPAIRED)

* Station 4 is a freshwater cattail marsh. The fish community could not be categorized due to the lack of a suitable ecological reference site in CLEAR Procedure 51.

Table 2A. Qualitative macroinvertebrate sampling results for Middle Branch Escanaba River, including Culvert B, M-41 Marsh as station 4, June 25-26, 1990.

TAXA	STATION 1	STATION 2	STATION 4
ANNELIDA (segmented worms)			
Oligochaeta (worms)		1	
Hirudinea (leeches)	4	2	
ARTHROPODA			
Isopoda (sowbugs)	2		
Amphipoda (scuds)	2	6	
Decapoda (crayfish)	1	3	
Arachnoidea			
Hydracarina			9
Insecta			
Ephemeroptera (mayflies)			
Siphlonuridae		2	
Baetidae	5	19	
Heptageniidae	2	14	
Ephemerellidae		4	
Caenidae	1	1	
Ephemeridae	5	14	
Odonata			
Lestidae			18
Coenagrionidae			1
Aeshnidae	6	3	10
Gomphidae	7	1	
Cordulegastridae	5		
Libellulidae			3
Plecoptera (stoneflies)			
Pteronarcyidae	2	2	
Hemiptera (true bugs)			
Belostomatidae			2
Belostoma		1	
Nepidae			1
Pleidae		1	1
Corixidae		2	10
Notonectidae		1	4
Gerridae		1	2
Hebridae			1
Megaloptera			
Sialis sp.		1	
Trichoptera (caddisflies)			
Hydropsychidae	3	1	
Glossosomatidae	5		
Hydroptilidae		1	
Phryganeidae		1	
Brachycentridae	9		
Limnephilidae	25	4	
Molannidae	2	1	
Helicopsychidae	6		
Leptoceridae	1	1	
Coleoptera (beetles)			
Gyrinidae (adults)	1	1	6
Haliplidae (adults)	1		
Dytiscidae (total)	3	5	19
Hydrophilidae (total)		1	2
Diptera (flies)			
Tipulidae	2	2	
Culicidae			1
Simuliidae	2	21	
Ceratopogonidae	1		1
Chironomidae	11	5	18
Tabanidae	1		
MOLLUSCA			
Gastropoda (snails)			
Somatogyrus		2	
Pelecypoda (clams)			
Sphaerium	12		
TOTAL INDIVIDUALS	129	125	109

Table 28. Macroinvertebrate metric evaluation of Middle Branch Escanaba River, June 25-26, 1990.*

METRIC	STATION 1 Value	STATION 1 Score	STATION 2 Value	STATION 2 Score
TOTAL NUMBER OF TAXA	28	6	32.0	6
NUMBER OF MAYFLY TAXA	4	4	6.0	6
NUMBER OF CADDISFLY TAXA	7	6	6	4
NUMBER OF STONEFLY TAXA	1	4	1	4
PERCENT MAYFLY COMP.	10.1	0	44.3	6
PERCENT CADDISFLY COMP.	39.5	6	4.9	0
PERCENT CONTR. DOM. TAXON	19.4	6	17.2	6
PERCENT ISOPOD, SNAIL, LEECH	4.7	2	3.3	2
PERCENT SURFACE AIR BREATHERS	5.4	4	10.7	4
RATIO EPT:CHIRON.	6.0	0	12.4	2
TOTAL SCORE		38		40
MACROINVERTEBRATE COMMUNITY CATEGORY		GOOD (SLIGHTLY IMPAIRED)		GOOD (SLIGHTLY IMPAIRED)

* Station 4 is a freshwater cattail marsh. The fish community could not be categorized due to the lack of a suitable ecological reference site in QLEAS Procedure 51.

Table 3. Habitat evaluation for Middle Branch Escanaba River, June 25, 1990.

HABITAT METRIC	STATION 1 SCORE	STATION 2 SCORE
Bottom Substrate Available Cover:	16	10
Embeddedness:	16	11
Velocity:Depth:	16	6
Flow Stability:	12	10
Bottom Deposition:	8	6
Pools-Riffles-Runs-Bends:	11	7
Bank Stability:	8	8
Bank Vegetative Stability:	10	10
Streamside Cover:	5	7
TOTAL SCORE	102	75
HABITAT CONDITION CATEGORY	GOOD (SLIGHTLY IMPAIRED)	FAIR (MODERATELY IMPAIRED)
Date:	6-25-90	6-25-90
Stream Type:	Warmwater	Warmwater
Weather:	P. Cloudy	P. Cloudy
Stream Order:	Third	Third
Air Temperature:	84 Deg. F.	79 Deg. F.
Water Temperature:	65 Deg. F.	69 Deg. F.
Ave. Stream Width:	28 Feet	30 Feet
Ave. Stream Depth:	1.3 Feet	2.5 Feet
Surface Velocity:	1 Ft./Sec.	0.5 Ft./Sec.
Estimated Flow:	36.4 CFS	37.5 CFS

Table 4. Chemical characteristics of water samples collected from different depths in the Humboldt Pit (Callahan Mining), June 26, 1990, Marquette Co., Michigan.

Parameter	Units	(HP-1) Surface	(HP-2) 50' Depth	(HP-3) 100' Depth	(HP-4) 150' Depth	(HP-5) 170' Depth	(HP-6) 180' Depth
Silver	ug/l	K 0.5	K 0.5	K 0.5	K 0.5	K 0.5	K 0.5
Alkalinity	mg CaCO3/l	168	182	183	183	181	185
Arsenic	ug/l	3.2	7.8	7.9	7.3	13	14
Calcium	mg/l	51.8	53.8	54.5	53.3	53.9	54.6
Cadmium	ug/l	K 0.2	K 0.2	K 0.2	K 0.2	K 0.2	K 0.2
Chlorophyll a	ug/l	K 1.0	--	--	--	--	--
Chloride	mg/l	33	38	38	38	37	37
Cyanide	ug/l	48	95	167	149	110	113
Amenable Cyanide	ug/l	K 5.0	5.0	46	40	6	15
COD	mg/l	8	9	7	6	16	10
Conductivity	umho/cm	830	904	909	909	912	912
Chromium	ug/l	K 1.0	1.5	1.1	1.2	11.1	9.2
Copper	ug/l	170	320	330	300	270	310
Iron	ug/l	184	59	75	75	4160	4350
Mercury	ug/l	K 0.5	K 0.5	K 0.5	K 0.5	K 0.5	K 0.5
Potassium	mg/l	29.1	32.7	32.9	32.7	32.5	32.7

K = not detected at the given detection level

(continued)

Table 4. continued

Parameter	Units	(HP-1) Surface	(HP-2) 50' Depth	(HP-3) 100' Depth	(HP-4) 150' Depth	(HP-5) 170' Depth	(HP-6) 180' Depth
Hardness	mg/l	260	--	--	--	--	--
Magnesium	mg/l	31.4	33.3	33.1	33.1	34.3	34.3
Sodium	mg/l	42.2	46.8	46.9	46.3	46.1	46.6
Nickel	ug/l	870	1040	1050	1030	970	1010
Nitrate + Nitrite	mg N/l	4.5	4.5	4.4	4.3	5.0	4.2
Ammonia	mg N/l	9.3	11.0	12.0	12.0	11.0	12.0
Kjeldahl Nitrogen	mg N/l	11.0	11.0	12.0	9.4	13.0	16.0
Lead	ug/l	10	9.6	7.5	4.1	23	15
pH	pH	8.18	8.14	8.16	8.15	8.14	8.13
Total Phosphorus	mg P/l	.08	.04	K .01	K .01	.08	.18
Suspended Solids	mg/l	K 4	K 4	K 4	K 4	100	57
Total Dissolved Solids	mg/l	520	540	550	540	560	540
Antimony	ug/l	92	109	105	105	99	98
.lenium	ug/l	1.3	1.1	1.1	1.1	1.0	1.0
Sulfate	mg/l	173	186	185	188	187	189
TOC	mg/l	3.2	3.2	3.2	3.2	3.0	3.1
Zinc	ug/l	129	120	124	108	133	119

K = not detected at the given detection level

Table 5. Chemical characteristics of water samples taken from the Middle Branch Escanaba River and the Humbolt Pit marsh drainage area, June 26, 1990, Marquette Co., Michigan.

Parameter	Units	Station 1	Station 6	Station 4	Station 3	Station 2
Silver	ug/l	K 0.5	K 0.5	K 0.5	K 0.5	K 0.5
Alkalinity	mg CaCO3/l	24	155	119	131	28
Arsenic	ug/l	2.0	1.3	2.1	3.1	1.6
Calcium	ug/l	7.7	49.9	42.7	46	8.4
Cadmium	ug/l	K 0.2	K 0.2	K 0.2	K 0.2	K 0.2
Chloride	mg/l	2	32	27	42	3
Cyanide	mg/l	K .005	0.044	0.025	0.022	K .005
Cobalt	ug/l	K 15	52	27	29	K 15
COD	mg/l	32	6	27	20	34
Conductivity	umho/cm	66	834	640	732	73
Chromium	ug/l	1.7	1.3	1.4	1.4	1.3
Copper	ug/l	2.0	130*	35*	30*	2.3
Iron	ug/l	1800	150	770	880	2000
Hardness	mg/l	28	250	210	220	31
Mercury	ug/l	K .5	K .5	K .5	K .5	K .5
Potassium	mg/l	0.39	28	22.6	22.7	0.63
Lithium	ug/l	K 5.0	K 5.0	K 5.0	K 5.0	K 5.0
Magnesium	mg/l	2.1	30.2	24.5	25.6	2.4
Manganese	ug/l	144	300	65	187	141
Sodium	mg/l	1.3	40	32.4	41.8	2.1
Nickel	ug/l	K 2.0	825*	310*	330*	3.6

(continued)

Table 5. continued

Parameter / Units	Station 1	Station 6	Station 4	Station 3	Station 2
Nitrate + Nitrite mg N/l	0.084	5.2	2.5	2.6	0.110
Ammonia mg N/l	0.030	8.7	0.70	2.9	0.052
Kjeldahl Nitrogen mg N/l	0.63	11.	1.74	3.7	0.55
Lead ug/l	K 1.0	K 1.0	K 1.0	K 1.0	K 1.0
pH pH	7.07	7.85	7.70	7.65	7.02
Total Phosphorus mg P/l	K .001	T .004	0.037	0.025	0.019
Antimony ug/l	K 1.0	88	44	47	K 1
Selenium ug/l	1.1	1.1	K 1.0	K 1.0	K 1.0
Sulfate mg/l	6	173	129	139	8
TOC mg/l	13.0	2.8	8.0	6.9	14.0
Zinc ug/l	K 4.0	40	12.6	13.5	K 4.0

K = not detected at given detection level.
* = exceeds Rule 57 allowable levels for total metals.

Table 7. Qualitative macroinvertebrate sampling results in the immediate vicinity of the Humboldt Pit Outfall 001 and marsh wellpad, July 31, 1990.

Taxa	Station 6 (Outfall 001)	Wellpad
Odonata		
Lestidae	S	A
Aeshnidae		A
Libellulidae		S
Hemiptera		
Gerridae	S	M
Notonectidae	S	A
Megaloptera		
Chauliodes sp.		S
Coleoptera		
Hydrophilidae		S
Diptera		
Chironomidae	S	M
Total No. of Taxa	4	8

S = sparse
M = moderate
A = abundant

Attachment 3
EA's 1995 Supplemental Biological Survey

EA Engineering, Science, and Technology

EA Midwest
444 Lake Cook Road, Suite 18
Deerfield, IL 60015
Telephone: 708-945-8010
Fax: 708-945-0296

31 October 1995
EA Project 13034

Mr. Randy Weimer
Coeur d'Alene Mines
505 Front Ave.
Coeur d'Alene, ID 83816-0316

Dear Randy:

The purpose of this letter is to summarize and discuss the zooplankton, fish, and macroinvertebrate data collected near Humboldt Pit on 15 and 16 August of this year. Sampling methodologies and level of effort were the same as used last year, except that zooplankton were collected only qualitatively this year.

ZOOPLANKTON

Zooplankton were collected on 16 August 1995 at seven locations in Humboldt marsh and two reference marsh locations (refer to EA 1993 for details regarding sampling locations). At all sites, a qualitative sample was collected by making several sweeps with a 0.3m diameter, #25 mesh dip net.

As was the case in 1994, no Daphnia species were collected from Humboldt marsh or the reference marshes (Table 1). Thus, any members of this genus should be excluded if the recalculation procedure is used to generate a site specific water quality criterion. Although no Daphnia were collected, three members of the family Daphnidae were collected, Simocephalus expinosus, Ceriodaphnia sp. and Scapholeberis kingi. Ceriodaphnia sp. was found at two of the five Humboldt marsh locations, but it did not occur at either of the reference locations. S. kingi occurred at 4 of the 7 Humboldt marsh locations and S. expinosus occurred at 6 of the 7 locations. Thus, all three daphnids were either restricted to Humboldt marsh or more common there than in the two reference marshes (Table 1). This is a very positive sign because daphnids are very sensitive to most metals. The presence of members of the family Daphnidae in Humboldt marsh indicates that it is appropriate to include a daphnid in any toxicity database used to derive site specific criterion. Ideally, however, that daphnid should be Ceriodaphnia, not Daphnia magna, D. pulex, or D. pulicaria.

Zooplankton taxa richness at Humboldt marsh locations 5 through 7 ranged from 6 to 11 taxa, while taxa richness at reference marsh Locations 11 and 12 varied from 6 to 9. Fewer taxa (2) were found at Humboldt marsh location 3. This reduction in richness and abundance might have been due to the Humboldt Pit seep. Alternatively, the reduction in taxa richness at

Location 3 may have been an artifact of sampling efficiency. Location 3 was covered by a thick mat of algae making collection of the sample very difficult. Even if the reduction at Location 3 was partially attributable to water from the seep, the area affected is restricted to the area within the beaver dam. Location 6, which receives most of the flow from Humboldt marsh had the second highest taxa richness of any location in Humboldt marsh and higher than at either of the reference marsh locations. Similarly, taxa richness was higher at Station 7 than at either of the reference locations. Thus, the zooplankton results are consistent with previous fish and macroinvertebrate results in that they demonstrate that the area of impact clearly does not extend beyond the beaver dam.

MACROINVERTEBRATES

Macroinvertebrate results are summarized in Tables 2 through 5. The 1995 results are consistent with those seen in 1993 and 1994 and species composition was very similar among the three years. Some observations are:

(1) As was noted in 1993 and 1994, snails were absent from Stations 1-5 in Humboldt marsh, but were present at Stations 6 and 7 in Humboldt marsh and at Reference Stations 11 and 12 (Table 2).

(2) Taxa richness in 1995 was within the range of values seen in 1993 and 1994 except at Station 7, where lower than normal taxa richness was noted (Table 3). The lower richness at Station 7 was probably due to water levels at this station being much lower than in previous years.

(3) As has sometimes been the case, taxa richness was somewhat lower at Stations 1 and 2 than at the other stations in Humboldt marsh and compared to the two reference locations (Table 3).

(4) Any impacts at Stations 1 and 2 are again quite localized as Stations 4 and 6 which receive water from the beaver pond and Station 3 which is within the beaver pond have taxa richness comparable to the reference marshes.

(5) Collections made in the Escanaba River upstream of the confluence with Humboldt marsh (Station 14) and collections downstream of it (Station 15) confirm the lack of impacts to the river. Both locations support similar macroinvertebrate faunas and similar taxa richness (Table 4). As was observed in 1993, macroinvertebrate index scores are similar upstream and downstream of the Humboldt marsh confluence (Table 5).

FISH

Fish results are presented in Tables 6, 7 and 8. These data show the following:

(1) Faunal composition and diversity in 1995 are consistent with values seen in 1993 and 1994.

(2) Species richness varied from three to seven species at all sites except Station 6 where only two species were collected (Table 7). As was the case in October 1993 and last August, catch rates and species richness were lowest at Station 6.

(3) Species richness was higher at stations closest to the seep (i.e., Stations 1-4) than at stations located further away (i.e., Stations 5-7).

Species composition and richness have generally been similar among the five sampling periods (Table 7).

Station	Species Richness
Station 1	3-5 species (except 7 in October 1993)
Station 2	4-5 species (except 2 in June 1993)
Station 3	5-7 species
Station 4	5-7 species
Station 5	5-6 species (except 9 in August 1994 and 3 this year)
Station 7	5-6 species (except 3 this year)
Station 11	3-5 species
Station 12	3-4 species

Variability has been greatest at Station 6 where species richness has varied from 2 to 10 species (Table 5). One factor that probably contributed to the greater variability in 1995 was low water levels in portions of the marsh. The level at Station 7 was the lowest I've seen it and definitely reduced our sampling effectiveness.

Please call if you have any questions.

Sincerely,

Greg

Greg Seegert
Project Manager

Table 1. Zooplankton collected from Humboldt Marsh and two reference marshes on 15 and 16 August 1995.

Taxa	Humboldt Marsh							Reference Marshes	
	1	2	3	4	5	6	7	11	12
COPEPODA									
nauplii	10	5	4	23	12	100	38	15	25
cyclopoid copepodites	2	1		4		8	23	6	6
Cyclops vernalis						2	1		
Eucyclops agilis						1	2		1
Eucylops speratus									3
Macrocyclops albidus						2	1		1
Mesocyclops edax					1				
Tropocyclops prasinus								2	
CLADOCERA									
Alona sp.				1	1	4	2	3	1
Ceriodaphnia sp.[a]						211	8		
Chydorus sphaericus	47	24	12	12	24	3	13	34	11
Ilyocryptus sp.									1
Pleuroxus denticulatus							9	3	
Scapholeberis kingi[a]	1				5	1	5		6
Simocephalus expinosus [a]	4	2		1	2	2	4		
ROTIFERA	126	95	87	140	190	68	209	42	52
Number of Taxa (exclusive of nauplii)	5	4	2	5	6	10	11	6	9

[a] Member of the family Daphnidae.

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Table 2 Results of a qualitative macroinvertebrate survey of Humboldt Marsh (St 1-7) and two reference marshes (St 11 & 12), 15 and 16 August 1995.

	Location									Locations Combined	
	1	2	3	4	5	6	7	11	12	No.	%
Oligochaeta	-	-	4	-	-	-	-	-	-	4	1.2
Hirudinea	-	1	-	-	-	-	-	1	1	3	0.9
Asellus	-	-	-	-	-	-	-	5	-	5	1.5
Caenidae	-	-	-	-	1	-	-	-	-	1	0.3
Coenagrionidae	-	2	3	1	10	-	-	-	-	16	4.8
Aeshnidae	4	7	5	3	4	4	-	-	2	29	8.6
Corduliidae	5	4	1	1	5	15	4	-	-	35	10.4
Libellulidae	7	6	8	21	16	23	8	4	5	98	29.2
Belostomatidae	-	-	-	1	1	1	-	-	1	4	1.2
Corixidae	-	-	-	-	1	2	2	9	1	15	4.5
Notonectidae	-	-	-	-	2	-	-	-	-	2	0.6
Saldidae	-	-	-	-	-	-	-	-	1	1	0.3
Brachycentridae	-	-	-	-	-	-	-	1	-	1	0.3
Phryganeidae	-	-	1	-	-	1	-	-	-	2	0.6
Dytiscidae	-	-	-	-	1	-	1		-	2	0.6
Haliplidae	-	2	4	4	15	2	3	-	-	30	8.9
Hydrophilidae	-	-	1	-	-	-	-	-	1	2	0.6
Chironomidae	4	6	9	7	9	8	2	1	-	46	13.7
Tabanidae	-	-	-	-	-	-	-	1	-	1	0.3
Stratiomyidae	-	-	-	1	-	-	-	-	-	1	0.3
Physidae	-	-	-	-	-	2	1	-	-	3	0.9
Planorbidae	-	-	-	-	-	5	5	3	4	17	5.1
Sphaeriidae	1	-	3	7	1	2	1	-	2	17	5.1
Corbiculidae	-	-	-	-	-	-	-	1	-	1	0.3
TOTAL	21	28	39	46	66	65	27	26	18	336	
TOTAL TAXA	5	7	10	9	12	11	9	9	9		

Table 3 Comparison of macroinvertebrate taxa richness among 1993, 1994, and 1995 in Humboldt marsh and two reference marshes

	Station								
	1	2	3	4	5	6	7	11	12
June 1993	7	5	6	8	9	13	10	9	11
August 1993	4	5	8	9	12	10	12	9	9
October 1993	11	9	8	9	11	14	15	10	10
July/Aug 1994	9	8	11	13	9	14	20	11	14
August 1995	5	7	10	9	12	11	9	9	9

Table 4. Results of qualitative macroinvertebrate collections from two locations on Middle Branch Escanaba River, 15 August 1995.

Taxa	Location 13 No.	Location 14 No.
Oligochaeta	1	–
Glossiphoniidae	1	–
Erpobdellidae	4	1
Asellus	4	2
Talitridae	7	–
Astacidae	3	13
Baetidae	3	1
Metretopidae	1	1
Heptageniidae	7	2
Siphlonuridae	–	1
Ephemerellidae	3	–
Ephemeridae	–	7
Aeshnidae	3	–
Cordulegaster	–	2
Gomphidae	6	2
Libellulidae	–	1
Calopterygidae	2	6
Pteronarcyidae	1	–
Notonectidae	–	1
Corixidae	6	2
Sialis	3	–
Polycentropodidae	3	–
Hydropsychidae	4	1
Molannidae	–	3
Polycentropodidae	–	1
Psychomyiidae	–	1
Phryganeidae	1	1
Dytiscidae	4	2
Gyrinidae	1	–
Haliplidae	–	3
Chironomidae	5	2
Simuliidae	6	5
Tipulidae	–	1
Tabanidae	1	2
Physidae	1	1
Corbiculidae	–	2
TOTAL	81	67
TOTAL TAXA	25	27

Table 5. Macroinvertebrate metric evaluation for two stations on the Middle Branch Escanaba River sampled in 1993 and on 15 August 1995

	Station 14				Station 15			
	1993			1995	1993			1995
	June	Aug	Oct	Aug	June	Aug	Oct	Aug
Total taxa	27(6)	34(6)	37(6)	25(6)	24(4)	33(6)	27(6)	27(6)
No. of mayfly taxa	4(4)	5(6)	7(6)	4(4)	4(4)	5(6)	5(6)	5(6)
No. of caddisfly taxa	6(6)	5(4)	7(6)	3(2)	3(2)	4(4)	3(2)	5(4)
No. of stonefly taxa	0(0)	4(6)	5(6)	1(4)	0(0)	2(6)	1(4)	0(0)
% mayflies	6.4(0)	16.3(0)	18.5(0)	15.4(0)	16.7(0)	11.2(0)	20.6(0)	17.6(0)
% caddisflies	14.5(2)	10.1(2)	6.3(0)	8.8(0)	15.1(4)	6.3(0)	3.0(0)	11.8(0)
% Dominant taxa	22.1(4)	27.9(4)	18.5(6)	12.1(6)	17.5(6)	15.1(6)	20.6(4)	19.1(6)
% Isopods, snails, leeches	9.9(0)	8.0(0)	26.6(0)	10.9(0)	9.5(0)	17.1(0)	10.6(0)	5.9(0)
% Surface dependent	1.1(6)	1.3(6)	9.4(4)	11.0(4)	5.5(4)	10.7(4)	15.3(4)	7.4(4)
	28	36	34	26	24	32	24	26
	fair	good	good	fair	fair	good	fair	fair

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Table 6 Fishes collected in Humboldt marsh and two reference marshes, 15 August 1995.

Species	Station: Humboldt March 1	2	3	4	5	6	7	Reference Stations 11	12	No. of Locations Species Collected
Northern pike					2	4				2
Central mudminnow	33	15	68	102	30	39	25	17	142	9
Pearl dace								6		1
Brassy minnow									2	1
Northern redbelly dace	1		20	5			1	10	34	6
Finescale dace	9	8	5	10			15	15	77	7
Fathead minnow	1	3	22	35				3	1	6
Creek chub								7	1	2
White sucker								6	11	2
Brook stickleback	2	1	2	9						4
Iowa darter		1			1					2
Total Species	5	5	5	5	3	2	3	7	7	

Table 7 Number of fish species collected at each sampling location in 1993, 1994, and 1995.

Station/Location		1993 June	1993 August	1993 October	1994 August	1995 August
1	Near Seep	3	4	7	4	5
2	Well pad	2	4	5	5	5
3	Beaver lodge	7	7	6	5	5
4	Downstream of beaver dam	6	7	5	6	5
5	N of Rt 41	5	6	6	9	3
6	Middle Rt 41 culvert	10	7	3	3	2
7	(R) *Edison foundation	5	6	6	5	3
11	(R) L. Michigamme marsh	3	5	5	5	7
12	(R) Black duck marsh	4	4	3	3	7

* R = Reference Location

Table 8. Fishes collected from the Middle Branch of the Escanaba River upstream and downstream of Humboldt Marsh.

Species	Upstream		Downstream	
	Aug 93	Aug 95	Aug 93	Aug 95
Brook trout	3	1	2	
Central mudminnow	11	12	2	16
Northern pike	1	6	3	2
Blacknose dace	19	6	5	2
White sucker	2	2		2
Pumpkinseed	1			
Mottled sculpin	39	10	17	14
Total Fish	76	37	29	36
Total Species	7	6	5	5
IBI Score	30	30	28	30

D-2

Humboldt Mill Aquatic Survey Report 2006

Humboldt Mill Aquatic Survey Report

April 5, 2007

Prepared for:
Foth Infrastructure & Environment, LLC
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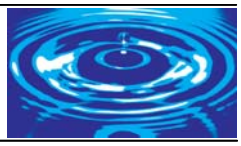

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1.0 EXECUTIVE SUMMARY

Advanced Ecological Management (AEM) conducted an environmental baseline aquatics survey in June, 2006 at the Humboldt Mill site for Kennecott Eagle Minerals Company (KEMC) under contract to Foth Infrastructure & Environment. The Humboldt Mill site is located in Upper Michigan, Marquette County as shown on Figure 1-1, Exhibit A. KEMC may conduct commercial activities at the site in the future. An aquatics survey at three stream stations included fish, macroinvertebrate, and habitat community ratings according to the metrics outlined in the Great Lakes and Environmental Assessment Section (GLEAS) Procedure Number 51 (P-51), a survey protocol for wadable streams and rivers. Additional aquatics surveys at nearby Lake Lory and an adjacent heron rookery pond were also conducted. Stream station and lake sampling survey locations are shown on Figure 1-2 and 1-3, Exhibit A respectively.

A summary of the fish, macroinvertebrate, and habitat ratings for the three stream stations are summarized in the table below. Station 1, located on an unnamed tributary of the Black River, has poor quality ratings for the fish and macroinvertebrate communities according to the P-51 protocol. Low dissolved oxygen within this station may contribute to poor ratings for these indicators. The stream habitat within Station 1 was rated as excellent.

	Station 1	**Station 2**	**Station 3**
Fish Community	Poor	Poor	Poor
Macroinvertebrate Community	Poor	Acceptable	Acceptable
Stream Habitat	Excellent	Excellent	Excellent

Station 2, also located on the unnamed tributary of the Black River, was rated as a poor fish community and an acceptable macroinvertebrate community according to the P-51 protocol. Aquatic habitat within Station 2 was rated as excellent.

Station 3, located on the Middle Branch of the Escanaba River, scored identically to Station 2. The fish community was rated as poor because less than 50 fish were collected, the macroinvertebrate community was rated as acceptable, and the habitat was rated as excellent.

No threatened or endangered species of fish or macroinvertebrates were observed within the three stream sample stations.

The fish community in Lake Lory was predominantly comprised of warm water species such as bluegill, largemouth bass, smallmouth bass, and black crappie. The fish community in the heron rookery pond was predominantly minnows, which provide a food supply for the nesting blue herons. No threatened and endangered fish species were observed in Lake Lory or the Heron Rookery Pond.

2.0 INTRODUCTION

Kennecott Eagle Minerals Company (KEMC) is investigating the Humboldt Mill in anticipation of using the mill to process ore from the proposed Eagle Mine site in northern Marquette County. This aquatics survey was conducted by Advanced Ecological Management, LLC (AEM) in June, 2006 to provide a description of the aquatic communities in the waters surrounding the Humboldt Mill. The objectives of this survey were to provide a general characterization of the aquatic communities and record any threatened and endangered aquatic species encountered. This site-specific survey as well as background information, provides data meeting the requirements of R 425.202 (2)(y) of Michigan's Natural Resources and Environmental Protection Act 451 of 1994 as amended Part 632. Evaluations of fish, macroinvertebrates, and aquatic habitat were conducted as part of this survey.

3.0 STUDY SITE

The Humboldt Mill property is a former iron ore mine and ore processing facility located in Humboldt, Michigan. The mill property and study area are located in Sections 1, 10, 11, 12, 13, 14, and 15 of Humboldt Township (Township 47 North, Range 29 West), south of Highway 41 and east of County Road 95 in Marquette County, Michigan (Figure 1-1, Exhibit A). The aquatic investigations conducted by AEM included a survey of the Middle Branch of the Escanaba River, located north of the mill property, streams in the vicinity of the mill, which are tributary to the Black River, Lake Lory, and a man-made pond located north of Lake Lory that functions as a heron rookery (herein referred to as the heron rookery pond). The survey locations are illustrated in Figures 1-2 and 1-3, Exhibit A. An additional water body appears on Figure 1-3 on the northeast side of Lake Lory between the heron rookery pond and Lake Lory. This is a wetland that generally has water present throughout the year and is hydraulically connected to Lake Lory. The habitat is represented by the sampling performed in Lake Lory.

Altogether, the sampling included stations in three stream locations, one lake, and one man-made impoundment (Heron Rookery Pond). The sampling stations were chosen based on their proximity to the processing facility, their ability to provide representative habitat and biological diversity, and their ability to be potentially impacted by the project. Table 3-1, Exhibit B provides a summary of the location information for the three stream sampling stations. Depiction of the sampling locations for the stream stations, Lake Lory and the heron rookery pond appear on Figures 1-2 and 1-3, Exhibit A.

The following is a description of individual sampling stations.

Station 1: Station 1 is located on an unnamed tributary of the Black River that flows south from a former iron-ore tailings basin (Figure 1-2). The upper end of Station 1 is located approximately 30 feet downstream from an unnamed east-west road that connects to County Road 601, and continues downstream (south) 100 feet. The station location was selected downstream of the road crossing to minimize the influence of beaver impoundments that are located upstream of the road crossing. Station 1 is a low gradient reach located downstream of numerous beaver impoundments and empties into another unnamed tributary of the Black River that flows from the outlet of Lake Lory.

The average width of Station 1 was 4.0 feet with an average depth of 3.6 feet. The substrate was predominantly comprised of organic matter, silt, and woody debris. The predominant riparian vegetation consisted of tussock sedge (*Carex stricta*). Woody shrubs such as sweet gale (*Myrica gale*), speckled alder (*Alnus rugosa*), and sandbar willow (*Salix exigua*) were also observed along the stream bank within the station (Photograph C-1, Exhibit C).

Station 2: The upstream extent of Station 2 is located approximately 80 feet downstream of the outlet of Lake Lory (Figure 1-2 Exhibit A). Station 2, which is located on a tributary to the Black River, is approximately 150 feet long and flows in a southwest direction at this location.

The average width of Station 2 was 16.7 feet with an average depth of 2.2 feet. The substrate was predominantly comprised of organic matter, silt, and woody debris. Much of the woody debris within Station 2 presumably occurred from beaver activity and displayed evidence of gnawing, or chewed markings. Similar to Station 1, the predominant riparian vegetation consisted of tussock sedge. Woody shrubs such as sweet gale and speckled alder were also observed along the stream bank within the station (Photographs C-2 and C-3, Exhibit C). Burreed (*Sparganium* sp.), spatterdock (*Nuphar luteum*), and rushes (*Juncus* sp.) were observed within the stream channel.

Station 3: Station 3 is located on the Middle Branch of the Escanaba River north of the Humboldt Mill. The upstream extent of the station is located approximately 85 feet downstream

(east) of the Wolf Road crossing (Figure 1-2, Exhibit A). Station 3 is approximately 300 feet long and the stream flows in a southeast direction at this location.

The average width of Station 3 was 35.6 feet with an average depth of 2.1 feet. The substrate was predominantly comprised of gravel, silt, and sand particles, and organic matter. The predominant riparian vegetation within Station 3 consisted of tussock sedge and speckled alder (Photograph C-4, Exhibit C). A submerged pondweed (*Potamogeton* sp.) was abundant throughout the stream channel.

Lake Lory: Lake Lory is approximately 128 acres in size and is located approximately 1.3 miles south of Highway 41 and approximately 1.9 miles east of County Road 95 (Figure 1-2, Exhibit A). Lake Lory drains to the south and east into an unnamed tributary of the Black River along its southwestern boundary where an earthen berm controls the hydrology of the lake. Ponds located along the northern boundary of the lake drain to the lake and historically functioned as tailings basins for the former iron ore mine. Photographs C-5 and C-6, Exhibit C show views of the lake.

Heron Rookery Pond: The man-made water body containing the blue heron nesting habitat (rookery) is located north of Lake Lory and is approximately 15 acres in size (Figures 1-2 and 1-3, Exhibit A). The heron rookery pond, approximately ¾ miles southeast of the processing facility, was formerly used as a tailings basin for iron ore processing. The hydrology of the pond is controlled by an earthen berm and culvert that are located along the southern boundary. Flooded timbers, located throughout the pond, provide nesting habitat for the great blue herons (Photograph C-7, Exhibit C).

Table 3-1 provides a summary of the location information for the three stream sampling stations identified above. Depiction of the sampling locations for Lake Lory and the Heron Rookery Pond appear on Figure 1-3.

4.0 METHODS

To characterize the quality of the streams within the vicinity of the mill, flowing water bodies were sampled according to the Michigan Department of Environmental Quality's Surface Water Quality Division Great Lakes and Environmental Assessment Section (GLEAS) *Procedure #51 Survey Protocols for Wadable Rivers* (MDEQ 2002). The GLEAS Procedure 51 (P-51) is a rapid bioassessment protocol that is used to evaluate stream quality based on fish, macroinvertebrates, and stream habitat characteristics.

Surface waters were sampled to characterize the fish communities and to provide a general characterization of the surface-water aquatic habitat. Lake Lory and the heron rookery pond (Figures 1-2, 1-3, Exhibit A;) were sampled using a variety of aquatic sampling methods.

4.1 Fish Collection

A backpack electroshocker was used in narrow (approximately ≤15 feet) or difficult-to-access stations (e.g., areas with abundant woody debris). A barge-mounted electroshocker was used to sample Station 3, which is deep and wide enough to permit the passage of the barge unit. On all stations, one pass was conducted in an upstream direction and the duration of electroshocking charge time was recorded for each pass. Stunned fish were placed in a live well for identification and enumeration. Following collection and fish identification, the enumerated fish were released within each station.

If the stream fish data were analyzed according to the P-51 metrics to produce a "fish score," that score could be used to rate the fish community as poor, neutral (acceptable), or excellent quality. There are ten metrics used to evaluate the fish community diversity. The score for each metric can range from –1 to +1 and are described as follows:

- -1 indicates the community is performing outside of (minus) two standard deviations from the average conditions found at excellent sites;
- 0 indicates the community is performing between the average condition and (minus) two standard deviations from the average condition found at excellent sites, and;
- +1 indicates the community is performing better than the average condition found at excellent sites.

The criteria for classifying a site as excellent, acceptable, or poor were predetermined and are listed in the P-51 methodology (Creel et al. 1998). The summation of the fish scores can range from –10 to +10 using these metrics. Streams that score from +5 to +10 are considered excellent. Stations that score from -5 to –10 are considered poor, while streams that score from -5 to +5 (including zero) are considered acceptable in fish community diversity (Creel et al. 1998).

The lake and pond sites are not classified for fish using the P-51 procedure. Because fish collection gear is not equally selective among sizes and species of fish, a combination of sampling gear, including a boom shocker, a backpack shocker, experimental gill nets, hoop nets, and a seine, were used to capture fish in Lake Lory and the Heron Rookery Pond. The gear and sample locations within Lake Lory were selected to provide a broad sampling coverage of aquatic habitat, and to minimize the bias created by gear selectivity and avoidance by fish.

The Heron Rookery Pond located to the north of Lake Lory functions as nesting habitat for great blue herons (*Ardea herodias*), which were nesting at the time of aquatic sampling. To minimize disturbance to these nesting birds, aquatic sampling was conducted along the south shoreline of the water body using a backpack electroshocker and a seine.

A seine measuring 6-feet wide by 50-feet long with a 0.19-inch mesh was fished in shallow areas around the south shoreline of the surface water body located north of Lake Lory. The typical seine haul procedure was to hold one end of the seine on shore and haul the free end in a 90° arc to the shore.

A boat-mounted shocking unit and generator (boom shocker) were used to collect fish in shallow water, near-shore areas of Lake Lory (Figure 1-3, Exhibit A). Pulsed direct current was used during the survey to minimize trauma to the fish. Electroshocking duration was automatically recorded as the total seconds of electricity that was discharged from the boom shocker in each transect. Boom shocking was conducted at night, which is more effective than shocking during daylight hours (Smith-Root 2005).

An experimental gill net is constructed from net panels of varying mesh sizes. Each experimental monofilament gill net consisted of five 6 by 25-foot panels ranging from 1.5- to 6-inch stretch mesh and was deployed along the bottom in various locations throughout Lake Lory

(Figure 1-3, Exhibit A,). The gill nets were set overnight throughout Lake Lory and were fished for approximately 12 hours.

Hoop nets were placed throughout Lake Lory (Figure 1-3, Exhibit A). Hoop nets were constructed of two-inch stretch mesh and the hoop diameter measured four feet with a 50-foot long center lead, and two 6- by 25-foot wing leads. The hoop nets were fished overnight for approximately 12 hours.

Catch-per-unit-effort (CPUE) is used as an index of fish abundance. Fish sampling efforts were standardized to units consistent with the Michigan Department of Natural Resources sampling protocol (Schneider et al. 2000). CPUE for the following gear was estimated as follows:

$$\text{CPUE} = \frac{N}{t}$$

Where,

N = number of fish caught

t = sample duration in hours (boom shocker)

t = sample duration in net nights (experimental gill net)

t = sample duration in net nights (hoop net)

t = one seine haul. (seine)

As part of the enumeration process, the species, length, weight, and number of fish captured were recorded. One representative of each species that was not identifiable in the field was placed in a voucher jar containing 10% formalin for later identification. Each voucher jar was labeled according to the sample location and date. Fish were identified to species using various taxonomic references (Eddy and Underhill 1978; Becker 1983; Page and Burr 1991; Coon 2001; Pflieger 1997). The Michigan County Element List (MNFI, 2006) was reviewed to determine if any threatened, endangered, or special concern aquatic species occurred within the vicinity of the project.

4.2 Macroinvertebrates

Macroinvertebrate sampling was conducted within the stream stations. Upon completion of fish sampling, aquatic macroinvertebrates, including mussels and decapods (crayfish), were collected within each station using D-framed kick-nets (Merritt et al. 1996). Stations were sampled for 30 minutes using two kick nets (total sample time = 1 hour) and samples were collected in all habitat types within each station to characterize the macroinvertebrate community. Collected specimens were stored in 500 ml plastic wide-mouth jars containing 70% ethanol, and were identified using various taxonomic references (Merritt and Cummins 1996; Pennak 1990; Peckarsky et al. 1990; Cummings and Mayer 1992).

The macroinvertebrate data were analyzed according to nine metrics identified in the P-51 methodology. The sum of the macroinvertebrate scores can range from –9 to +9; and like the fish community, are graded as excellent, acceptable (slightly impaired), or poor according to the summation of the metric scores.

4.3 Stream Habitat Evaluation

Riparian and instream habitats were qualitatively described for each station. A description of stream morphology included run/riffle/pool/shallow pool configurations, substrate, substrate embeddedness, instream cover, vegetation, flow stability, and bank stability. Stream habitat was rated as excellent, good, marginal, or poor based on P-51 scores interpreted from 10 habitat metrics. Habitat was rated according to the following P-51 habitat scores (MDEQ 2002):

Habitat Characterization	Total Point Score
1. Excellent	> 154
2. Good	105 – 154
3. Marginal	56 – 104
4. Poor	< 56

Photographs were taken at each station to illustrate the conditions during the sampling period. Water temperature, pH, dissolved oxygen, and conductivity were measured as part of the stream habitat evaluation. These water quality parameters were measured using a Yellow Springs Instrument Model YSI 556 water quality meter.

5.0 RESULTS AND DISCUSSION

All of the aquatic sampling of the Humboldt Mill was conducted from 7 June 2006 through 12 June 2006. Sampling of the Middle Branch of the Escanaba River (Station 3) was conducted on 12 June 2006. The sampling of Lake Lory and the pond to the north was conducted from 7 June 2006 through 9 June 2006. Station 1 and Station 2 were sampled on 10 June 2006.

5.1 Streams

All streams sampled within the project vicinity are located in a region that is classified as a Northern Lakes and Forests ecoregion (Creel et al. 1998). Therefore, all P-51 scoring was based on metrics that relied on typical data from this ecoregion.

5.1.1 Station 1

A total of nine fish were collected in Station 1 including six central mudminnows (*Umbra limi*), two blacknose dace (*Rhinichthys atratulus*), and one creek chub (*Semotilus atromaculatus*:, Table 5-1, Exhibit B). The CPUE estimate was 3.9 fish/minute of backpack electroshocking for the reach. Because fewer than 50 fish were collected from Station 1, the site was considered "poor" quality with respect to fish (MDEQ 2002). No threatened, endangered, or special concern fish species were observed in Station 1.

A total of 20 macroinvertebrates were collected from Station 1 where clams, snails, and midge larvae (Chironomidae) were the most frequently observed organisms within the station (Table 5-2, Exhibit B). The macroinvertebrate community was rated as "poor" (Table 5-3, Exhibit B). No threatened, endangered, or special concern macroinvertebrate species were observed in Station 1.

Station 1 was classified as a glide/pool habitat based on use of the P-51 protocol. The habitat was rated as "excellent" based on the total habitat metric score according to the P-51 protocol (Table 5-4, Exhibit B). However, dissolved oxygen was low (3.5 mg O_2/L, Table 5-5, Exhibit B), and may degrade the ability of the aquatic habitat to support a diversity and abundance of aquatic biota. The low dissolved oxygen may account for the low number of macroinvertebrates that were collected and the few fish that were observed within Station 1. The conductivity was the highest among all locations sampled for this survey at 124 microSiemens per cm (µS/cm).

5.1.2 Station 2

A total of 17 fish were observed in Station 2. Northern redbelly dace (*Phoxinus eos*), central mudminnows, and creek chubs were the most abundant fish within this station (Table 5-1, Exhibit B). The CPUE estimate was 4.0 fish/minute of backpack electroshocking within the reach. Because fewer than 50 fish were collected from Station 2, the site was considered a "poor" quality fish community. No threatened, endangered, or special concern fish species were observed in Station 2.

A total of 78 macroinvertebrates were collected from Station 2. Dipterans, Trichopterans (caddis flies), and Ephemeropterans (mayflies) were the most frequently observed organisms (Table 5-2, Exhibit B). The total score for the macroinvertebrate metrics was -3 and the macroinvertebrate community was rated as "acceptable" (Table 5-3, Exhibit B). No threatened, endangered, or special concern macroinvertebrate species were observed in Station 2.

Station 2 was classified as a glide/pool habitat based on use of the P-51 protocol. The habitat was rated as "excellent" according to the P-51 total habitat metric score (Table 5-4, Exhibit B).

Water temperature within Station 2 was the warmest observed temperature (19.7 °C) among the stream sample stations (Table 5-5, Exhibit B). This is not surprising since Station 2 is downstream of Lake Lory. The conductivity was lower within Station 2 (65 µS/cm) than was observed within Station 1, but dissolved oxygen was much higher (6.98 mg O_2/L), which may account for a higher number of fish and macroinvertebrates than were observed in Station 1.

5.1.3 Station 3

Station 3 was sampled using a barge-mounted electroshocker where a total of 35 fish representing 10 taxa were observed. Common shiners (*Luxilus cornutus*) and northern redbelly dace were the most frequently observed fish (Table 5-1, Exhibit B). The CPUE estimate for Station 3 was 1.8 fish/minute of barge electroshocking. Because fewer than 50 fish were collected from Station 3, the site was considered a "poor" quality fish community. No threatened, endangered, or special concern fish species were observed in Station 3.

A total of 101 macroinvertebrates were collected from Station 3. Mayflies, caddis flies, and Dipterans were the most frequently observed organisms (Table 5-2, Exhibit B). The total score for the macroinvertebrate metrics was 1 and the macroinvertebrate community was rated as

"acceptable" (Table 5-3, Exhibit B). No threatened, endangered, or special concern macroinvertebrate species were observed in Station 3.

Station 3 was evaluated as a glide/pool habitat according to the P-51 protocol. The habitat was rated as "excellent" based on the P-51 total habitat metric score (Table 5-4, Exhibit B).

5.2 Lake Lory and Pond

5.2.1 Lake Lory

Three hoop nets were fished in nearshore areas throughout the lake, two days each, for approximately 12 hours of soak time each day (Figure 1-3, Exhibit A). The hoop nets were fished from 7 June 2006 through 9 June 2006. The hoop nets were typically set late in the day (approximately 22:00) and were checked the next day for fish at approximately 12:00.

Three experimental gill nets were fished in three locations throughout the lake for approximately 12 hours of soak time for each net (Figure 1-3, Exhibit A). Two experimental gill nets were placed in the lake on 7 June 2006 at approximately 24:00 and were removed from the lake on 8 June 2006 at approximately 12:00 the next day. The third gill net was placed in the lake on 8 June at approximately 24:00 and was removed at 11:46 the next day.

Boom shocking was conducted along 5 transects that were situated parallel to the shoreline (Figure 1-3, Exhibit A). The transect length ranged from a minimum of 257 feet to a maximum of 483 feet.

A total of 194 fish were collected from Lake Lory including seven different taxa (Table 5-6, Exhibit B). Bluegills (*Lepomis macrochirus*) were the most frequently observed species followed by yellow perch (*Perca flavescens*) and black crappie (*Pomoxis nigromaculatus*) among all sample gear. No threatened, endangered, or special concern fish species were observed in Lake Lory.

Most of the fish were collected using the boom shocker (Table 5-6, Exhibit B). The average total CPUE for the boom shocker was 189 fish per hour and varied among transects.

The total CPUE varied by location among all hoop net locations, and ranged from a minimum of 1 fish per net night for hoop net 1, to a maximum of 26 fish per net night in hoop net 3. The gill nets were the most effective means for capturing yellow perch. The total number of fish captured in gill nets ranged from zero fish in gill net 2, to nine fish in gill nets 1 and 3.

The average length and weight of fish is presented in Table 5-7, Exhibit B. The average length of bluegills, which were the most abundant fish in Lake Lory, was 6.5 inches (s = 1.3 inches), and the average weight of bluegills was 0.2 pounds (s = 0.1 pounds). Only two suckers were weighed because the others collected escaped before weighing. A standard deviation could not be calculated and two sample points did not provide a sufficient sample size to determine an average weight.

Many fish collected in Lake Lory appeared in good condition. However, black spot, which is caused by a parasite (larval trematode) that burrows into the skin of the fish, was frequently observed in the bluegills, black crappie, largemouth bass, smallmouth bass, and yellow perch.

Floating, submerged, and emergent aquatic vegetation were observed in patches along the shoreline of Lake Lory. Burreed, floating pondweed (*Potamogeton natans*), bigleaf pondweed (*Potamogeton amplifolius*), rushes, and water-starwort (*Callitriche* sp.) were the predominant species of aquatic vegetation that were observed along the shoreline (Photographs C-5, C-6, Exhibit C). Large woody debris in the form of downed trees and submerged standing timber contributed to the aquatic habitat of Lake Lory.

Water temperature, pH, dissolved oxygen, and conductivity were measured on the surface of Lake Lory near the western shoreline on 8 June 2006. The surface water temperature (22 °C) was slightly warmer than the water temperature that was measured in Station 2 at the outlet of Lake Lory on 10 June 2006 (Table 5-5, Exhibit B). The conductivity of Lake Lory was low (68 µS/cm), but was consistent with most of the other sites sampled as part of this survey. Dissolved oxygen on the surface was 8.1 mg O_2/L and pH was close to neutral at 7.4 (Table 5-5, Exhibit B).

5.2.2 Heron Rookery Pond

The heron rookery pond was sampled for fish using a backpack shocker. Attempts were made to sample the water body using a seine, however, abundant aquatic vegetation and woody debris did not permit the successful use of this sampling gear.

A total of 39 fish were collected from the pond (Table 5-8, Exhibit B). Most of the fish collected from the pond were minnows, including emerald shiners (*Notropis atherinoides*), northern redbelly dace, and bluntnose minnows (*Pimephales notatus*). The minnows likely serve as an important food source for the nesting blue herons. No threatened, endangered, or special concern fish species were observed in the pond.

In addition to the standing timber, aquatic vegetation was abundant along the south shoreline and appeared to be abundant throughout the pond. Common elodea (*Elodea canadensis*) was the predominant submerged aquatic vegetation. Common cattails (*Typha latifolia*) were abundant along the southwest shoreline, and spadderdock and arrowhead (*Saggitaria* sp.) were observed along the shoreline.

The warmest water temperature observed during the survey was recorded in the pond at 25 °C (Table 5-5, Exhibit B). Conductivity was low (87 µS/cm), and dissolved oxygen was the highest level observed during this survey (10.2 mg O_2/L).

6.0 REFERENCES

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EXHIBIT A

REPORT FIGURES

Baraga

Michigamme Twp

Champion Twp

Powell Twp

Ishpeming Twp

Marquette Twp

Negaunee Twp

Ely Twp

Van Riper State Park

Marquette

Champion Mine Site

Ropes Mine Site

~24 Miles

US 41

Marquette

Lake Superior

Ishpeming

Negaunee

Humboldt Mill
Project Location

US 95

CR 601

Republic Twp

Sands Twp

Chocolay Twp

Tilden Mine Site

Empire Mine Site

Tilden Twp

Richmond Twp

Humboldt Twp

West Branch Twp

Skandia Twp

NOTES

1. Horizontal datum based on NAD 83/94.
   Horizontal coordinates based on UTM Zone 16.
2. All base information downloaded from Michigan Center of Geographic Information (http://www.michigan.gov/cgi).
3. Site Location - Project Site within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.

LEGEND

- Counties
- Minor Civil Divisions
- Lakes and Rivers
- KEMC Project Location
- Highways
- Major Roads
- Minor Roads
- Railroads

N

ADVANCED ECOLOGICAL MANAGEMENT

Foth Infrastructure & Environment, LLC

Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	AKM	DATE: APR. '07	
APPROVED BY:	SVD1	DATE: APR. '07	
APPROVED BY:		DATE:	

Kennecott Eagle Minerals

FIGURE 1-1

HUMBOLDT MILL PROJECT
PROJECT LOCATION

Scale: 0 1.5 3 Miles

Date: APRIL 2007

Prepared by: DAT

Project No: 06W003

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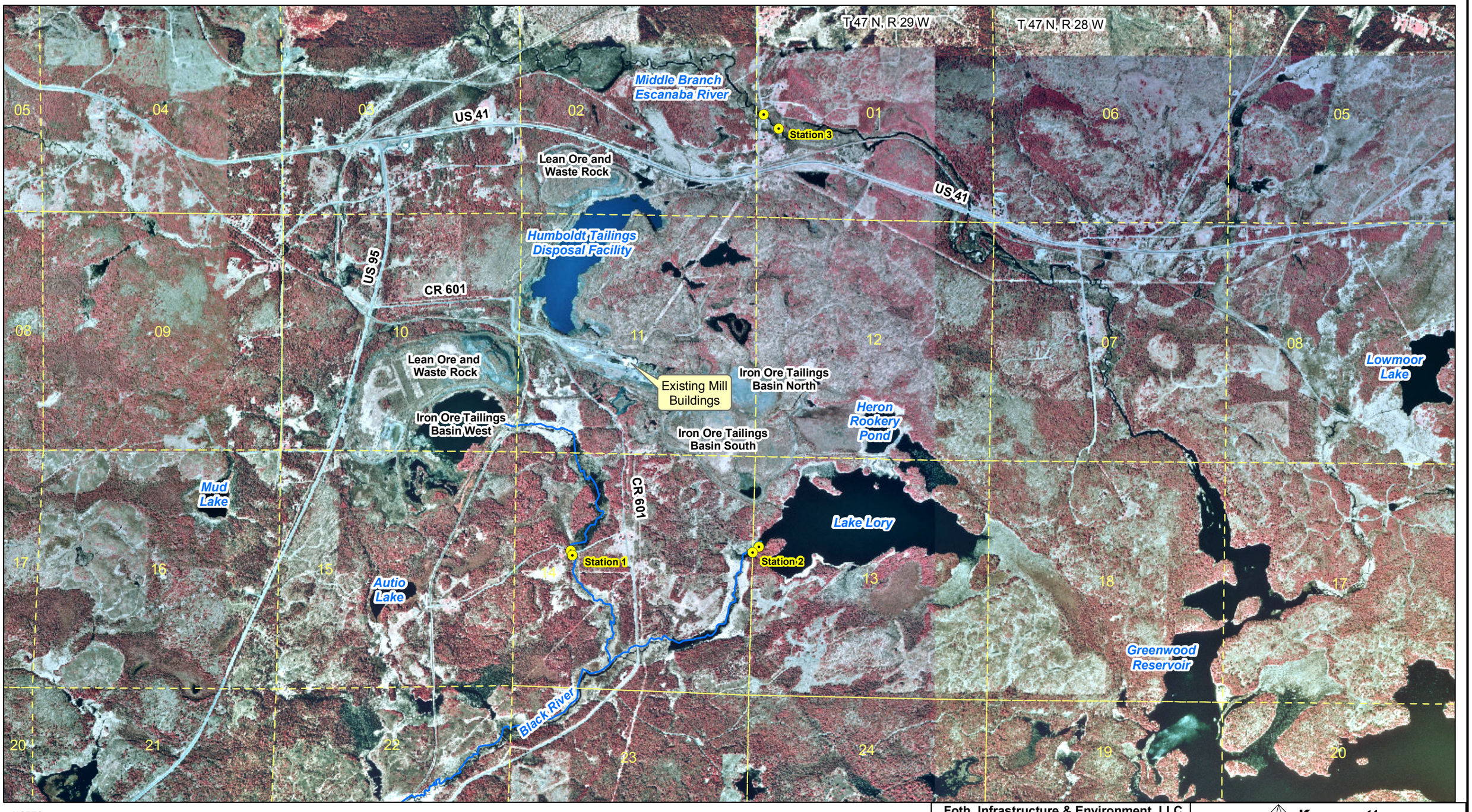


NOTES

1. Base Information, USGS georeferenced Digital Raster Graphics (DRG) and 1998 Digital Orthophoto Quads are from Michigan Center of Geographic Information (http://www.michigan.gov/cgi/)
2. Horizontal datum based on NAD 83/94. Horizontal coordinates based on UTM Zone 16.
3. Site Location - Project Site within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.

LEGEND

- PLSS Sections
- Sample Location Extents (upstream and downstream)

N

ADVANCED ECOLOGICAL MANAGEMENT

Foth Infrastructure & Environment, LLC

M:\06w003\mxd\AEM\kmc_humboldt_StreamSample_Fig1-2_11x17.mxd October 23, 2007

Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	AKM	DATE: APR. '07
APPROVED BY:	SVD1	DATE: APR. '07
APPROVED BY:		DATE:

Kennecott
Eagle Minerals

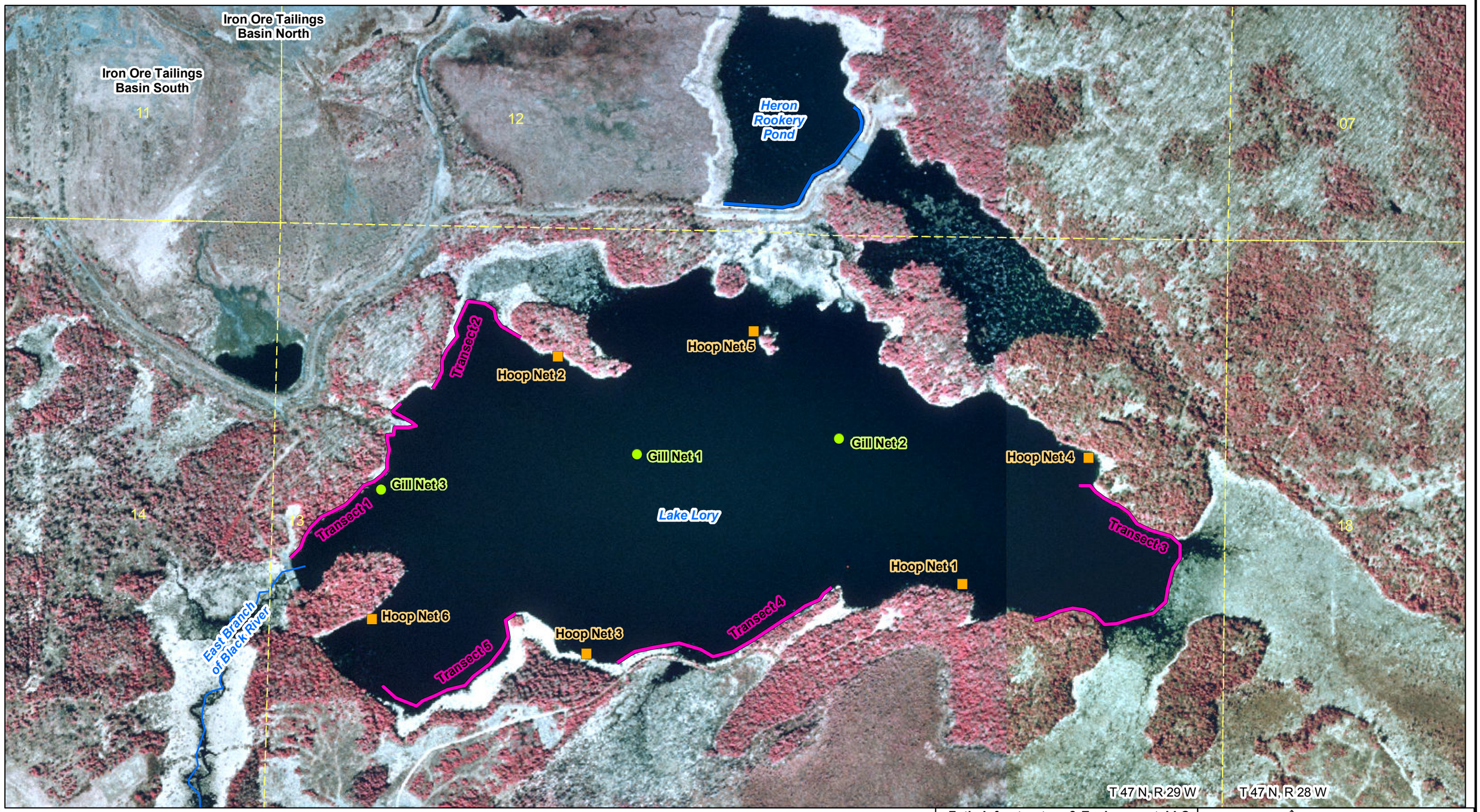
FIGURE 1-2
HUMBOLDT MILL PROJECT
STREAM SAMPLE LOCATIONS

Scale: 0 1,000 2,000 Feet

Date: APRIL 2007

Prepared by: DAT

Project No: 06W003



NOTES

1. Base Information, USGS georeferenced Digital Raster Graphics (DRG) and 1998 Digital Orthophoto Quads are from Michigan Center of Geographic Information (http://www.michigan.gov/cgi/)
2. Horizontal datum based on NAD 83/94. Horizontal coordinates based on UTM Zone 16.
3. Site Location - Project Site within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.

LEGEND

- PLSS Sections
- Hoop Net Locations
- Gill Net Locations
- Backpack Shocker Transect
- Boom Shocker Transect

N

Advanced Ecological Management

Foth Infrastructure & Environment, LLC

Foth Infrastructure & Environment, LLC				
REVISED	DATE	BY	DESCRIPTION	
CHECKED BY:	AKM		DATE: APR. '07	
APPROVED BY:	SVD1		DATE: APR. '07	
APPROVED BY:			DATE:	

Kennecott
Eagle Minerals

FIGURE 1-3
HUMBOLDT MILL PROJECT
LAKE LORY AND HERON ROOKERY POND
AQUATIC SURVEY LOCATIONS

Scale: 0 250 500 Feet	Date: APRIL 2007
Prepared by: DAT	Project No: 06W003

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EXHIBIT B

REPORT TABLES

Table 3-1. Stream Station Location Description.

Station Number	Stream Name	Latitude/Longitude NAD 1983	Township/Range/Section	Location Description
1	Unnamed Tributary of the Black River	N 46.47222 W 87.90249	Humboldt Twp. T47N, R29W, Sec 14	Upstream extent approximately 30 feet downstream of road crossing
2	Unnamed Tributary of the Black River	N 46.47284 W 87.88657	Humboldt Twp. T47N, R29W, Sec 13	Upstream extent approximately 80 feet downstream of Lake Lory outlet
3	Middle Branch of the Escanaba River	N 46.49899 W 87.886086	Humboldt Twp. T47N, R29W, Sec 1	Upstream extent approximately 85 feet downstream of Wolf Road Crossing

Table 5-1. Stream Fish Collection Data – Stations 1-3.

Scientific Name	Common name	Station 1	Station 2	Station 3
Catostomus commersoni	white sucker			1
Cottus bairdi	mottled sculpin			3
Esox lucius	northern pike			2
Lepomis macrochirus	bluegill			1
Luxilus cornutus	common shiner			16
Notropis heterolepis	blacknose shiner		1	
Noturus gyrinus	tadpole madtom			2
Perca flavescens	yellow perch		1	1
Phoxinus eos	northern redbelly dace		7	4
Pimephales notatus	bluntnose minnow			3
Rhinichthys atratulus	blacknose dace	2		2
Semotilus atromaculatus	creek chub	1	5	
Umbra limi	central mudminnow	6	3	
	Total Captured	**9**	**17**	**35**

Table 5-2. Stream Macroinvertebrate Collection Data – Stations 1-3.

TAXA	Station 1	Station 2	Station 3
ANNELIDA (segmented worms)			
Hirudinea (leeches)		1	
Oligochaeta (worms)	1	1	
ARTHROPODA			
Crustacea			
Amphipoda (scuds)	1	6	
Decapoda (crayfish)			3
Insecta			
Ephemeroptera (mayflies)			
Baetidae			5
Caenidae		1	
Ephemerellidae		12	2
Ephemeridae			29
Heptageniidae			9
Odonata			
Anisoptera (dragonflies)			
Aeshnidae	1		
Cordulegastridae		1	
Zygoptera (damselflies)			
Calopterygidae			5
Coenagrionidae		5	
Hemiptera (true bugs)			
Gerridae	2	4	3
Trichoptera (caddisflies)			
Helicopsychidae			1
Limnephilidae	1	12	12
Polycentropodidae			1
Coleoptera (beetles)			
Elmidae			4
Haliplidae (larvae)		1	
Diptera (flies)			
Ceratopogonidae		2	
Chironomidae	3	2	14
Simuliidae		23	
Tipulidae			11
MOLLUSCA			
Gastropoda (snails)			
Physidae	2		
Pelecypoda (bivalves)			
Sphaeriidae (clams)	9	7	2
TOTAL INDIVIDUALS	**20**	**78**	**101**

Table 5-3. Stream Macroinvertebrate Scores and Community Ratings – Station 1-3.

	Station 1		Station 2		Station 3	
METRIC	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Total Number of Taxa	8	0	14	0	14	0
Number of Mayfly Taxa	0	-1	2	-1	4	0
Number of Caddisfly Taxa	1	-1	1	-1	3	0
Number of Stonefly Taxa	0	-1	0	-1	0	-1
Percent Mayfly Composition.	0.0	-1	16.7	0	44.6	1
Percent Caddisfly Composition.	5.0	0	15.4	0	13.9	0
Percent Dominant Taxon	45.0	-1	29.5	-1	28.7	-1
Dominant Taxon	Sphaeriidae Pelecypoda		Simuliidae Diptera		Ephemeridae Ephemerotera	
Percent Isopod, Snail, Leech	10.0	0	1.3	1	0.0	1
Percent Surface. Air Breathers	10.0	0	5.1	0	3.0	1
TOTAL SCORE		**-5**		**-3**		**1**
COMMUNITY RATING		**Poor**		**Acceptable**		**Acceptable**

Table 5-4. Stream Habitat Scores and Ratings – Station 1-3.

Habitat Metric	Station 1 glide/pool	Station 2 glide/pool	Station 3 glide/pool
Substrate and Instream Cover			
Epifaunal Substrate/Avail. Cover	13	15	14
Pool Substrate Characterization	10	12	16
Pool Variability	10	9	13
Sediment Deposition	18	18	19
Channel Morphology			
Maintained Flow Volume	8	8	9
Flashiness	8	10	8
Channel Alteration	17	18	18
Channel Sinuosity	17	13	14
Riparian and Bank Structure			
Bank Stability (L)	9	10	10
Bank Stability (R)	9	10	10
Vegetative Protection (L)	10	10	10
Vegetative Protection (R)	10	10	10
Riparian Veg. Zone Width (L)	10	10	9
Riparian Veg. Zone Width (L)	10	10	9
Total Score	**159**	**163**	**169**
Habitat Rating	**Excellent**	**Excellent**	**Excellent**

Table 5-5. Recorded Water Quality – Stations 1-3.

Station Number	Date	Time	Temp °C	pH	Conductivity micro siemens/cm	Dissolved Oxygen mg O_2/L
1	6/10/2006	10:00	14.2	6.8	124	3.5
2	6/10/2006	14:00	19.6	6.9	65	7.0
3	6/10/2006	15:05	15.2	7.9	69	7.9
Lake Lory	6/8/2006	15:20	22.2	7.4	68	8.1
Heron Rookery Pond	6/8/2006	14:20	24. 9	7.2	87	10.2

Table 5-6. Lake Lory Fish Collection Data.

Scientific Name	Common Name	Number of Taxa by Sample Gear		
		Hoop Nets	Gill Nets	Boom Shocker
Pomoxis nigromaculatus	black crappie	6		19
Lepomis macrochirus	bluegill	34		40
Micropterus salmoides	largemouth bass	1	1	17
Lepomis gibbosus	pumpkinseed	3		18
Micropterus dolomieu	smallmouth bass			17
Catostomus commersoni	white sucker	5	2	2
Perca flavescens	yellow perch	1	15	13
Total Collected by Gear		**50**	**18**	**126**
Total Number of Fish Collected		**194**		

Table 5-7. Lake Lory Fish Statistical Data.

	Length - inches				Weight - pounds			
Common Name	**min**	**max**	**average**	**stdev***	**min**	**max**	**average**	**stdev***
black crappie	6.6	10.5	8.6	1.0	0.2	0.5	0.3	0.1
bluegill	1.8	10.6	6.5	1.3	0.002	0.6	0.2	0.1
largemouth bass	2.8	14.1	8.7	4.4	0.01	1	0.2	0.3
pumpkinseed	3.5	8.2	6.0	0.9	0.03	0.5	0.2	0.1
smallmouth bass	2.6	13.8	7.6	3.7	0.009	0.7	0.3	0.2
white sucker	9.4	18.9	14.5	3.9	0.3	0.6	n/a[1]	n/a[1]
yellow perch	2.7	8.7	6.6	1.7	0.006	0.2	0.1	0.07

*** standard deviation**

[1] sample size did not enable standard deviation calculation.

Table 5-8. Fish Collection Data from the Heron Rookery Pond

Scientific Name	Common Name	Number Captured
Ameiurus melas	black bullhead	2
Etheostoma exile	Iowa darter	1
Notemigonus crysoleucas	golden shiner	3
Notropis atherinoides	emerald shiner	14
Notropis heterodon	blacknose shiner	2
Perca flavescens	yellow perch	2
Phoxinus eos	northern redbelly dace	8
Phoxinus neogaeus	finescale dace	1
Pimephales notatus	bluntnose minnow	6
	Total Number Captured	**39**

EXHIBIT C

PHOTOGRAPHS

Figure C-1. Station 1 – Upstream Extent
View looking south, downstream.

Figure C-2 Station 2 – Upstream Extent.
View looking southwest, downstream.

Figure C-3 Station 2 – Downstream Extent.
View looking northeast, upstream.

Figure C-4 Station 3 – Upstream Extent.
View to east, downstream.

Figure C-5 Lake Lory – View to West.
Note aquatic vegetation and woody debris.

Figure C-6 Lake Lory – View to Southeast.
Note aquatic vegetation and woody debris.

Figure C-7 Heron Rookery Pond – Blue Heron Nest.

D-3

Humboldt Tailings Disposal Facility
Aquatic Survey Report 2007

ADVANCED ECOLOGICAL MANAGEMENT
2692 165th Avenue - Morley, MI 49336
(231) 856-7707
Prepared by: R. Douglas Workman, Ph.D.

To: Andrea Martin, Foth Infrastructure & Environment
Steve Donohue, Foth Infrastructure & Environment

Date: October 30, 2007

Memo: Aquatic Survey of the Humboldt Tailings Disposal Facility

INTRODUCTION

AEM conducted an environmental baseline aquatic survey in June, 2007 at the Humboldt Mill Tailings Disposal Facility (HTDF) for Kennecott Eagle Minerals Company under contract to Foth Infrastructure & Environment, LLC. Fish and aquatic macroinvetebrate communities were investigated. This work complements the survey performed in 2006 on the Humboldt Mill site in general as documented in the Humboldt Mill Aquatic Survey Report 2006 (AEM, 2007). The project is located approximately 24 miles west of Marquette Michigan as shown on Figure 1-1. The HTDF is a water-filled iron ore pit containing tailings that exists directly north of the existing mill facility.

The HTDF was excavated as a mine beginning in 1954. The Humboldt Mine extracted iron ore until 1968 when mining activity ceased and the pit was allowed to fill with water. After milling operations in the adjacent mill ceased in 1968 with the mine closure, milling resumed in 1984 with ore from the nearby Ropes Gold Mine. Tailings from that process were placed in the excavated pit which then became a tailings disposal facility.

The HTDF is approximately 3,400 feet long and 950 feet wide. The bathymetry of the water body is characterized by very steep slopes, (Figure 1-2). Shallow littoral areas of approximately 15 feet deep or less are predominantly limited to the northern and southern extents of the HTDF (Figure 1-2). Exposed bedrock characterizes most of the shoreline. Aquatic vegetation is scarce throughout the HTDF and is confined to shallow areas located in the north and south areas.

METHODS

Fish were collected using a combination of sampling gear including a boom shocker, experimental gill nets, and hoop nets from June 4 to June 5, 2007. The gear and sample locations within the HTDF were selected based on accessibility, to provide a broad sampling coverage of aquatic habitat, and to minimize the bias created by gear selectivity and avoidance by fish.

A boat-mounted shocking unit and generator (boom shocker) were used to collect fish in shallow water and near-shore areas of the HTDF (Figure 1-3). Pulsed direct current was used during the survey to minimize trauma to the fish. Electroshocking duration was automatically recorded as the total seconds of electricity that was discharged from the boom shocker in each transect. Boom shocking was conducted at night, which is more effective than shocking during daylight hours (Smith-Root, 2004).

Multiple panel gill nets of varying mesh size (experimental gill net) were fished in several locations throughout the HTDF (Figure 1-3). Each experimental monofilament gill net consisted of five 6-foot by 25-foot panels ranging from 1.5- to 6-inch stretch mesh, and was set overnight and fished for approximately 12 hours.

Hoop nets were placed in two locations where the slope of the substrate was suitable to permit the placement of the nets (Figure 1-3). Hoop nets were constructed of two-inch stretch mesh and the hoop diameter measured four feet with a 50-foot long center lead, and two 6-foot by 25-foot wing leads. The hoop nets were fished overnight for approximately 12 hours.

As part of the enumeration process, the species, length, weight, and number of fish captured were recorded. One representative of each species that was not identifiable in the field was placed in a voucher jar containing 10% formalin for later identification. Each voucher jar was labeled according to the sample location and date. Fish were identified to species using various taxonomic references (Eddy and Underhill, 1978; Becker, 1983; Page and Burr, 1991; Coon, 2001; and Pflieger, 1997). The Michigan County Element List (MNFI, 2007) was reviewed to determine if any threatened, endangered, or special concern aquatic species occurred within the HTDF.

Aquatic macroinvertebrate sampling was conducted along the shoreline of the HTDF using a D-frame kick-net, and a PONAR sediment-grabbing device from five locations

(Figure 1-3). Collected specimens were stored in 500 ml plastic wide-mouth jars containing 70% ethanol, and were identified using various taxonomic references (Merritt and Cummins, 2008; McCafferty, 1998; Pennak, 1990; Peckarsky et al., 1990; Cummings and Mayer, 1992).

RESULTS

A total of 302 fish and six different taxa were collected from the HTDF (Table 1). Common shiners (*Luxilus cornutus*) and white suckers (*Catostomus commersonii*) were the most frequently collected fish, and were typically collected from rock piles and from jagged bedrock regions along the shoreline. Northern pike (*Esox lucius*) were predominantly captured within the gill nets and one pike was collected during electroshocking.

Table 1. List of fish collected from HTDF during June, 2007.

Scientific Name	Common Name	Number Collected	Sample Gear
Catostomus commersonii	white sucker	107	boom shocker
Esox lucius	northern pike	1	boom shocker
Esox lucius	northern pike	7	gill net
Luxilus cornutus	common shiner	125	boom shocker
Pimephales promelas	fathead minnow	55	boom shocker
Phoxinus eos	northern redbelly dace	1	boom shocker
Semotilus atromaculatus	creek chub	6	boom shocker
	Total Collected	**302**	

The average length of northern pike was 28.9 inches (standard deviation, s = 1.3 inches, sample size, n = 8) and the average weight was 5.7 pounds (s = 0.5 pounds, n = 8). The white suckers that were collected were small in size and ranged from 1.6 to 7.4 inches in length (Chart 1). The average length of the white suckers was 4.4 inches (s = 0.8 inches, n = 107) and the average weight was 0.6 ounces (s = 0.4 ounces, n = 107).

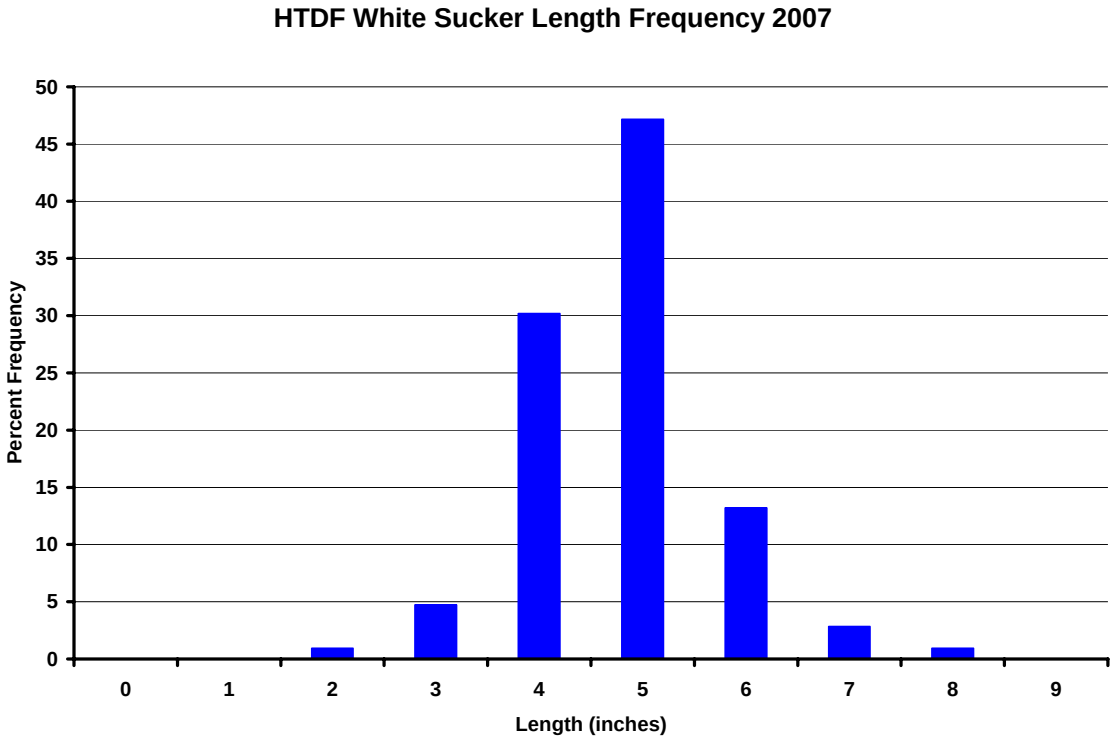

Chart 1. Length frequency distribution of white suckers (*Catostomus commersonii*) within HTDF during June 2007.

The fish community within the HTDF was predominantly comprised of minnow species and small white suckers, with the presence of large piscivorous northern pike that are likely to make use of these minnow species and white suckers as forage. No threatened, endangered, or special concern fish species were collected within the HTDF. The lack of habitat diversity, such as a well developed littoral component of submerged and emergent vegetation and woody debris may account for the lack of diversity of fish sizes and species.

Aquatic macroinvertebrate sampling was conducted on June 6, 2007 within the HTDF. All macroinvertebrates were collected using the PONAR sediment grabbing device and none were collected along the shoreline in the D-framed dip nets. A total of 10 macroinvertebrates were collected. Midge larvae (Chironomidae) were the most frequently collected macroinvertebrate (Table 2). One dragonfly comprised the only other Order observed among the HTDF macroinvertebrates.

The bedrock-dominated habitat in the littoral area of the HTDF and lack of habitat diversity, including few aquatic macrophytes, do not provide suitable conditions for the development of an abundant and diverse aquatic macroinvertebrate community within the HTDF. Low primary productivity, which is often associated with a bedrock-dominated aquatic system, may also contribute to low abundance and diversity by limiting the available food supply to macroinvertebrates.

Table 2. List of macroinvertebrates collected from the Humboldt Tailings Disposal Facility on June 6, 2007

Order	Family	Genus	Species	Number of taxa
Diptera	Chironomidae			5
Diptera	Chironomidae	*Ablabesmyia*		1
Diptera	Chironomidae	*Microtendipes*		3
Odonata	Gomphidae	*Dromogomphus*	*spinosus*	1
		Total Number of Taxa		**10**

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Baraga

Michigamme Twp

Champion Twp

Powell Twp

Ishpeming Twp

Marquette Twp

Negaunee Twp

Ely Twp

Van Riper State Park

Marquette

Champion Mine Site

Ropes Mine Site

~24 Miles

US 41

Marquette

Lake Superior

Ishpeming

Negaunee

Humboldt Mill
Project Location

US 95

CR 601

Republic Twp

Sands Twp

Chocolay Twp

Tilden Mine Site

Empire Mine Site

Tilden Twp

Richmond Twp

Humboldt Twp

West Branch Twp

Skandia Twp

NOTES

1. Horizontal datum based on NAD 83/94.
   Horizontal coordinates based on UTM Zone 16.
2. All base information downloaded from Michigan Center of Geographic Information (http://www.michigan.gov/cgi).
3. Site Location - Project Site within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.

LEGEND

- Counties
- Minor Civil Divisions
- Lakes and Rivers
- KEMC Project Location
- Highways
- Major Roads
- Minor Roads
- Railroads

N

ADVANCED ECOLOGICAL MANAGEMENT

Foth Infrastructure & Environment, LLC

M:\06w003\mxd\AEM\kmc_humboldt_ProjectLocation_11x17.mxd October 24, 2007

Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	AKM	DATE: OCT. '07
APPROVED BY:	SVD1	DATE: OCT. '07
APPROVED BY:		DATE:

Kennecott Eagle Minerals

FIGURE 1-1

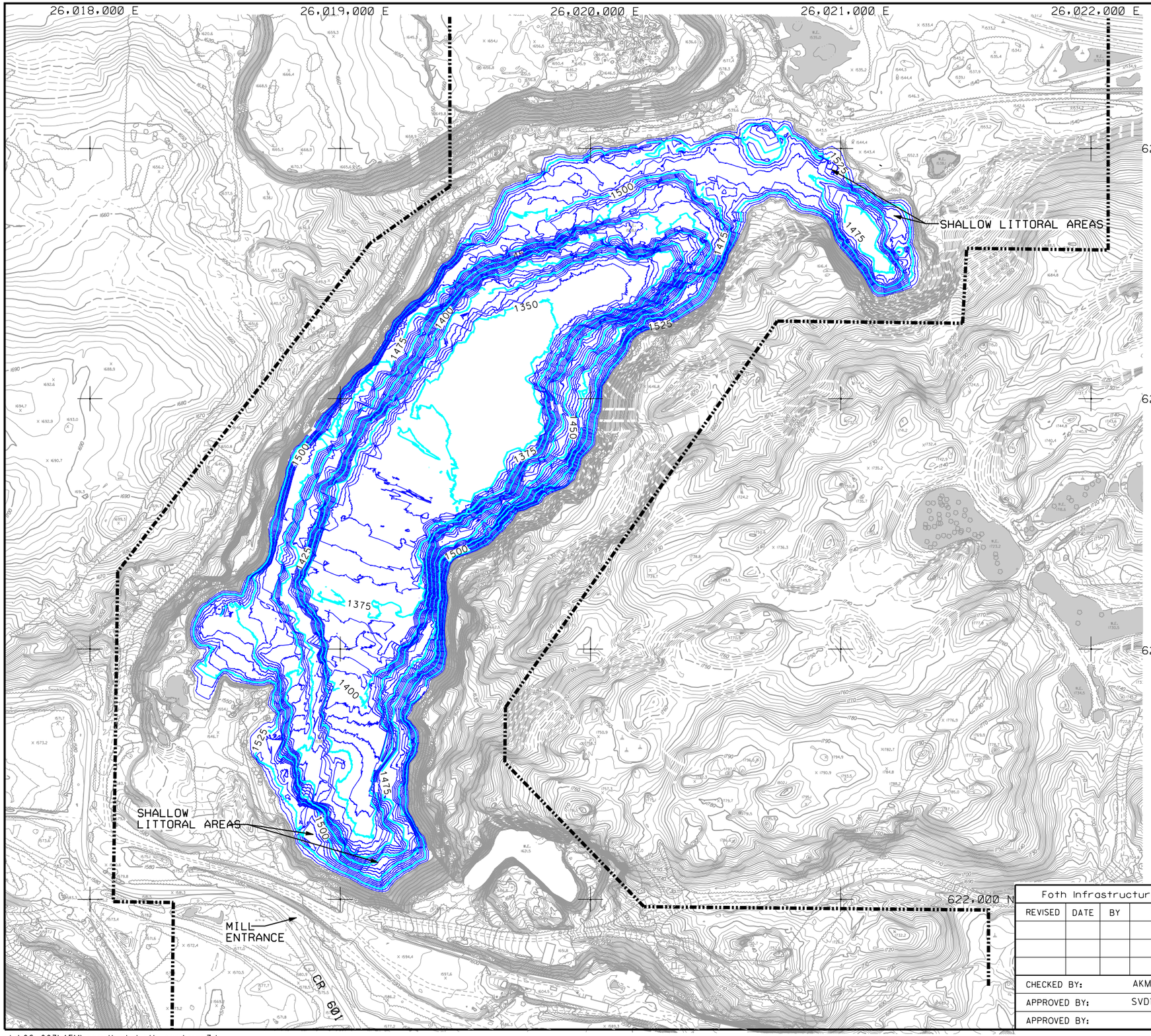
HUMBOLDT MILL PROJECT
PROJECT LOCATION

Scale: 0 1.5 3 Miles

Date: OCTOBER 2007

Prepared by: DAT

Project No: 06W003



LEGEND

- EXISTING ELEV. CONTOUR IN FEET (1570)
- SPOT ELEVATION (1705.3)
- TREE
- TREE LINE
- BUILDING
- TRAIL
- PAVED ROAD
- UNPAVED ROAD
- STREAM/LAKE
- SURFACE WATER
- KEMC PROJECT LOCATION
- LAKE ELEVATION CONTOUR (1500)

N

NOTES:

1. TOPOGRAPHIC AND PLANIMETRIC DATA SUPPLIED BY AERO-METRIC ENGINEERING, SHEBOYGAN, WISCONSIN. DATE OF PHOTOGRAPHY: APRIL 27, 2006.
2. CONTOUR INTERVAL BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. HORIZONTAL DATUM BASED ON NAD 83/96. HORIZONTAL COORDINATES BASED ON MICHIGAN STATE PLANE.
3. KEMC PROJECT LOCATION WITHIN SECTIONS 2 AND 11 T47N, R29W, HUMBOLDT TOWNSHIP, MARQUETTE COUNTY, MICHIGAN.
4. TOPOGRAPHIC CONTOUR INTERVAL SHOWN IS 2 FOOT.
5. BATHYMETRIC CONTOURS ARE FROM FOTH SURVEY DATED MAY 3 & 4, 2007. CONTOURS SHOWN ARE 5 FOOT INTERVAL.

Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	AKM	DATE: OCT. '07
APPROVED BY:	SVD1	DATE: OCT. '07
APPROVED BY:		DATE:

Kennecott Eagle Minerals

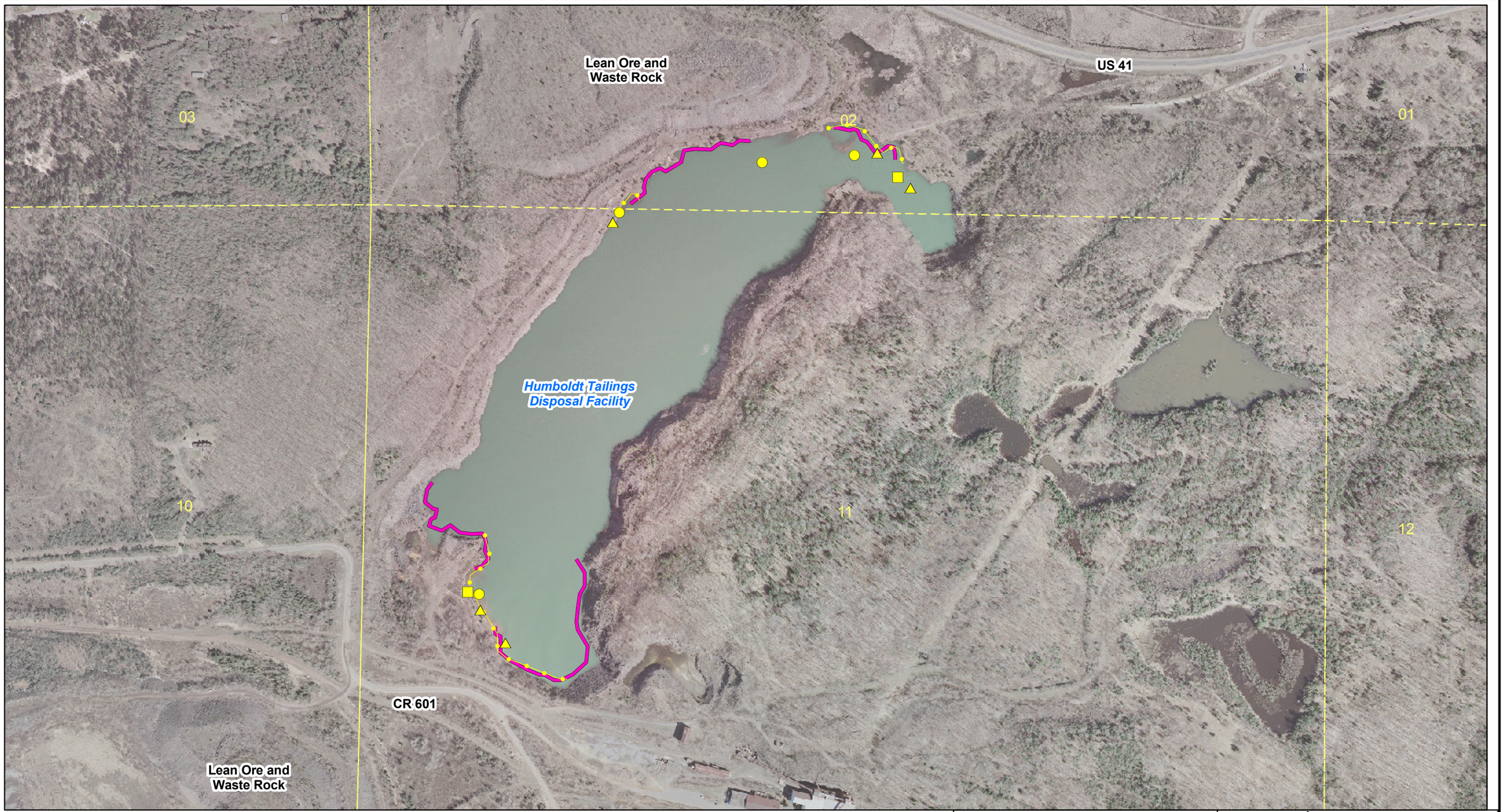
FIGURE 1-2

HUMBOLDT PIT BATHYMETRIC SURVEY

Scale: 0 200' 400' | Date: OCTOBER, 2007

Prepared By: JOW | Project No. 06W003

L:\06w003\AEM\aem_Humb-bath-contour.3d
10/25/2007 dat



NOTES

1. Orthophotography supplied by Aero-Metric Engineering, Sheboygan, Wisconsin. Date of photography: April 27, 2006.
2. Horizontal datum based on NAD 83/94. Horizontal coordinates based on UTM Zone 16.
3. Site Location - Project Site within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.

LEGEND

- PLSS Sections
- Hoop Net Locations
- Gill Net Locations
- Ponar Macro
- Pit Bug Transect
- Boom Shocker Transect

N

ADVANCED ECOLOGICAL MANAGEMENT

Foth Infrastructure & Environment, LLC

M:\06w003\mxd\AEM\kmc_humboldt_AquaticSurvey_11x17.mxd October 24, 2007

Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	AKM	DATE: OCT. '07	
APPROVED BY:	SVD1	DATE: OCT. '07	
APPROVED BY:		DATE:	

Kennecott
Eagle Minerals

FIGURE 1-3
HUMBOLDT MILL PROJECT
HUMBOLDT TAILINGS DISPOSAL FACILITY
AQUATIC SURVEY LOCATIONS

Scale: 0 250 500 Feet

Date: OCTOBER 2007

Prepared by: DAT

Project No: 06W003

D-4

Humboldt Project – HTDF Summary of 2007 Fish Contaminant Data

ADVANCED ECOLOGICAL MANAGEMENT

Memo

Date: September 23, 2007

To: Andrea Martin, Foth Infrastructure and Environment

From: R. Douglas Workman, Ph.D.

RE: Humboldt Mill Project, Summary of 2007 Fish Contaminant Data Sampled from Lake Lory and the HTDF

Dear Andrea;

Per your request, attached is a summary of the contaminant data tested from fish collected from Lake Lory and the Humboldt Tailings Disposal Facility (HTDF) in June, 2007. Fish were collected by Advanced Ecological Management LLC fisheries personnel in both water bodies by means of a boat-mounted electroshocker. Ten fish of a species that was abundant in each waterbody (Lake Lory: bluegill (*Lepomis macrochirus,* data summarized in Table 1); HTDF: white suckers (*Catostomus commersonii* data summarized in Table 2)) were analyzed for a variety of metals. The metals data are summarized below by waterbody. A comparison between the two sets of samples appears in Table 3. The lab data is attached in Table 4 and includes all metal contaminants and lab data. The fish were tested whole at Pace Analytical Services, Inc., Green Bay, Wisconsin (Batch numbers 884529 and 884631). The laboratory report is provided in Attachment 1.

Lake Lory (Table 1)

Ten bluegill were collected from Lake Lory on June 4, 2007. Data are summarized in Table 1. Bluegill ranged in length from 171 mm to 230 mm (average length; $\bar{x}$ = 195.6 mm; standard deviation; *s* = 17.7) and ranged in weight from 120.6 g to 327.8 g ($\bar{x}$ = 209.3 mm; *s* = 58.5). Copper concentrations ranged from 0.24 mg/kg to 0.66 mg/kg ($\bar{x}$ = 0.36 mg/kg; *s* = 0.13) and nickel concentrations ranged from 0.34 to 0.43 ($\bar{x}$ = 0.35 mg/kg; *s* = 0.03). Mercury levels ranged from 0.058 mg/kg to 0.11 mg/kg ($\bar{x}$ = 0.11 mg/kg; *s* = 0.01) and arsenic concentrations ranged from 0.027 mg/kg to 0.13 mg/kg ($\bar{x}$ = 0.1 mg/kg; *s* = 0.001). See Table 1 for additional data on metals content.

HDTF (Table 2)

Ten white suckers were collected from the HDTF on June 5, 2007. White suckers ranged in length from 121 mm to 144 mm ($\bar{x}$ = 131.6 mm; *s* = 17.7) and ranged in weight from 17.9 g to 35.1 g ($\bar{x}$ = 25.9 mm; *s* = 58.5). Copper concentrations ranged from 0.54 mg/kg to 2.9 mg/kg ($\bar{x}$ = 1.33 mg/kg; *s* = 0.81) and nickel concentrations ranged from 0.34 mg/kg to 3.6 mg/kg ($\bar{x}$ = 1.08 mg/kg; *s* = 1.02). Mercury levels ranged from 0.0064 to 0.017 mg/kg ($\bar{x}$ = 0.01 mg/kg; s = 0.003) and arsenic levels ranged from 0.061 and 0.83 mg/kg ($\bar{x}$ = 0.20 mg/kg; s = 0.01). See Table 2 for additional data on metals.

Humboldt Mill Project
Summary of 2007 Fish Contaminant Data

Table 1 Lake Lory Fish Sampled June, 2007 - Bluegills (Lepomis macrochirus)																
			Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample				
Parameter	CAS No	Units	1	2	3	4	5	6	7	8	9	10	Maximum	Minimum	Average	std dev
Length	-	mm	194	189	172	204	190	230	212	202	192	171	230	171.0	195.6	17.7
Weight	-	g	198.4	202.2	143.5	241.6	174.1	327.8	253.4	220.2	211.1	120.6	327.8	120.6	209.3	58.5
Aluminum	7429-90-5	mg/Kg wet	17	15	1.2	9	1.3	56	2.4	3.7	1.5	0.85	56	0.850	10.8	17.0
Antimony	7440-36-0	mg/Kg wet	0.0085	0.016	0.0085	0.0085	0.0085	0.0085	0.0085	0.0085	0.0085	0.0085	0.016	0.009	0.0093	0.002
Arsenic	7440-38-2	mg/Kg wet	0.093	0.12	0.045	0.13	0.054	0.08	0.054	0.027	0.13	0.052	0.13	0.027	0.079	0.038
Barium	7440-39-3	mg/Kg wet	0.91	0.68	0.46	0.74	0.55	0.68	1	0.35	0.75	0.42	1.0	0.350	0.654	0.211
Beryllium	7440-41-7	mg/Kg wet	0.008	0.01	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.01	0.007	0.0074	0.001
Boron	7440-42-8	mg/Kg wet	0.19	0.32	0.12	0.11	0.087	0.16	0.094	0.079	0.068	0.049	0.32	0.049	0.128	0.080
Cadmium	7440-43-9	mg/Kg wet	0.017	0.011	0.009	0.01	0.009	0.013	0.0081	0.0081	0.011	0.01	0.017	0.008	0.0106	0.003
Chromium	7440-47-3	mg/Kg wet	0.24	0.19	0.12	0.28	0.16	0.5	0.13	0.15	0.12	0.14	0.5	0.120	0.203	0.117
Cobalt	7440-48-4	mg/Kg wet	0.035	0.034	0.014	0.03	0.015	0.057	0.022	0.019	0.014	0.011	0.06	0.011	0.0251	0.014
Copper	7440-50-8	mg/Kg wet	0.66	0.33	0.29	0.35	0.27	0.52	0.36	0.29	0.33	0.24	0.66	0.240	0.364	0.129
Iron	7439-89-6	mg/Kg wet	95	93	55	86	47	140	65	47	70	35	140	35.0	73.3	31.2
Manganese	7439-96-5	mg/Kg wet	19	12	6.2	20	11	24	15	4.1	18	9.8	24	4.1	13.9	6.4
Mercury	7439-97-6	mg/Kg wet	0.086	0.085	0.064	0.083	0.083	0.064	0.11	0.073	0.058	0.083	0.11	0.058	0.079	0.015
Molybdenum	7439-98-7	mg/Kg wet	0.12	0.083	0.088	0.15	0.065	0.11	0.11	0.067	0.078	0.058	0.15	0.058	0.093	0.029
Nickel	7440-02-0	mg/Kg wet	0.34	0.34	0.34	0.34	0.34	0.43	0.34	0.34	0.34	0.34	0.43	0.340	0.349	0.028
Selenium	7782-49-2	mg/Kg wet	0.58	0.41	0.4	0.45	0.55	0.49	0.45	0.38	0.47	0.47	0.58	0.380	0.465	0.063
Silver	7440-22-4	mg/Kg wet	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	2.2E-10
Strontium	7440-24-6	mg/Kg wet	17	11	10	12	11	20	19	8.9	10	7.9	20	7.9	12.7	4.34
Zinc	7440-66-6	mg/Kg wet	19	14	16	14	15	17	19	16	15	13	19	13.0	15.8	2.04
Percent Solids	E-10151	% wet	26	24.2	25.5	22.8	23.7	25.8	21.4	24.8	24.5	23.8	26	21.4	24.3	1.42

Table 2 HTDF Fish Sampled June, 2007 - White Suckers (Catostomus commersonii)																
			Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample				
Parameter	CAS No	Units	1	2	3	4	5	6	7	8	9	10	Maximum	Minimum	Average	std dev
Length	-	mm	127	136	144	128	132	128	134	121	142	124	144	121.0	131.6	7.5
Weight	-	g	22.7	27.5	35.1	26.1	31.3	23.5	22.9	17.9	28.4	23.5	35.1	17.9	25.9	4.9
Aluminum	7429-90-5	mg/Kg wet	0.88	0.92	14	46	0.99	0.95	0.83	0.66	1.2	0.93	46	0.660	6.7	14.4
Antimony	7440-36-0	mg/Kg wet	0.026	0.024	0.06	0.2	0.0085	0.058	0.011	0.0085	0.0085	0.028	0.2	0.009	0.0433	0.058
Arsenic	7440-38-2	mg/Kg wet	0.075	0.061	0.83	0.22	0.12	0.1	0.12	0.092	0.27	0.089	0.83	0.061	0.198	0.232
Barium	7440-39-3	mg/Kg wet	0.32	0.39	0.79	0.72	0.51	0.28	0.32	0.33	0.41	0.44	0.8	0.280	0.451	0.175
Beryllium	7440-41-7	mg/Kg wet	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.000
Boron	7440-42-8	mg/Kg wet	0.12	0.18	0.12	0.22	0.1	0.24	0.11	0.17	0.13	0.14	0.24	0.100	0.153	0.048
Cadmium	7440-43-9	mg/Kg wet	0.0081	0.012	0.0081	0.01	0.0081	0.0081	0.0081	0.0081	0.0081	0.0081	0.012	0.008	0.0087	0.001
Chromium	7440-47-3	mg/Kg wet	0.11	0.16	0.25	0.2	0.12	0.12	0.13	0.096	0.099	0.13	0.25	0.096	0.1415	0.049
Cobalt	7440-48-4	mg/Kg wet	0.069	0.066	0.16	0.27	0.052	0.16	0.042	0.041	0.064	0.096	0.27	0.041	0.102	0.074
Copper	7440-50-8	mg/Kg wet	0.89	1.2	2.7	2.9	0.93	1.4	0.54	0.85	0.75	1.1	2.9	0.540	1.326	0.814
Iron	7439-89-6	mg/Kg wet	50	44	450	230	32	40	39	46	80	56	450	32.0	106.7	134.1
Manganese	7439-96-5	mg/Kg wet	29	35	19	57	13	23	12	9.4	9.1	44	57	9.1	25.1	16.2
Mercury	7439-97-6	mg/Kg wet	0.013	0.012	0.011	0.013	0.0064	0.017	0.0068	0.012	0.016	0.0096	0.017	0.006	0.012	0.003
Molybdenum	7439-98-7	mg/Kg wet	0.057	0.044	0.14	0.15	0.041	0.091	0.041	0.19	0.043	0.076	0.19	0.041	0.087	0.054
Nickel	7440-02-0	mg/Kg wet	0.69	0.52	1.5	3.6	0.34	1.7	0.34	0.37	0.52	1.2	3.6	0.340	1.078	1.017
Selenium	7782-49-2	mg/Kg wet	0.54	0.58	0.62	0.53	0.5	0.53	0.37	0.48	0.46	0.56	0.62	0.370	0.517	0.070
Silver	7440-22-4	mg/Kg wet	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	2.2E-10
Strontium	7440-24-6	mg/Kg wet	8.5	11	4.7	9.1	6.3	8.8	8.1	14	9.7	11	14	4.7	9.1	2.59
Zinc	7440-66-6	mg/Kg wet	21	19	13	17	22	20	22	14	20	19	22	13.0	18.7	3.13
Percent Solids	E-10151	% wet	21.3	18.6	21.1	22.7	17.1	21.6	22.2	19.9	20.4	23.4	23.4	17.1	20.8	1.91

Table 3 Comparason of Averages Lake Lory Samples vs. HTDF Samples

			Lake Lory - Bluegills			HTDF - White Suckers		
Parameter	CAS No	Units	Maximum	Minimum	Average	Maximum	Minimum	Average
Length	-	mm	230	171	195.6	144	121	131.6
Weight	-	g	327.8	120.6	209.29	35.1	17.9	25.89
Aluminum	7429-90-5	mg/Kg wet	56	0.85	10.795	46	0.66	6.736
Antimony	7440-36-0	mg/Kg wet	0.016	0.0085	0.00925	0.2	0.0085	0.04325
Arsenic	7440-38-2	mg/Kg wet	0.13	0.027	0.0785	0.83	0.061	0.1977
Barium	7440-39-3	mg/Kg wet	1	0.35	0.654	0.79	0.28	0.451
Beryllium	7440-41-7	mg/Kg wet	0.01	0.007	0.0074	0.0070	0.0070	0.0070
Boron	7440-42-8	mg/Kg wet	0.32	0.049	0.1277	0.24	0.10	0.1530
Cadmium	7440-43-9	mg/Kg wet	0.0170	0.0081	0.0106	0.0120	0.0081	0.0087
Chromium	7440-47-3	mg/Kg wet	0.5	0.12	0.203	0.250	0.096	0.142
Cobalt	7440-48-4	mg/Kg wet	0.057	0.011	0.0251	0.27	0.041	0.102
Copper	7440-50-8	mg/Kg wet	0.66	0.24	0.364	2.9	0.54	1.326
Iron	7439-89-6	mg/Kg wet	140	35	73.3	450	32	106.7
Manganese	7439-96-5	mg/Kg wet	24	4.1	13.91	57	9.1	25.05
Mercury	7439-97-6	mg/Kg wet	0.110	0.058	0.079	0.017	0.006	0.012
Molybdenum	7439-98-7	mg/Kg wet	0.150	0.058	0.093	0.190	0.041	0.087
Nickel	7440-02-0	mg/Kg wet	0.43	0.34	0.349	3.6	0.34	1.078
Selenium	7782-49-2	mg/Kg wet	0.58	0.38	0.465	0.62	0.37	0.517
Silver	7440-22-4	mg/Kg wet	0.011	0.011	0.011	0.011	0.011	0.011
Strontium	7440-24-6	mg/Kg wet	20	7.9	12.68	14	4.7	9.12
Zinc	7440-66-6	mg/Kg wet	19	13	15.8	22	13	18.7
Percent Solids	E-10151	% wet	26	21.4	24.25	23.4	17.1	20.83

The higher average metal concentration between Lake Lory samples and HTDF samples have been highlighted in yellow.

Table 4. Humboldt Mill Project Summary of 2007 Fish Contaminants Data
Lab Analysis Data.

Lab Sample Number	Field ID	Parameter	Result	MDL	EQL	Units	Collection Date	Analysis Date
884529-001	#1 LAKE LORY	Aluminum	17	0.36	5.0	mg/Kg wet	06/04/07	06/21/07
884529-001	#1 LAKE LORY	Antimony	0.0085	0.0085	0.10	mg/Kg wet	06/04/07	06/27/07
884529-001	#1 LAKE LORY	Arsenic	0.093	0.013	0.10	mg/Kg wet	06/04/07	06/21/07
884529-001	#1 LAKE LORY	Barium	0.91	0.034	0.10	mg/Kg wet	06/04/07	06/21/07
884529-001	#1 LAKE LORY	Beryllium	0.0080	0.0070	0.10	mg/Kg wet	06/04/07	06/21/07
884529-001	#1 LAKE LORY	Boron	0.19	0.031	1.0	mg/Kg wet	06/04/07	06/21/07
884529-001	#1 LAKE LORY	Cadmium	0.017	0.0081	0.10	mg/Kg wet	06/04/07	06/21/07
884529-001	#1 LAKE LORY	Chromium	0.24	0.038	0.10	mg/Kg wet	06/04/07	06/21/07
884529-001	#1 LAKE LORY	Cobalt	0.035	0.0061	0.10	mg/Kg wet	06/04/07	06/21/07
884529-001	#1 LAKE LORY	Copper	0.66	0.13	1.0	mg/Kg wet	06/04/07	06/21/07
884529-001	#1 LAKE LORY	Iron	95	1.9	5.0	mg/Kg wet	06/04/07	06/21/07
884529-001	#1 LAKE LORY	Manganese	19	0.082	1.0	mg/Kg wet	06/04/07	06/21/07
884529-001	#1 LAKE LORY	Mercury	0.086	0.0024	0.010	mg/Kg wet	06/04/07	06/15/07
884529-001	#1 LAKE LORY	Molybdenum	0.12	0.016	1.0	mg/Kg wet	06/04/07	06/21/07
884529-001	#1 LAKE LORY	Nickel	0.34	0.34	1.0	mg/Kg wet	06/04/07	06/21/07
884529-001	#1 LAKE LORY	Selenium	0.58	0.045	0.10	mg/Kg wet	06/04/07	06/21/07
884529-001	#1 LAKE LORY	Silver	0.011	0.011	0.050	mg/Kg wet	06/04/07	06/27/07
884529-001	#1 LAKE LORY	Strontium	17	0.057	1.0	mg/Kg wet	06/04/07	06/21/07
884529-001	#1 LAKE LORY	Zinc	19	1.4	5.0	mg/Kg wet	06/04/07	06/21/07
884529-001	#1 LAKE LORY	Percent Solids	26.0			% wet	06/04/07	07/03/07
884529-002	#2 LAKE LORY	Aluminum	15	0.36	5.0	mg/Kg wet	06/04/07	06/21/07
884529-002	#2 LAKE LORY	Antimony	0.016	0.0085	0.10	mg/Kg wet	06/04/07	06/27/07
884529-002	#2 LAKE LORY	Arsenic	0.12	0.013	0.10	mg/Kg wet	06/04/07	06/21/07
884529-002	#2 LAKE LORY	Barium	0.68	0.034	0.10	mg/Kg wet	06/04/07	06/21/07
884529-002	#2 LAKE LORY	Beryllium	0.010	0.0070	0.10	mg/Kg wet	06/04/07	06/21/07
884529-002	#2 LAKE LORY	Boron	0.32	0.031	1.0	mg/Kg wet	06/04/07	06/21/07
884529-002	#2 LAKE LORY	Cadmium	0.011	0.0081	0.10	mg/Kg wet	06/04/07	06/21/07
884529-002	#2 LAKE LORY	Chromium	0.19	0.038	0.10	mg/Kg wet	06/04/07	06/21/07
884529-002	#2 LAKE LORY	Cobalt	0.034	0.0061	0.10	mg/Kg wet	06/04/07	06/21/07
884529-002	#2 LAKE LORY	Copper	0.33	0.13	1.0	mg/Kg wet	06/04/07	06/21/07
884529-002	#2 LAKE LORY	Iron	93	1.9	5.0	mg/Kg wet	06/04/07	06/21/07
884529-002	#2 LAKE LORY	Manganese	12	0.082	1.0	mg/Kg wet	06/04/07	06/21/07
884529-002	#2 LAKE LORY	Mercury	0.085	0.0024	0.010	mg/Kg wet	06/04/07	06/15/07
884529-002	#2 LAKE LORY	Molybdenum	0.083	0.016	1.0	mg/Kg wet	06/04/07	06/21/07
884529-002	#2 LAKE LORY	Nickel	0.34	0.34	1.0	mg/Kg wet	06/04/07	06/21/07
884529-002	#2 LAKE LORY	Selenium	0.41	0.045	0.10	mg/Kg wet	06/04/07	06/21/07
Lab Sample Number	Field ID	Parameter	Result	MDL	EQL	Units	Collection Date	Analysis Date

Table 4. Humboldt Mill Project Summary of 2007 Fish Contaminants Data
Lab Analysis Data.

884529-002	#2 LAKE LORY	Silver	0.011	0.011	0.050	mg/Kg wet	06/04/07	06/27/07
884529-002	#2 LAKE LORY	Strontium	11	0.057	1.0	mg/Kg wet	06/04/07	06/21/07
884529-002	#2 LAKE LORY	Zinc	14	1.4	5.0	mg/Kg wet	06/04/07	06/21/07
884529-002	#2 LAKE LORY	Percent Solids	24.2			% wet	06/04/07	07/03/07
884529-003	#3 LAKE LORY	Aluminum	1.2	0.36	5.0	mg/Kg wet	06/04/07	06/21/07
884529-003	#3 LAKE LORY	Antimony	0.0085	0.0085	0.10	mg/Kg wet	06/04/07	06/27/07
884529-003	#3 LAKE LORY	Arsenic	0.045	0.013	0.10	mg/Kg wet	06/04/07	06/21/07
884529-003	#3 LAKE LORY	Barium	0.46	0.034	0.10	mg/Kg wet	06/04/07	06/21/07
884529-003	#3 LAKE LORY	Beryllium	0.0070	0.0070	0.10	mg/Kg wet	06/04/07	06/21/07
884529-003	#3 LAKE LORY	Boron	0.12	0.031	1.0	mg/Kg wet	06/04/07	06/21/07
884529-003	#3 LAKE LORY	Cadmium	0.0090	0.0081	0.10	mg/Kg wet	06/04/07	06/21/07
884529-003	#3 LAKE LORY	Chromium	0.12	0.038	0.10	mg/Kg wet	06/04/07	06/21/07
884529-003	#3 LAKE LORY	Cobalt	0.014	0.0061	0.10	mg/Kg wet	06/04/07	06/21/07
884529-003	#3 LAKE LORY	Copper	0.29	0.13	1.0	mg/Kg wet	06/04/07	06/21/07
884529-003	#3 LAKE LORY	Iron	55	1.9	5.0	mg/Kg wet	06/04/07	06/21/07
884529-003	#3 LAKE LORY	Manganese	6.2	0.082	1.0	mg/Kg wet	06/04/07	06/21/07
884529-003	#3 LAKE LORY	Mercury	0.064	0.0024	0.010	mg/Kg wet	06/04/07	06/15/07
884529-003	#3 LAKE LORY	Molybdenum	0.088	0.016	1.0	mg/Kg wet	06/04/07	06/21/07
884529-003	#3 LAKE LORY	Nickel	0.34	0.34	1.0	mg/Kg wet	06/04/07	06/21/07
884529-003	#3 LAKE LORY	Selenium	0.40	0.045	0.10	mg/Kg wet	06/04/07	06/21/07
884529-003	#3 LAKE LORY	Silver	0.011	0.011	0.050	mg/Kg wet	06/04/07	06/27/07
884529-003	#3 LAKE LORY	Strontium	10	0.057	1.0	mg/Kg wet	06/04/07	06/21/07
884529-003	#3 LAKE LORY	Zinc	16	1.4	5.0	mg/Kg wet	06/04/07	06/21/07
884529-003	#3 LAKE LORY	Percent Solids	25.5			% wet	06/04/07	07/03/07
884529-004	#4 LAKE LORY	Aluminum	9.0	0.36	5.0	mg/Kg wet	06/04/07	06/21/07
884529-004	#4 LAKE LORY	Antimony	0.0085	0.0085	0.10	mg/Kg wet	06/04/07	06/27/07
884529-004	#4 LAKE LORY	Arsenic	0.13	0.013	0.10	mg/Kg wet	06/04/07	06/21/07
884529-004	#4 LAKE LORY	Barium	0.74	0.034	0.10	mg/Kg wet	06/04/07	06/21/07
884529-004	#4 LAKE LORY	Beryllium	0.0070	0.0070	0.10	mg/Kg wet	06/04/07	06/21/07
884529-004	#4 LAKE LORY	Boron	0.11	0.031	1.0	mg/Kg wet	06/04/07	06/21/07
884529-004	#4 LAKE LORY	Cadmium	0.010	0.0081	0.10	mg/Kg wet	06/04/07	06/21/07
884529-004	#4 LAKE LORY	Chromium	0.28	0.038	0.10	mg/Kg wet	06/04/07	06/21/07
884529-004	#4 LAKE LORY	Cobalt	0.030	0.0061	0.10	mg/Kg wet	06/04/07	06/21/07
884529-004	#4 LAKE LORY	Copper	0.35	0.13	1.0	mg/Kg wet	06/04/07	06/21/07
884529-004	#4 LAKE LORY	Iron	86	1.9	5.0	mg/Kg wet	06/04/07	06/21/07
884529-004	#4 LAKE LORY	Manganese	20	0.082	1.0	mg/Kg wet	06/04/07	06/21/07
Lab Sample Number	Field ID	Parameter	Result	MDL	EQL	Units	Collection Date	Analysis Date
884529-004	#4 LAKE LORY	Mercury	0.083	0.0024	0.010	mg/Kg wet	06/04/07	06/15/07

Table 4. Humboldt Mill Project Summary of 2007 Fish Contaminants Data
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884529-004	#4 LAKE LORY	Molybdenum	0.15	0.016	1.0	mg/Kg wet	06/04/07	06/21/07
884529-004	#4 LAKE LORY	Nickel	0.34	0.34	1.0	mg/Kg wet	06/04/07	06/21/07
884529-004	#4 LAKE LORY	Selenium	0.45	0.045	0.10	mg/Kg wet	06/04/07	06/21/07
884529-004	#4 LAKE LORY	Silver	0.011	0.011	0.050	mg/Kg wet	06/04/07	06/27/07
884529-004	#4 LAKE LORY	Strontium	12	0.057	1.0	mg/Kg wet	06/04/07	06/21/07
884529-004	#4 LAKE LORY	Zinc	14	1.4	5.0	mg/Kg wet	06/04/07	06/21/07
884529-004	#4 LAKE LORY	Percent Solids	22.8			% wet	06/04/07	07/03/07
884529-005	#5 LAKE LORY	Aluminum	1.3	0.36	5.0	mg/Kg wet	06/04/07	06/21/07
884529-005	#5 LAKE LORY	Antimony	0.0085	0.0085	0.10	mg/Kg wet	06/04/07	06/27/07
884529-005	#5 LAKE LORY	Arsenic	0.054	0.013	0.10	mg/Kg wet	06/04/07	06/21/07
884529-005	#5 LAKE LORY	Barium	0.55	0.034	0.10	mg/Kg wet	06/04/07	06/21/07
884529-005	#5 LAKE LORY	Beryllium	0.0070	0.0070	0.10	mg/Kg wet	06/04/07	06/21/07
884529-005	#5 LAKE LORY	Boron	0.087	0.031	1.0	mg/Kg wet	06/04/07	06/21/07
884529-005	#5 LAKE LORY	Cadmium	0.0090	0.0081	0.10	mg/Kg wet	06/04/07	06/21/07
884529-005	#5 LAKE LORY	Chromium	0.16	0.038	0.10	mg/Kg wet	06/04/07	06/21/07
884529-005	#5 LAKE LORY	Cobalt	0.015	0.0061	0.10	mg/Kg wet	06/04/07	06/21/07
884529-005	#5 LAKE LORY	Copper	0.27	0.13	1.0	mg/Kg wet	06/04/07	06/21/07
884529-005	#5 LAKE LORY	Iron	47	1.9	5.0	mg/Kg wet	06/04/07	06/21/07
884529-005	#5 LAKE LORY	Manganese	11	0.082	1.0	mg/Kg wet	06/04/07	06/21/07
884529-005	#5 LAKE LORY	Mercury	0.083	0.0024	0.010	mg/Kg wet	06/04/07	06/15/07
884529-005	#5 LAKE LORY	Molybdenum	0.065	0.016	1.0	mg/Kg wet	06/04/07	06/21/07
884529-005	#5 LAKE LORY	Nickel	0.34	0.34	1.0	mg/Kg wet	06/04/07	06/21/07
884529-005	#5 LAKE LORY	Selenium	0.55	0.045	0.10	mg/Kg wet	06/04/07	06/21/07
884529-005	#5 LAKE LORY	Silver	0.011	0.011	0.050	mg/Kg wet	06/04/07	06/27/07
884529-005	#5 LAKE LORY	Strontium	11	0.057	1.0	mg/Kg wet	06/04/07	06/21/07
884529-005	#5 LAKE LORY	Zinc	15	1.4	5.0	mg/Kg wet	06/04/07	06/21/07
884529-005	#5 LAKE LORY	Percent Solids	23.7			% wet	06/04/07	07/03/07
884529-006	#6 LAKE LORY	Aluminum	56	0.36	5.0	mg/Kg wet	06/04/07	06/21/07
884529-006	#6 LAKE LORY	Antimony	0.0085	0.0085	0.10	mg/Kg wet	06/04/07	06/27/07
884529-006	#6 LAKE LORY	Arsenic	0.080	0.013	0.10	mg/Kg wet	06/04/07	06/21/07
884529-006	#6 LAKE LORY	Barium	0.68	0.034	0.10	mg/Kg wet	06/04/07	06/21/07
884529-006	#6 LAKE LORY	Beryllium	0.0070	0.0070	0.10	mg/Kg wet	06/04/07	06/21/07
884529-006	#6 LAKE LORY	Boron	0.16	0.031	1.0	mg/Kg wet	06/04/07	06/21/07
884529-006	#6 LAKE LORY	Cadmium	0.013	0.0081	0.10	mg/Kg wet	06/04/07	06/21/07
884529-006	#6 LAKE LORY	Chromium	0.50	0.038	0.10	mg/Kg wet	06/04/07	06/21/07
Lab Sample Number	Field ID	Parameter	Result	MDL	EQL	Units	Collection Date	Analysis Date
884529-006	#6 LAKE LORY	Cobalt	0.057	0.0061	0.10	mg/Kg wet	06/04/07	06/21/07
884529-006	#6 LAKE LORY	Copper	0.52	0.13	1.0	mg/Kg wet	06/04/07	06/21/07

Table 4. Humboldt Mill Project Summary of 2007 Fish Contaminants Data
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884529-006	#6 LAKE LORY	Iron	140	1.9	5.0	mg/Kg wet	06/04/07	06/21/07
884529-006	#6 LAKE LORY	Manganese	24	0.082	1.0	mg/Kg wet	06/04/07	06/21/07
884529-006	#6 LAKE LORY	Mercury	0.064	0.0024	0.010	mg/Kg wet	06/04/07	06/15/07
884529-006	#6 LAKE LORY	Molybdenum	0.11	0.016	1.0	mg/Kg wet	06/04/07	06/21/07
884529-006	#6 LAKE LORY	Nickel	0.43	0.34	1.0	mg/Kg wet	06/04/07	06/21/07
884529-006	#6 LAKE LORY	Selenium	0.49	0.045	0.10	mg/Kg wet	06/04/07	06/21/07
884529-006	#6 LAKE LORY	Silver	0.011	0.011	0.050	mg/Kg wet	06/04/07	06/27/07
884529-006	#6 LAKE LORY	Strontium	20	0.057	1.0	mg/Kg wet	06/04/07	06/21/07
884529-006	#6 LAKE LORY	Zinc	17	1.4	5.0	mg/Kg wet	06/04/07	06/21/07
884529-006	#6 LAKE LORY	Percent Solids	25.8			% wet	06/04/07	07/03/07
884529-007	#7 LAKE LORY	Aluminum	2.4	0.36	5.0	mg/Kg wet	06/04/07	06/21/07
884529-007	#7 LAKE LORY	Antimony	0.0085	0.0085	0.10	mg/Kg wet	06/04/07	06/27/07
884529-007	#7 LAKE LORY	Arsenic	0.054	0.013	0.10	mg/Kg wet	06/04/07	06/21/07
884529-007	#7 LAKE LORY	Barium	1.0	0.034	0.10	mg/Kg wet	06/04/07	06/21/07
884529-007	#7 LAKE LORY	Beryllium	0.0070	0.0070	0.10	mg/Kg wet	06/04/07	06/21/07
884529-007	#7 LAKE LORY	Boron	0.094	0.031	1.0	mg/Kg wet	06/04/07	06/21/07
884529-007	#7 LAKE LORY	Cadmium	0.0081	0.0081	0.10	mg/Kg wet	06/04/07	06/21/07
884529-007	#7 LAKE LORY	Chromium	0.13	0.038	0.10	mg/Kg wet	06/04/07	06/21/07
884529-007	#7 LAKE LORY	Cobalt	0.022	0.0061	0.10	mg/Kg wet	06/04/07	06/21/07
884529-007	#7 LAKE LORY	Copper	0.36	0.13	1.0	mg/Kg wet	06/04/07	06/21/07
884529-007	#7 LAKE LORY	Iron	65	1.9	5.0	mg/Kg wet	06/04/07	06/21/07
884529-007	#7 LAKE LORY	Manganese	15	0.082	1.0	mg/Kg wet	06/04/07	06/21/07
884529-007	#7 LAKE LORY	Mercury	0.11	0.0024	0.010	mg/Kg wet	06/04/07	06/15/07
884529-007	#7 LAKE LORY	Molybdenum	0.11	0.016	1.0	mg/Kg wet	06/04/07	06/21/07
884529-007	#7 LAKE LORY	Nickel	0.34	0.34	1.0	mg/Kg wet	06/04/07	06/21/07
884529-007	#7 LAKE LORY	Selenium	0.45	0.045	0.10	mg/Kg wet	06/04/07	06/21/07
884529-007	#7 LAKE LORY	Silver	0.011	0.011	0.050	mg/Kg wet	06/04/07	06/27/07
884529-007	#7 LAKE LORY	Strontium	19	0.057	1.0	mg/Kg wet	06/04/07	06/21/07
884529-007	#7 LAKE LORY	Zinc	19	1.4	5.0	mg/Kg wet	06/04/07	06/21/07
884529-007	#7 LAKE LORY	Percent Solids	21.4			% wet	06/04/07	07/03/07
884529-008	#8 LAKE LORY	Aluminum	3.7	0.36	5.0	mg/Kg wet	06/04/07	06/21/07
884529-008	#8 LAKE LORY	Antimony	0.0085	0.0085	0.10	mg/Kg wet	06/04/07	06/27/07
884529-008	#8 LAKE LORY	Arsenic	0.027	0.013	0.10	mg/Kg wet	06/04/07	06/21/07
884529-008	#8 LAKE LORY	Barium	0.35	0.034	0.10	mg/Kg wet	06/04/07	06/21/07
Lab Sample Number	Field ID	Parameter	Result	MDL	EQL	Units	Collection Date	Analysis Date
884529-008	#8 LAKE LORY	Beryllium	0.0070	0.0070	0.10	mg/Kg wet	06/04/07	06/21/07
884529-008	#8 LAKE LORY	Boron	0.079	0.031	1.0	mg/Kg wet	06/04/07	06/21/07
884529-008	#8 LAKE LORY	Cadmium	0.0081	0.0081	0.10	mg/Kg wet	06/04/07	06/21/07

Table 4. Humboldt Mill Project Summary of 2007 Fish Contaminants Data
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884529-008	#8 LAKE LORY	Chromium	0.15	0.038	0.10	mg/Kg wet	06/04/07	06/21/07
884529-008	#8 LAKE LORY	Cobalt	0.019	0.0061	0.10	mg/Kg wet	06/04/07	06/21/07
884529-008	#8 LAKE LORY	Copper	0.29	0.13	1.0	mg/Kg wet	06/04/07	06/21/07
884529-008	#8 LAKE LORY	Iron	47	1.9	5.0	mg/Kg wet	06/04/07	06/21/07
884529-008	#8 LAKE LORY	Manganese	4.1	0.082	1.0	mg/Kg wet	06/04/07	06/21/07
884529-008	#8 LAKE LORY	Mercury	0.073	0.0024	0.010	mg/Kg wet	06/04/07	06/15/07
884529-008	#8 LAKE LORY	Molybdenum	0.067	0.016	1.0	mg/Kg wet	06/04/07	06/21/07
884529-008	#8 LAKE LORY	Nickel	0.34	0.34	1.0	mg/Kg wet	06/04/07	06/21/07
884529-008	#8 LAKE LORY	Selenium	0.38	0.045	0.10	mg/Kg wet	06/04/07	06/21/07
884529-008	#8 LAKE LORY	Silver	0.011	0.011	0.050	mg/Kg wet	06/04/07	06/27/07
884529-008	#8 LAKE LORY	Strontium	8.9	0.057	1.0	mg/Kg wet	06/04/07	06/21/07
884529-008	#8 LAKE LORY	Zinc	16	1.4	5.0	mg/Kg wet	06/04/07	06/21/07
884529-008	#8 LAKE LORY	Percent Solids	24.8			% wet	06/04/07	07/03/07
884529-009	#9 LAKE LORY	Aluminum	1.5	0.36	5.0	mg/Kg wet	06/04/07	06/21/07
884529-009	#9 LAKE LORY	Antimony	0.0085	0.0085	0.10	mg/Kg wet	06/04/07	06/27/07
884529-009	#9 LAKE LORY	Arsenic	0.13	0.013	0.10	mg/Kg wet	06/04/07	06/21/07
884529-009	#9 LAKE LORY	Barium	0.75	0.034	0.10	mg/Kg wet	06/04/07	06/21/07
884529-009	#9 LAKE LORY	Beryllium	0.0070	0.0070	0.10	mg/Kg wet	06/04/07	06/21/07
884529-009	#9 LAKE LORY	Boron	0.068	0.031	1.0	mg/Kg wet	06/04/07	06/21/07
884529-009	#9 LAKE LORY	Cadmium	0.011	0.0081	0.10	mg/Kg wet	06/04/07	06/21/07
884529-009	#9 LAKE LORY	Chromium	0.12	0.038	0.10	mg/Kg wet	06/04/07	06/21/07
884529-009	#9 LAKE LORY	Cobalt	0.014	0.0061	0.10	mg/Kg wet	06/04/07	06/21/07
884529-009	#9 LAKE LORY	Copper	0.33	0.13	1.0	mg/Kg wet	06/04/07	06/21/07
884529-009	#9 LAKE LORY	Iron	70	1.9	5.0	mg/Kg wet	06/04/07	06/21/07
884529-009	#9 LAKE LORY	Manganese	18	0.082	1.0	mg/Kg wet	06/04/07	06/21/07
884529-009	#9 LAKE LORY	Mercury	0.058	0.0024	0.010	mg/Kg wet	06/04/07	06/15/07
884529-009	#9 LAKE LORY	Molybdenum	0.078	0.016	1.0	mg/Kg wet	06/04/07	06/21/07
884529-009	#9 LAKE LORY	Nickel	0.34	0.34	1.0	mg/Kg wet	06/04/07	06/21/07
884529-009	#9 LAKE LORY	Selenium	0.47	0.045	0.10	mg/Kg wet	06/04/07	06/21/07
884529-009	#9 LAKE LORY	Silver	0.011	0.011	0.050	mg/Kg wet	06/04/07	06/27/07
884529-009	#9 LAKE LORY	Strontium	10	0.057	1.0	mg/Kg wet	06/04/07	06/21/07
884529-009	#9 LAKE LORY	Zinc	15	1.4	5.0	mg/Kg wet	06/04/07	06/21/07
884529-009	#9 LAKE LORY	Percent Solids	24.5			% wet	06/04/07	07/03/07
Lab Sample Number	Field ID	Parameter	Result	MDL	EQL	Units	Collection Date	Analysis Date
884529-010	#10 LAKE LORY	Aluminum	0.85	0.36	5.0	mg/Kg wet	06/04/07	06/21/07
884529-010	#10 LAKE LORY	Antimony	0.0085	0.0085	0.10	mg/Kg wet	06/04/07	06/27/07
884529-010	#10 LAKE LORY	Arsenic	0.052	0.013	0.10	mg/Kg wet	06/04/07	06/21/07
884529-010	#10 LAKE LORY	Barium	0.42	0.034	0.10	mg/Kg wet	06/04/07	06/21/07

Table 4. Humboldt Mill Project Summary of 2007 Fish Contaminants Data
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884529-010	#10 LAKE LORY	Beryllium	0.0070	0.0070	0.10	mg/Kg wet	06/04/07	06/21/07
884529-010	#10 LAKE LORY	Boron	0.049	0.031	1.0	mg/Kg wet	06/04/07	06/21/07
884529-010	#10 LAKE LORY	Cadmium	0.010	0.0081	0.10	mg/Kg wet	06/04/07	06/21/07
884529-010	#10 LAKE LORY	Chromium	0.14	0.038	0.10	mg/Kg wet	6/4/2007	06/21/07
884529-010	#10 LAKE LORY	Cobalt	0.011	0.0061	0.10	mg/Kg wet	06/04/07	06/21/07
884529-010	#10 LAKE LORY	Copper	0.24	0.13	1.0	mg/Kg wet	06/04/07	06/21/07
884529-010	#10 LAKE LORY	Iron	35	1.9	5.0	mg/Kg wet	06/04/07	06/21/07
884529-010	#10 LAKE LORY	Manganese	9.8	0.082	1.0	mg/Kg wet	06/04/07	06/21/07
884529-010	#10 LAKE LORY	Mercury	0.083	0.0024	0.010	mg/Kg wet	06/04/07	06/15/07
884529-010	#10 LAKE LORY	Molybdenum	0.058	0.016	1.0	mg/Kg wet	06/04/07	06/21/07
884529-010	#10 LAKE LORY	Nickel	0.34	0.34	1.0	mg/Kg wet	06/04/07	06/21/07
884529-010	#10 LAKE LORY	Selenium	0.47	0.045	0.10	mg/Kg wet	06/04/07	06/21/07
884529-010	#10 LAKE LORY	Silver	0.011	0.011	0.050	mg/Kg wet	06/04/07	06/27/07
884529-010	#10 LAKE LORY	Strontium	7.9	0.057	1.0	mg/Kg wet	06/04/07	06/21/07
884529-010	#10 LAKE LORY	Zinc	13	1.4	5.0	mg/Kg wet	06/04/07	06/21/07
884529-010	#10 LAKE LORY	Percent Solids	23.8			% wet	06/04/07	07/03/07
884631-001	#1 PIT LAKE	Aluminum	0.88	0.36	5.0	mg/Kg wet	06/05/07	06/21/07
884631-001	#1 PIT LAKE	Antimony	0.026	0.0085	0.10	mg/Kg wet	06/05/07	06/27/07
884631-001	#1 PIT LAKE	Arsenic	0.075	0.013	0.10	mg/Kg wet	06/05/07	06/21/07
884631-001	#1 PIT LAKE	Barium	0.32	0.034	0.10	mg/Kg wet	06/05/07	06/21/07
884631-001	#1 PIT LAKE	Beryllium	0.0070	0.0070	0.10	mg/Kg wet	06/05/07	06/21/07
884631-001	#1 PIT LAKE	Boron	0.12	0.031	1.0	mg/Kg wet	06/05/07	06/21/07
884631-001	#1 PIT LAKE	Cadmium	0.0081	0.0081	0.10	mg/Kg wet	06/05/07	06/21/07
884631-001	#1 PIT LAKE	Chromium	0.11	0.038	0.10	mg/Kg wet	06/05/07	06/21/07
884631-001	#1 PIT LAKE	Cobalt	0.069	0.0061	0.10	mg/Kg wet	06/05/07	06/21/07
884631-001	#1 PIT LAKE	Copper	0.89	0.13	1.0	mg/Kg wet	06/05/07	06/21/07
884631-001	#1 PIT LAKE	Iron	50	1.9	5.0	mg/Kg wet	06/05/07	06/21/07
884631-001	#1 PIT LAKE	Manganese	29	0.082	1.0	mg/Kg wet	06/05/07	06/21/07
884631-001	#1 PIT LAKE	Mercury	0.013	0.0024	0.010	mg/Kg wet	06/05/07	06/15/07
884631-001	#1 PIT LAKE	Molybdenum	0.057	0.016	1.0	mg/Kg wet	06/05/07	06/21/07
884631-001	#1 PIT LAKE	Nickel	0.69	0.34	1.0	mg/Kg wet	06/05/07	06/21/07
884631-001	#1 PIT LAKE	Selenium	0.54	0.045	0.10	mg/Kg wet	06/05/07	06/21/07
Lab Sample Number	Field ID	Parameter	Result	MDL	EQL	Units	Collection Date	Analysis Date
884631-001	#1 PIT LAKE	Silver	0.011	0.011	0.050	mg/Kg wet	06/05/07	06/27/07
884631-001	#1 PIT LAKE	Strontium	8.5	0.057	1.0	mg/Kg wet	06/05/07	06/21/07
884631-001	#1 PIT LAKE	Zinc	21	1.4	5.0	mg/Kg wet	06/05/07	06/21/07
884631-001	#1 PIT LAKE	Percent Solids	21.3			% wet	06/05/07	07/03/07
884631-002	#2 PIT LAKE	Aluminum	0.92	0.36	5.0	mg/Kg wet	06/05/07	06/21/07

Table 4. Humboldt Mill Project Summary of 2007 Fish Contaminants Data
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884631-002	#2 PIT LAKE	Antimony	0.024	0.0085	0.10	mg/Kg wet	06/05/07	06/27/07
884631-002	#2 PIT LAKE	Arsenic	0.061	0.013	0.10	mg/Kg wet	06/05/07	06/21/07
884631-002	#2 PIT LAKE	Barium	0.39	0.034	0.10	mg/Kg wet	06/05/07	06/21/07
884631-002	#2 PIT LAKE	Beryllium	0.0070	0.0070	0.10	mg/Kg wet	06/05/07	06/21/07
884631-002	#2 PIT LAKE	Boron	0.18	0.031	1.0	mg/Kg wet	06/05/07	06/21/07
884631-002	#2 PIT LAKE	Cadmium	0.012	0.0081	0.10	mg/Kg wet	06/05/07	06/21/07
884631-002	#2 PIT LAKE	Chromium	0.16	0.038	0.10	mg/Kg wet	06/05/07	06/21/07
884631-002	#2 PIT LAKE	Cobalt	0.066	0.0061	0.10	mg/Kg wet	06/05/07	06/21/07
884631-002	#2 PIT LAKE	Copper	1.2	0.13	1.0	mg/Kg wet	06/05/07	06/21/07
884631-002	#2 PIT LAKE	Iron	44	1.9	5.0	mg/Kg wet	06/05/07	06/21/07
884631-002	#2 PIT LAKE	Manganese	35	0.082	1.0	mg/Kg wet	06/05/07	06/21/07
884631-002	#2 PIT LAKE	Mercury	0.012	0.0024	0.010	mg/Kg wet	06/05/07	06/15/07
884631-002	#2 PIT LAKE	Molybdenum	0.044	0.016	1.0	mg/Kg wet	06/05/07	06/21/07
884631-002	#2 PIT LAKE	Nickel	0.52	0.34	1.0	mg/Kg wet	06/05/07	06/21/07
884631-002	#2 PIT LAKE	Selenium	0.58	0.045	0.10	mg/Kg wet	06/05/07	06/21/07
884631-002	#2 PIT LAKE	Silver	0.011	0.011	0.050	mg/Kg wet	06/05/07	06/27/07
884631-002	#2 PIT LAKE	Strontium	11	0.057	1.0	mg/Kg wet	06/05/07	06/21/07
884631-002	#2 PIT LAKE	Zinc	19	1.4	5.0	mg/Kg wet	06/05/07	06/21/07
884631-002	#2 PIT LAKE	Percent Solids	18.6			% wet	06/05/07	07/03/07
884631-003	#3 PIT LAKE	Aluminum	14	0.36	5.0	mg/Kg wet	06/05/07	06/21/07
884631-003	#3 PIT LAKE	Antimony	0.060	0.0085	0.10	mg/Kg wet	06/05/07	06/27/07
884631-003	#3 PIT LAKE	Arsenic	0.83	0.013	0.10	mg/Kg wet	06/05/07	06/21/07
884631-003	#3 PIT LAKE	Barium	0.79	0.034	0.10	mg/Kg wet	06/05/07	06/21/07
884631-003	#3 PIT LAKE	Beryllium	0.0070	0.0070	0.10	mg/Kg wet	06/05/07	06/21/07
884631-003	#3 PIT LAKE	Boron	0.12	0.031	1.0	mg/Kg wet	06/05/07	06/21/07
884631-003	#3 PIT LAKE	Cadmium	0.0081	0.0081	0.10	mg/Kg wet	06/05/07	06/21/07
884631-003	#3 PIT LAKE	Chromium	0.25	0.038	0.10	mg/Kg wet	06/05/07	06/21/07
884631-003	#3 PIT LAKE	Cobalt	0.16	0.0061	0.10	mg/Kg wet	06/05/07	06/21/07
884631-003	#3 PIT LAKE	Copper	2.7	0.13	1.0	mg/Kg wet	06/05/07	06/21/07
884631-003	#3 PIT LAKE	Iron	450	1.9	5.0	mg/Kg wet	06/05/07	06/21/07
884631-003	#3 PIT LAKE	Manganese	19	0.082	1.0	mg/Kg wet	06/05/07	06/21/07
Lab Sample Number	Field ID	Parameter	Result	MDL	EQL	Units	Collection Date	Analysis Date
884631-003	#3 PIT LAKE	Mercury	0.011	0.0024	0.010	mg/Kg wet	06/05/07	06/15/07
884631-003	#3 PIT LAKE	Molybdenum	0.14	0.016	1.0	mg/Kg wet	06/05/07	06/21/07
884631-003	#3 PIT LAKE	Nickel	1.5	0.34	1.0	mg/Kg wet	06/05/07	06/21/07
884631-003	#3 PIT LAKE	Selenium	0.62	0.045	0.10	mg/Kg wet	06/05/07	06/21/07
884631-003	#3 PIT LAKE	Silver	0.011	0.011	0.050	mg/Kg wet	06/05/07	06/27/07
884631-003	#3 PIT LAKE	Strontium	4.7	0.057	1.0	mg/Kg wet	06/05/07	06/21/07

Table 4. Humboldt Mill Project Summary of 2007 Fish Contaminants Data
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884631-003	#3 PIT LAKE	Zinc	13	1.4	5.0	mg/Kg wet	06/05/07	06/21/07
884631-003	#3 PIT LAKE	Percent Solids	21.1			% wet	06/05/07	07/03/07
884631-004	#4 PIT LAKE	Aluminum	46	0.36	5.0	mg/Kg wet	06/05/07	06/21/07
884631-004	#4 PIT LAKE	Antimony	0.20	0.0085	0.10	mg/Kg wet	06/05/07	06/27/07
884631-004	#4 PIT LAKE	Arsenic	0.22	0.013	0.10	mg/Kg wet	06/05/07	06/21/07
884631-004	#4 PIT LAKE	Barium	0.72	0.034	0.10	mg/Kg wet	06/05/07	06/21/07
884631-004	#4 PIT LAKE	Beryllium	0.0070	0.0070	0.10	mg/Kg wet	06/05/07	06/21/07
884631-004	#4 PIT LAKE	Boron	0.22	0.031	1.0	mg/Kg wet	06/05/07	06/21/07
884631-004	#4 PIT LAKE	Cadmium	0.010	0.0081	0.10	mg/Kg wet	06/05/07	06/21/07
884631-004	#4 PIT LAKE	Chromium	0.20	0.038	0.10	mg/Kg wet	06/05/07	06/21/07
884631-004	#4 PIT LAKE	Cobalt	0.27	0.0061	0.10	mg/Kg wet	06/05/07	06/21/07
884631-004	#4 PIT LAKE	Copper	2.9	0.13	1.0	mg/Kg wet	06/05/07	06/21/07
884631-004	#4 PIT LAKE	Iron	230	1.9	5.0	mg/Kg wet	06/05/07	06/21/07
884631-004	#4 PIT LAKE	Manganese	57	0.082	1.0	mg/Kg wet	06/05/07	06/21/07
884631-004	#4 PIT LAKE	Mercury	0.013	0.0024	0.010	mg/Kg wet	06/05/07	06/15/07
884631-004	#4 PIT LAKE	Molybdenum	0.15	0.016	1.0	mg/Kg wet	06/05/07	06/21/07
884631-004	#4 PIT LAKE	Nickel	3.6	0.34	1.0	mg/Kg wet	06/05/07	06/21/07
884631-004	#4 PIT LAKE	Selenium	0.53	0.045	0.10	mg/Kg wet	06/05/07	06/21/07
884631-004	#4 PIT LAKE	Silver	0.011	0.011	0.050	mg/Kg wet	06/05/07	06/27/07
884631-004	#4 PIT LAKE	Strontium	9.1	0.057	1.0	mg/Kg wet	06/05/07	06/21/07
884631-004	#4 PIT LAKE	Zinc	17	1.4	5.0	mg/Kg wet	06/05/07	06/21/07
884631-004	#4 PIT LAKE	Percent Solids	22.7			% wet	06/05/07	07/03/07
884631-005	#5 PIT LAKE	Aluminum	0.99	0.36	5.0	mg/Kg wet	06/05/07	06/21/07
884631-005	#5 PIT LAKE	Antimony	0.0085	0.0085	0.10	mg/Kg wet	06/05/07	06/27/07
884631-005	#5 PIT LAKE	Arsenic	0.12	0.013	0.10	mg/Kg wet	06/05/07	06/21/07
884631-005	#5 PIT LAKE	Barium	0.51	0.034	0.10	mg/Kg wet	06/05/07	06/21/07
884631-005	#5 PIT LAKE	Beryllium	0.0070	0.0070	0.10	mg/Kg wet	06/05/07	06/21/07
884631-005	#5 PIT LAKE	Boron	0.10	0.031	1.0	mg/Kg wet	06/05/07	06/21/07
884631-005	#5 PIT LAKE	Cadmium	0.0081	0.0081	0.10	mg/Kg wet	06/05/07	06/21/07
884631-005	#5 PIT LAKE	Chromium	0.12	0.038	0.10	mg/Kg wet	06/05/07	06/21/07
Lab Sample Number	Field ID	Parameter	Result	MDL	EQL	Units	Collection Date	Analysis Date
884631-005	#5 PIT LAKE	Cobalt	0.052	0.0061	0.10	mg/Kg wet	06/05/07	06/21/07
884631-005	#5 PIT LAKE	Copper	0.93	0.13	1.0	mg/Kg wet	06/05/07	06/21/07
884631-005	#5 PIT LAKE	Iron	32	1.9	5.0	mg/Kg wet	06/05/07	06/21/07
884631-005	#5 PIT LAKE	Manganese	13	0.082	1.0	mg/Kg wet	06/05/07	06/21/07
884631-005	#5 PIT LAKE	Mercury	0.0064	0.0024	0.010	mg/Kg wet	06/05/07	06/15/07
884631-005	#5 PIT LAKE	Molybdenum	0.041	0.016	1.0	mg/Kg wet	06/05/07	06/21/07
884631-005	#5 PIT LAKE	Nickel	0.34	0.34	1.0	mg/Kg wet	06/05/07	06/21/07

Table 4. Humboldt Mill Project Summary of 2007 Fish Contaminants Data
Lab Analysis Data.

884631-005	#5 PIT LAKE	Selenium	0.50	0.045	0.10	mg/Kg wet	06/05/07	06/21/07
884631-005	#5 PIT LAKE	Silver	0.011	0.011	0.050	mg/Kg wet	06/05/07	06/27/07
884631-005	#5 PIT LAKE	Strontium	6.3	0.057	1.0	mg/Kg wet	06/05/07	06/21/07
884631-005	#5 PIT LAKE	Zinc	22	1.4	5.0	mg/Kg wet	06/05/07	06/21/07
884631-005	#5 PIT LAKE	Percent Solids	17.1			% wet	06/05/07	07/03/07
884631-006	#6 PIT LAKE	Aluminum	0.95	0.36	5.0	mg/Kg wet	06/05/07	06/21/07
884631-006	#6 PIT LAKE	Antimony	0.058	0.0085	0.10	mg/Kg wet	06/05/07	06/27/07
884631-006	#6 PIT LAKE	Arsenic	0.10	0.013	0.10	mg/Kg wet	06/05/07	06/21/07
884631-006	#6 PIT LAKE	Barium	0.28	0.034	0.10	mg/Kg wet	06/05/07	06/21/07
884631-006	#6 PIT LAKE	Beryllium	0.0070	0.0070	0.10	mg/Kg wet	06/05/07	06/21/07
884631-006	#6 PIT LAKE	Boron	0.24	0.031	1.0	mg/Kg wet	06/05/07	06/21/07
884631-006	#6 PIT LAKE	Cadmium	0.0081	0.0081	0.10	mg/Kg wet	06/05/07	06/21/07
884631-006	#6 PIT LAKE	Chromium	0.12	0.038	0.10	mg/Kg wet	06/05/07	06/21/07
884631-006	#6 PIT LAKE	Cobalt	0.16	0.0061	0.10	mg/Kg wet	06/05/07	06/21/07
884631-006	#6 PIT LAKE	Copper	1.4	0.13	1.0	mg/Kg wet	06/05/07	06/21/07
884631-006	#6 PIT LAKE	Iron	40	1.9	5.0	mg/Kg wet	06/05/07	06/21/07
884631-006	#6 PIT LAKE	Manganese	23	0.082	1.0	mg/Kg wet	06/05/07	06/21/07
884631-006	#6 PIT LAKE	Mercury	0.017	0.0024	0.010	mg/Kg wet	06/05/07	06/15/07
884631-006	#6 PIT LAKE	Molybdenum	0.091	0.016	1.0	mg/Kg wet	06/05/07	06/21/07
884631-006	#6 PIT LAKE	Nickel	1.7	0.34	1.0	mg/Kg wet	06/05/07	06/21/07
884631-006	#6 PIT LAKE	Selenium	0.53	0.045	0.10	mg/Kg wet	06/05/07	06/21/07
884631-006	#6 PIT LAKE	Silver	0.011	0.011	0.050	mg/Kg wet	06/05/07	06/27/07
884631-006	#6 PIT LAKE	Strontium	8.8	0.057	1.0	mg/Kg wet	06/05/07	06/21/07
884631-006	#6 PIT LAKE	Zinc	20	1.4	5.0	mg/Kg wet	06/05/07	06/21/07
884631-006	#6 PIT LAKE	Percent Solids	21.6			% wet	06/05/07	07/03/07
884631-007	#7 PIT LAKE	Aluminum	0.83	0.36	5.0	mg/Kg wet	06/05/07	06/21/07
884631-007	#7 PIT LAKE	Antimony	0.011	0.0085	0.10	mg/Kg wet	06/05/07	06/27/07
884631-007	#7 PIT LAKE	Arsenic	0.12	0.013	0.10	mg/Kg wet	06/05/07	06/21/07
884631-007	#7 PIT LAKE	Barium	0.32	0.034	0.10	mg/Kg wet	06/05/07	06/21/07
Lab Sample Number	Field ID	Parameter	Result	MDL	EQL	Units	Collection Date	Analysis Date
884631-007	#7 PIT LAKE	Beryllium	0.0070	0.0070	0.10	mg/Kg wet	06/05/07	06/21/07
884631-007	#7 PIT LAKE	Boron	0.11	0.031	1.0	mg/Kg wet	06/05/07	06/21/07
884631-007	#7 PIT LAKE	Cadmium	0.0081	0.0081	0.10	mg/Kg wet	06/05/07	06/21/07
884631-007	#7 PIT LAKE	Chromium	0.13	0.038	0.10	mg/Kg wet	06/05/07	06/21/07
884631-007	#7 PIT LAKE	Cobalt	0.042	0.0061	0.10	mg/Kg wet	06/05/07	06/21/07
884631-007	#7 PIT LAKE	Copper	0.54	0.13	1.0	mg/Kg wet	06/05/07	06/21/07
884631-007	#7 PIT LAKE	Iron	39	1.9	5.0	mg/Kg wet	06/05/07	06/21/07
884631-007	#7 PIT LAKE	Manganese	12	0.082	1.0	mg/Kg wet	06/05/07	06/21/07

Table 4. Humboldt Mill Project Summary of 2007 Fish Contaminants Data
Lab Analysis Data.

884631-007	#7 PIT LAKE	Mercury	0.0068	0.0024	0.010	mg/Kg wet	06/05/07	06/15/07
884631-007	#7 PIT LAKE	Molybdenum	0.041	0.016	1.0	mg/Kg wet	06/05/07	06/21/07
884631-007	#7 PIT LAKE	Nickel	0.34	0.34	1.0	mg/Kg wet	06/05/07	06/21/07
884631-007	#7 PIT LAKE	Selenium	0.37	0.045	0.10	mg/Kg wet	06/05/07	06/21/07
884631-007	#7 PIT LAKE	Silver	0.011	0.011	0.050	mg/Kg wet	06/05/07	06/27/07
884631-007	#7 PIT LAKE	Strontium	8.1	0.057	1.0	mg/Kg wet	06/05/07	06/21/07
884631-007	#7 PIT LAKE	Zinc	22	1.4	5.0	mg/Kg wet	06/05/07	06/21/07
884631-007	#7 PIT LAKE	Percent Solids	22.2			% wet	06/05/07	07/03/07
884631-008	#8 PIT LAKE	Aluminum	0.66	0.36	5.0	mg/Kg wet	06/05/07	06/21/07
884631-008	#8 PIT LAKE	Antimony	0.0085	0.0085	0.10	mg/Kg wet	06/05/07	06/27/07
884631-008	#8 PIT LAKE	Arsenic	0.092	0.013	0.10	mg/Kg wet	06/05/07	06/21/07
884631-008	#8 PIT LAKE	Barium	0.33	0.034	0.10	mg/Kg wet	06/05/07	06/21/07
884631-008	#8 PIT LAKE	Beryllium	0.0070	0.0070	0.10	mg/Kg wet	06/05/07	06/21/07
884631-008	#8 PIT LAKE	Boron	0.17	0.031	1.0	mg/Kg wet	06/05/07	06/21/07
884631-008	#8 PIT LAKE	Cadmium	0.0081	0.0081	0.10	mg/Kg wet	06/05/07	06/21/07
884631-008	#8 PIT LAKE	Chromium	0.096	0.038	0.10	mg/Kg wet	06/05/07	06/21/07
884631-008	#8 PIT LAKE	Cobalt	0.041	0.0061	0.10	mg/Kg wet	06/05/07	06/21/07
884631-008	#8 PIT LAKE	Copper	0.85	0.13	1.0	mg/Kg wet	06/05/07	06/21/07
884631-008	#8 PIT LAKE	Iron	46	1.9	5.0	mg/Kg wet	06/05/07	06/21/07
884631-008	#8 PIT LAKE	Manganese	9.4	0.082	1.0	mg/Kg wet	06/05/07	06/21/07
884631-008	#8 PIT LAKE	Mercury	0.012	0.0024	0.010	mg/Kg wet	06/05/07	06/15/07
884631-008	#8 PIT LAKE	Molybdenum	0.19	0.016	1.0	mg/Kg wet	06/05/07	06/21/07
884631-008	#8 PIT LAKE	Nickel	0.37	0.34	1.0	mg/Kg wet	06/05/07	06/21/07
884631-008	#8 PIT LAKE	Selenium	0.48	0.045	0.10	mg/Kg wet	06/05/07	06/21/07
884631-008	#8 PIT LAKE	Silver	0.011	0.011	0.050	mg/Kg wet	06/05/07	06/27/07
884631-008	#8 PIT LAKE	Strontium	14	0.057	1.0	mg/Kg wet	06/05/07	06/21/07
884631-008	#8 PIT LAKE	Zinc	14	1.4	5.0	mg/Kg wet	06/05/07	06/21/07
884631-008	#8 PIT LAKE	Percent Solids	19.9			% wet	06/05/07	07/03/07
Lab Sample Number	Field ID	Parameter	Result	MDL	EQL	Units	Collection Date	Analysis Date
884631-009	#9 PIT LAKE	Aluminum	1.2	0.36	5.0	mg/Kg wet	06/05/07	06/21/07
884631-009	#9 PIT LAKE	Antimony	0.0085	0.0085	0.10	mg/Kg wet	06/05/07	06/27/07
884631-009	#9 PIT LAKE	Arsenic	0.27	0.013	0.10	mg/Kg wet	06/05/07	06/21/07
884631-009	#9 PIT LAKE	Barium	0.41	0.034	0.10	mg/Kg wet	06/05/07	06/21/07
884631-009	#9 PIT LAKE	Beryllium	0.0070	0.0070	0.10	mg/Kg wet	06/05/07	06/21/07
884631-009	#9 PIT LAKE	Boron	0.13	0.031	1.0	mg/Kg wet	06/05/07	06/21/07
884631-009	#9 PIT LAKE	Cadmium	0.0081	0.0081	0.10	mg/Kg wet	06/05/07	06/21/07
884631-009	#9 PIT LAKE	Chromium	0.099	0.038	0.10	mg/Kg wet	06/05/07	06/21/07
884631-009	#9 PIT LAKE	Cobalt	0.064	0.0061	0.10	mg/Kg wet	06/05/07	06/21/07

Table 4. Humboldt Mill Project Summary of 2007 Fish Contaminants Data
Lab Analysis Data.

884631-009	#9 PIT LAKE	Copper	0.75	0.13	1.0	mg/Kg wet	06/05/07	06/21/07
884631-009	#9 PIT LAKE	Iron	80	1.9	5.0	mg/Kg wet	06/05/07	06/21/07
884631-009	#9 PIT LAKE	Manganese	9.1	0.082	1.0	mg/Kg wet	06/05/07	06/21/07
884631-009	#9 PIT LAKE	Mercury	0.016	0.0024	0.010	mg/Kg wet	06/05/07	06/15/07
884631-009	#9 PIT LAKE	Molybdenum	0.043	0.016	1.0	mg/Kg wet	06/05/07	06/21/07
884631-009	#9 PIT LAKE	Nickel	0.52	0.34	1.0	mg/Kg wet	06/05/07	06/21/07
884631-009	#9 PIT LAKE	Selenium	0.46	0.045	0.10	mg/Kg wet	06/05/07	06/21/07
884631-009	#9 PIT LAKE	Silver	0.011	0.011	0.050	mg/Kg wet	06/05/07	06/27/07
884631-009	#9 PIT LAKE	Strontium	9.7	0.057	1.0	mg/Kg wet	06/05/07	06/21/07
884631-009	#9 PIT LAKE	Zinc	20	1.4	5.0	mg/Kg wet	06/05/07	06/21/07
884631-009	#9 PIT LAKE	Percent Solids	20.4			% wet	06/05/07	07/03/07
884631-010	#10 PIT LAKE	Aluminum	0.93	0.36	5.0	mg/Kg wet	06/05/07	06/21/07
884631-010	#10 PIT LAKE	Antimony	0.028	0.0085	0.10	mg/Kg wet	06/05/07	06/27/07
884631-010	#10 PIT LAKE	Arsenic	0.089	0.013	0.10	mg/Kg wet	06/05/07	06/21/07
884631-010	#10 PIT LAKE	Barium	0.44	0.034	0.10	mg/Kg wet	06/05/07	06/21/07
884631-010	#10 PIT LAKE	Beryllium	0.0070	0.0070	0.10	mg/Kg wet	06/05/07	06/21/07
884631-010	#10 PIT LAKE	Boron	0.14	0.031	1.0	mg/Kg wet	06/05/07	06/21/07
884631-010	#10 PIT LAKE	Cadmium	0.0081	0.0081	0.10	mg/Kg wet	06/05/07	06/21/07
884631-010	#10 PIT LAKE	Chromium	0.13	0.038	0.10	mg/Kg wet	06/05/07	06/21/07
884631-010	#10 PIT LAKE	Cobalt	0.096	0.0061	0.10	mg/Kg wet	06/05/07	06/21/07
884631-010	#10 PIT LAKE	Copper	1.1	0.13	1.0	mg/Kg wet	06/05/07	06/21/07
884631-010	#10 PIT LAKE	Iron	56	1.9	5.0	mg/Kg wet	06/05/07	06/21/07
884631-010	#10 PIT LAKE	Manganese	44	0.082	1.0	mg/Kg wet	06/05/07	06/21/07
884631-010	#10 PIT LAKE	Mercury	0.0096	0.0024	0.010	mg/Kg wet	06/05/07	06/15/07
884631-010	#10 PIT LAKE	Molybdenum	0.076	0.016	1.0	mg/Kg wet	06/05/07	06/21/07
884631-010	#10 PIT LAKE	Nickel	1.2	0.34	1.0	mg/Kg wet	06/05/07	06/21/07
884631-010	#10 PIT LAKE	Selenium	0.56	0.045	0.10	mg/Kg wet	06/05/07	06/21/07
Lab Sample Number	Field ID	Parameter	Result	MDL	EQL	Units	Collection Date	Analysis Date
884631-010	#10 PIT LAKE	Silver	0.011	0.011	0.050	mg/Kg wet	06/05/07	06/27/07
884631-010	#10 PIT LAKE	Strontium	11	0.057	1.0	mg/Kg wet	06/05/07	06/21/07
884631-010	#10 PIT LAKE	Zinc	19	1.4	5.0	mg/Kg wet	06/05/07	06/21/07
884631-010	#10 PIT LAKE	Percent Solids	23.4			% wet	06/05/07	07/03/07

Attachment 1

Analytical Laboratories Reports
Batch No.'s 884529 and 884631)

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, Inc.
1241 Bellevue Street, Suite 9
Green Bay, WI 54302
Phone: 920.469.2436
Fax: 920.469.8827

July 6, 2007

Andrea Martin
Foth & Van Dyke
2737 South Ridge Road
Green Bay, WI 54304

Dear Ms. Martin:

Enclosed is a report for the metals and moisture analysis of fish samples for the Humboldt Lory and Pit Lake sites (06W003). The samples were assigned to batch numbers 884529 and 884631 for laboratory tracking purposes.

If you have any questions regarding this data please call me at (608) 232-3300 ext. 302.

Sincerely,

Marge Allen-Trinkner for Tod N.

Tod Noltemeyer
Project Manager

Pace Analytical®

1241 Bellevue Street, Suite 9
Green Bay, WI 54302
920-469-2436, Fax: 920-469-8827

Analytical Report Number: 884529

Client: FOTH INFRASTRUCTURE & ENVIRONMENT

Lab Contact: Tod Noltemeyer

Project Name: HUMBOLDT LAKE LORY

Project Number: 06W003

Lab Sample Number	Field ID	Matrix	Collection Date
884529-001	#1 LAKE LORY	BIOTA	06/04/07 08:15
884529-002	#2 LAKE LORY	BIOTA	06/04/07 08:30
884529-003	#3 LAKE LORY	BIOTA	06/04/07 09:15
884529-004	#4 LAKE LORY	BIOTA	06/04/07 09:56
884529-005	#5 LAKE LORY	BIOTA	06/04/07 10:30
884529-006	#6 LAKE LORY	BIOTA	06/04/07 10:32
884529-007	#7 LAKE LORY	BIOTA	06/04/07 10:32
884529-008	#8 LAKE LORY	BIOTA	06/04/07 10:41
884529-009	#9 LAKE LORY	BIOTA	06/04/07 11:02
884529-010	#10 LAKE LORY	BIOTA	06/04/07 11:15

I certify that the data contained in this Final Report has been generated and reviewed in accordance with approved methods and Laboratory Standard Operating Procedure. Exceptions, if any, are discussed in the accompanying sample comments. Release of this final report is authorized by Laboratory management, as is verified by the following signature. This report shall not be reproduced, except in full, without the written consent of Pace Analytical Services, Inc. The sample results relate only to the analytes of interest tested.

Results reported herein conform to the most current NELAC standards, where applicable, unless otherwise narrated in the body of the report.

REPORT OF LABORATORY ANALYSIS

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Marge Allen-Trunkner for Tod N.
Approval Signature

7.9.07
Date

Pace Analytical®

1241 Bellevue Street, Suite 9
Green Bay, WI 54302
920-469-2436, Fax: 920-469-8827

Analytical Report Number: 884631

Client: FOTH INFRASTRUCTURE & ENVIRONMENT
Lab Contact: Tod Noltemeyer
Project Name: HUMBOLDT PIT LAKE
Project Number: 06W003

Lab Sample Number	Field ID	Matrix	Collection Date
884631-001	#1 PIT LAKE	BIOTA	06/05/07
884631-002	#2 PIT LAKE	BIOTA	06/05/07
884631-003	#3 PIT LAKE	BIOTA	06/05/07
884631-004	#4 PIT LAKE	BIOTA	06/05/07
884631-005	#5 PIT LAKE	BIOTA	06/05/07
884631-006	#6 PIT LAKE	BIOTA	06/05/07
884631-007	#7 PIT LAKE	BIOTA	06/05/07
884631-008	#8 PIT LAKE	BIOTA	06/05/07
884631-009	#9 PIT LAKE	BIOTA	06/05/07
884631-010	#10 PIT LAKE	BIOTA	06/05/07

I certify that the data contained in this Final Report has been generated and reviewed in accordance with approved methods and Laboratory Standard Operating Procedure. Exceptions, if any, are discussed in the accompanying sample comments. Release of this final report is authorized by Laboratory management, as is verified by the following signature. This report shall not be reproduced, except in full, without the written consent of Pace Analytical Services, Inc. The sample results relate only to the analytes of interest tested.

Results reported herein conform to the most current NELAC standards, where applicable, unless otherwise narrated in the body of the report.

REPORT OF LABORATORY ANALYSIS

This report shall not be reproduced, except in full, without the written consent of Pace Analytical Services, Inc..

Approval Signature **Date**

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436

Analytical Report Number: 884529

Client : FOTH INFRASTRUCTURE & ENVIRONMENT
Project Name : HUMBOLDT LAKE LORY
Project Number : 06W003
Field ID : #1 LAKE LORY

Matrix Type : BIOTA
Collection Date : 06/04/07
Report Date : 07/09/07
Lab Sample Number : 884529-001

INORGANICS

Test	Result	MDL	EQL	Dil.	Units	Code	Anl Date/Time	Prep Method	Anl Method
Aluminum	17	0.36	5.0	1	mg/Kg wet		06/21/07 02:58 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Antimony	0.0085	U 0.0085	0.10	1	mg/Kg wet		06/27/07 11:24 AM	SW846 3050B	SW846 6020
							Prep Date/Time: 06/19/07 11:15 AM	Anl By: AWH	
Arsenic	0.093	B 0.013	0.10	1	mg/Kg wet		06/21/07 02:58 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Barium	0.91	0.034	0.10	1	mg/Kg wet		06/21/07 02:58 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Beryllium	0.0080	B 0.0070	0.10	1	mg/Kg wet		06/21/07 02:58 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Boron	0.19	B 0.031	1.0	1	mg/Kg wet	AN	06/21/07 02:58 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Cadmium	0.017	B 0.0081	0.10	1	mg/Kg wet		06/21/07 02:58 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Chromium	0.24	0.038	0.10	1	mg/Kg wet		06/21/07 02:58 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Cobalt	0.035	B 0.0061	0.10	1	mg/Kg wet		06/21/07 02:58 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Copper	0.66	B 0.13	1.0	1	mg/Kg wet		06/21/07 02:58 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Iron	95	1.9	5.0	1	mg/Kg wet		06/21/07 02:58 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Manganese	19	0.082	1.0	1	mg/Kg wet	N	06/21/07 02:58 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Mercury	0.086	0.0024	0.010	1	mg/Kg wet		06/15/07 05:14 PM	SW846 M7471	SW846 M7471
							Prep Date/Time: 06/15/07 03:15 PM	Anl By: MSB	
Molybdenum	0.12	B 0.016	1.0	1	mg/Kg wet		06/21/07 02:58 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Nickel	0.34	U 0.34	1.0	1	mg/Kg wet		06/21/07 02:58 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Selenium	0.58	0.045	0.10	1	mg/Kg wet		06/21/07 02:58 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Silver	0.011	U 0.011	0.050	1	mg/Kg wet		06/27/07 11:24 AM	SW846 3050B	SW846 6020
							Prep Date/Time: 06/19/07 11:15 AM	Anl By: AWH	
Strontium	17	0.057	1.0	1	mg/Kg wet	N	06/21/07 02:58 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Zinc	19	1.4	5.0	1	mg/Kg wet	N	06/21/07 02:58 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Percent Solids	26.0	—	—	1	% wet		07/03/07	SM 2540G M	SM 2540G M
							Prep Date/Time: 07/03/07	Anl By: JAL	

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Analytical Report Number: 884529

Client : FOTH INFRASTRUCTURE & ENVIRONMENT
Project Name : HUMBOLDT LAKE LORY
Project Number : 06W003
Field ID : #2 LAKE LORY

Matrix Type : BIOTA
Collection Date : 06/04/07
Report Date : 07/09/07
Lab Sample Number : 884529-002

INORGANICS

Test	Result	MDL	EQL	Dil.	Units	Code	Anl Date/Time	Prep Method	Anl Method
Aluminum	15	0.36	5.0	1	mg/Kg wet		06/21/07 03:21 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Antimony	0.016	B 0.0085	0.10	1	mg/Kg wet		06/27/07 11:44 AM	SW846 3050B	SW846 6020
							Prep Date/Time: 06/19/07 11:15 AM	Anl By: AWH	
Arsenic	0.12	0.013	0.10	1	mg/Kg wet		06/21/07 03:21 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Barium	0.68	0.034	0.10	1	mg/Kg wet		06/21/07 03:21 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Beryllium	0.010	B 0.0070	0.10	1	mg/Kg wet		06/21/07 03:21 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Boron	0.32	B 0.031	1.0	1	mg/Kg wet	A	06/21/07 03:21 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Cadmium	0.011	B 0.0081	0.10	1	mg/Kg wet		06/21/07 03:21 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Chromium	0.19	0.038	0.10	1	mg/Kg wet		06/21/07 03:21 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Cobalt	0.034	B 0.0061	0.10	1	mg/Kg wet		06/21/07 03:21 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Copper	0.33	B 0.13	1.0	1	mg/Kg wet		06/21/07 03:21 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Iron	93	1.9	5.0	1	mg/Kg wet		06/21/07 03:21 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Manganese	12	0.082	1.0	1	mg/Kg wet		06/21/07 03:21 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Mercury	0.085	0.0024	0.010	1	mg/Kg wet		06/15/07 05:18 PM	SW846 M7471	SW846 M7471
							Prep Date/Time: 06/15/07 03:15 PM	Anl By: MSB	
Molybdenum	0.083	B 0.016	1.0	1	mg/Kg wet		06/21/07 03:21 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Nickel	0.34	U 0.34	1.0	1	mg/Kg wet		06/21/07 03:21 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Selenium	0.41	0.045	0.10	1	mg/Kg wet		06/21/07 03:21 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Silver	0.011	U 0.011	0.050	1	mg/Kg wet		06/27/07 11:44 AM	SW846 3050B	SW846 6020
							Prep Date/Time: 06/19/07 11:15 AM	Anl By: AWH	
Strontium	11	0.057	1.0	1	mg/Kg wet		06/21/07 03:21 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Zinc	14	1.4	5.0	1	mg/Kg wet		06/21/07 03:21 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Percent Solids	24.2	—	—	1	% wet		07/03/07	SM 2540G M	SM 2540G M
							Prep Date/Time: 07/03/07	Anl By: JAL	

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Analytical Report Number: 884529

Client : FOTH INFRASTRUCTURE & ENVIRONMENT
Project Name : HUMBOLDT LAKE LORY
Project Number : 06W003
Field ID : #3 LAKE LORY

Matrix Type : BIOTA
Collection Date : 06/04/07
Report Date : 07/09/07
Lab Sample Number : 884529-003

INORGANICS

Test	Result	MDL	EQL	Dil.	Units	Code	Anl Date/Time	Prep Method	Anl Method
Aluminum	1.2	B 0.36	5.0	1	mg/Kg wet		06/21/07 03:36 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Antimony	0.0085	U 0.0085	0.10	1	mg/Kg wet		06/27/07 11:52 AM	SW846 3050B	SW846 6020
							Prep Date/Time: 06/19/07 11:15 AM	Anl By: AWH	
Arsenic	0.045	B 0.013	0.10	1	mg/Kg wet		06/21/07 03:36 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Barium	0.46	0.034	0.10	1	mg/Kg wet		06/21/07 03:36 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Beryllium	0.0070	U 0.0070	0.10	1	mg/Kg wet		06/21/07 03:36 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Boron	0.12	B 0.031	1.0	1	mg/Kg wet	A	06/21/07 03:36 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Cadmium	0.0090	B 0.0081	0.10	1	mg/Kg wet		06/21/07 03:36 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Chromium	0.12	0.038	0.10	1	mg/Kg wet		06/21/07 03:36 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Cobalt	0.014	B 0.0061	0.10	1	mg/Kg wet		06/21/07 03:36 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Copper	0.29	B 0.13	1.0	1	mg/Kg wet		06/21/07 03:36 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Iron	55	1.9	5.0	1	mg/Kg wet		06/21/07 03:36 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Manganese	6.2	0.082	1.0	1	mg/Kg wet		06/21/07 03:36 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Mercury	0.064	0.0024	0.010	1	mg/Kg wet		06/15/07 05:19 PM	SW846 M7471	SW846 M7471
							Prep Date/Time: 06/15/07 03:15 PM	Anl By: MSB	
Molybdenum	0.088	B 0.016	1.0	1	mg/Kg wet		06/21/07 03:36 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Nickel	0.34	U 0.34	1.0	1	mg/Kg wet		06/21/07 03:36 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Selenium	0.40	0.045	0.10	1	mg/Kg wet		06/21/07 03:36 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Silver	0.011	U 0.011	0.050	1	mg/Kg wet		06/27/07 11:52 AM	SW846 3050B	SW846 6020
							Prep Date/Time: 06/19/07 11:15 AM	Anl By: AWH	
Strontium	10	0.057	1.0	1	mg/Kg wet		06/21/07 03:36 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Zinc	16	1.4	5.0	1	mg/Kg wet		06/21/07 03:36 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Percent Solids	25.5	—	—	1	% wet		07/03/07	SM 2540G M	SM 2540G M
							Prep Date/Time: 07/03/07	Anl By: JAL	

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Analytical Report Number: 884529

Client : FOTH INFRASTRUCTURE & ENVIRONMENT
Project Name : HUMBOLDT LAKE LORY
Project Number : 06W003
Field ID : #4 LAKE LORY

Matrix Type : BIOTA
Collection Date : 06/04/07
Report Date : 07/09/07
Lab Sample Number : 884529-004

INORGANICS

Test	Result	MDL	EQL	Dil.	Units	Code	Anl Date/Time	Prep Method	Anl Method
Aluminum	9.0	0.36	5.0	1	mg/Kg wet		06/21/07 03:44 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Antimony	0.0085	U 0.0085	0.10	1	mg/Kg wet		06/27/07 11:57 AM	SW846 3050B	SW846 6020
							Prep Date/Time: 06/19/07 11:15 AM	Anl By: AWH	
Arsenic	0.13	0.013	0.10	1	mg/Kg wet		06/21/07 03:44 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Barium	0.74	0.034	0.10	1	mg/Kg wet		06/21/07 03:44 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Beryllium	0.0070	U 0.0070	0.10	1	mg/Kg wet		06/21/07 03:44 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Boron	0.11	B 0.031	1.0	1	mg/Kg wet	A	06/21/07 03:44 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Cadmium	0.010	B 0.0081	0.10	1	mg/Kg wet		06/21/07 03:44 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Chromium	0.28	0.038	0.10	1	mg/Kg wet		06/21/07 03:44 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Cobalt	0.030	B 0.0061	0.10	1	mg/Kg wet		06/21/07 03:44 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Copper	0.35	B 0.13	1.0	1	mg/Kg wet		06/21/07 03:44 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Iron	86	1.9	5.0	1	mg/Kg wet		06/21/07 03:44 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Manganese	20	0.082	1.0	1	mg/Kg wet		06/21/07 03:44 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Mercury	0.083	0.0024	0.010	1	mg/Kg wet		06/15/07 05:21 PM	SW846 M7471	SW846 M7471
							Prep Date/Time: 06/15/07 03:15 PM	Anl By: MSB	
Molybdenum	0.15	B 0.016	1.0	1	mg/Kg wet		06/21/07 03:44 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Nickel	0.34	U 0.34	1.0	1	mg/Kg wet		06/21/07 03:44 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Selenium	0.45	0.045	0.10	1	mg/Kg wet		06/21/07 03:44 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Silver	0.011	U 0.011	0.050	1	mg/Kg wet		06/27/07 11:57 AM	SW846 3050B	SW846 6020
							Prep Date/Time: 06/19/07 11:15 AM	Anl By: AWH	
Strontium	12	0.057	1.0	1	mg/Kg wet		06/21/07 03:44 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Zinc	14	1.4	5.0	1	mg/Kg wet		06/21/07 03:44 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Percent Solids	22.8	---	---	1	% wet		07/03/07	SM 2540G M	SM 2540G M
							Prep Date/Time: 07/03/07	Anl By: JAL	

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Analytical Report Number: 884529

Client : FOTH INFRASTRUCTURE & ENVIRONMENT
Project Name : HUMBOLDT LAKE LORY
Project Number : 06W003
Field ID : #5 LAKE LORY

Matrix Type : BIOTA
Collection Date : 06/04/07
Report Date : 07/09/07
Lab Sample Number : 884529-005

INORGANICS

Test	Result	MDL	EQL	Dil.	Units	Code	Anl Date/Time	Prep Method	Anl Method
Aluminum	1.3	B 0.36	5.0	1	mg/Kg wet		06/21/07 03:52 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Antimony	0.0085	U 0.0085	0.10	1	mg/Kg wet		06/27/07 12:01 PM	SW846 3050B	SW846 6020
							Prep Date/Time: 06/19/07 11:15 AM	Anl By: AWH	
Arsenic	0.054	B 0.013	0.10	1	mg/Kg wet		06/21/07 03:52 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Barium	0.55	0.034	0.10	1	mg/Kg wet		06/21/07 03:52 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Beryllium	0.0070	U 0.0070	0.10	1	mg/Kg wet		06/21/07 03:52 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Boron	0.087	B 0.031	1.0	1	mg/Kg wet	A	06/21/07 03:52 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Cadmium	0.0090	B 0.0081	0.10	1	mg/Kg wet		06/21/07 03:52 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Chromium	0.16	0.038	0.10	1	mg/Kg wet		06/21/07 03:52 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Cobalt	0.015	B 0.0061	0.10	1	mg/Kg wet		06/21/07 03:52 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Copper	0.27	B 0.13	1.0	1	mg/Kg wet		06/21/07 03:52 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Iron	47	1.9	5.0	1	mg/Kg wet		06/21/07 03:52 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Manganese	11	0.082	1.0	1	mg/Kg wet		06/21/07 03:52 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Mercury	0.083	0.0024	0.010	1	mg/Kg wet		06/15/07 05:25 PM	SW846 M7471	SW846 M7471
							Prep Date/Time: 06/15/07 03:15 PM	Anl By: MSB	
Molybdenum	0.065	B 0.016	1.0	1	mg/Kg wet		06/21/07 03:52 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Nickel	0.34	U 0.34	1.0	1	mg/Kg wet		06/21/07 03:52 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Selenium	0.55	0.045	0.10	1	mg/Kg wet		06/21/07 03:52 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Silver	0.011	U 0.011	0.050	1	mg/Kg wet		06/27/07 12:01 PM	SW846 3050B	SW846 6020
							Prep Date/Time: 06/19/07 11:15 AM	Anl By: AWH	
Strontium	11	0.057	1.0	1	mg/Kg wet		06/21/07 03:52 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Zinc	15	1.4	5.0	1	mg/Kg wet		06/21/07 03:52 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Percent Solids	23.7	—	—	1	% wet		07/03/07	SM 2540G M	SM 2540G M
							Prep Date/Time: 07/03/07	Anl By: JAL	

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Analytical Report Number: 884529

Client : FOTH INFRASTRUCTURE & ENVIRONMENT
Project Name : HUMBOLDT LAKE LORY
Project Number : 06W003
Field ID : #6 LAKE LORY

Matrix Type : BIOTA
Collection Date : 06/04/07
Report Date : 07/09/07
Lab Sample Number : 884529-006

INORGANICS

Test	Result	MDL	EQL	Dil.	Units	Code	Anl Date/Time	Prep Method	Anl Method
Aluminum	56	0.36	5.0	1	mg/Kg wet		06/21/07 04:14 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Antimony	0.0085	U 0.0085	0.10	1	mg/Kg wet		06/27/07 12:05 PM	SW846 3050B	SW846 6020
							Prep Date/Time: 06/19/07 11:15 AM	Anl By: AWH	
Arsenic	0.080	B 0.013	0.10	1	mg/Kg wet		06/21/07 04:14 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Barium	0.68	0.034	0.10	1	mg/Kg wet		06/21/07 04:14 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Beryllium	0.0070	U 0.0070	0.10	1	mg/Kg wet		06/21/07 04:14 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Boron	0.16	B 0.031	1.0	1	mg/Kg wet	A	06/21/07 04:14 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Cadmium	0.013	B 0.0081	0.10	1	mg/Kg wet		06/21/07 04:14 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Chromium	0.50	0.038	0.10	1	mg/Kg wet		06/21/07 04:14 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Cobalt	0.057	B 0.0061	0.10	1	mg/Kg wet		06/21/07 04:14 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Copper	0.52	B 0.13	1.0	1	mg/Kg wet		06/21/07 04:14 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Iron	140	1.9	5.0	1	mg/Kg wet		06/21/07 04:14 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Manganese	24	0.082	1.0	1	mg/Kg wet		06/21/07 04:14 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Mercury	0.064	0.0024	0.010	1	mg/Kg wet		06/15/07 05:26 PM	SW846 M7471	SW846 M7471
							Prep Date/Time: 06/15/07 03:15 PM	Anl By: MSB	
Molybdenum	0.11	B 0.016	1.0	1	mg/Kg wet		06/21/07 04:14 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Nickel	0.43	B 0.34	1.0	1	mg/Kg wet		06/21/07 04:14 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Selenium	0.49	0.045	0.10	1	mg/Kg wet		06/21/07 04:14 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Silver	0.011	U 0.011	0.050	1	mg/Kg wet		06/27/07 12:05 PM	SW846 3050B	SW846 6020
							Prep Date/Time: 06/19/07 11:15 AM	Anl By: AWH	
Strontium	20	0.057	1.0	1	mg/Kg wet		06/21/07 04:14 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Zinc	17	1.4	5.0	1	mg/Kg wet		06/21/07 04:14 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Percent Solids	25.8	---	---	1	% wet		07/03/07	SM 2540G M	SM 2540G M
							Prep Date/Time: 07/03/07	Anl By: JAL	

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Analytical Report Number: 884529

Client : FOTH INFRASTRUCTURE & ENVIRONMENT
Project Name : HUMBOLDT LAKE LORY
Project Number : 06W003
Field ID : #7 LAKE LORY

Matrix Type : BIOTA
Collection Date : 06/04/07
Report Date : 07/09/07
Lab Sample Number : 884529-007

INORGANICS

Test	Result	MDL	EQL	Dil.	Units	Code	Anl Date/Time	Prep Method	Anl Method
Aluminum	2.4	B 0.36	5.0	1	mg/Kg wet		06/21/07 04:22 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Antimony	0.0085	U 0.0085	0.10	1	mg/Kg wet		06/27/07 12:09 PM	SW846 3050B	SW846 6020
							Prep Date/Time: 06/19/07 11:15 AM	Anl By: AWH	
Arsenic	0.054	B 0.013	0.10	1	mg/Kg wet		06/21/07 04:22 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Barium	1.0	0.034	0.10	1	mg/Kg wet		06/21/07 04:22 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Beryllium	0.0070	U 0.0070	0.10	1	mg/Kg wet		06/21/07 04:22 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Boron	0.094	B 0.031	1.0	1	mg/Kg wet	A	06/21/07 04:22 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Cadmium	0.0081	U 0.0081	0.10	1	mg/Kg wet		06/21/07 04:22 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Chromium	0.13	0.038	0.10	1	mg/Kg wet		06/21/07 04:22 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Cobalt	0.022	B 0.0061	0.10	1	mg/Kg wet		06/21/07 04:22 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Copper	0.36	B 0.13	1.0	1	mg/Kg wet		06/21/07 04:22 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Iron	65	1.9	5.0	1	mg/Kg wet		06/21/07 04:22 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Manganese	15	0.082	1.0	1	mg/Kg wet		06/21/07 04:22 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Mercury	0.11	0.0024	0.010	1	mg/Kg wet		06/15/07 05:27 PM	SW846 M7471	SW846 M7471
							Prep Date/Time: 06/15/07 03:15 PM	Anl By: MSB	
Molybdenum	0.11	B 0.016	1.0	1	mg/Kg wet		06/21/07 04:22 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Nickel	0.34	U 0.34	1.0	1	mg/Kg wet		06/21/07 04:22 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Selenium	0.45	0.045	0.10	1	mg/Kg wet		06/21/07 04:22 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Silver	0.011	U 0.011	0.050	1	mg/Kg wet		06/27/07 12:09 PM	SW846 3050B	SW846 6020
							Prep Date/Time: 06/19/07 11:15 AM	Anl By: AWH	
Strontium	19	0.057	1.0	1	mg/Kg wet		06/21/07 04:22 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Zinc	19	1.4	5.0	1	mg/Kg wet		06/21/07 04:22 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Percent Solids	21.4	—	—	1	% wet		07/03/07	SM 2540G M	SM 2540G M
							Prep Date/Time: 07/03/07	Anl By: JAL	

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Analytical Report Number: 884529

Client : FOTH INFRASTRUCTURE & ENVIRONMENT
Project Name : HUMBOLDT LAKE LORY
Project Number : 06W003
Field ID : #8 LAKE LORY

Matrix Type : BIOTA
Collection Date : 06/04/07
Report Date : 07/09/07
Lab Sample Number : 884529-008

INORGANICS

Test	Result	MDL	EQL	Dil.	Units	Code	Anl Date/Time	Prep Method	Anl Method
Aluminum	3.7	B 0.36	5.0	1	mg/Kg wet		06/21/07 04:29 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Antimony	0.0085	U 0.0085	0.10	1	mg/Kg wet		06/27/07 12:13 PM	SW846 3050B	SW846 6020
							Prep Date/Time: 06/19/07 11:15 AM	Anl By: AWH	
Arsenic	0.027	B 0.013	0.10	1	mg/Kg wet		06/21/07 04:29 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Barium	0.35	0.034	0.10	1	mg/Kg wet		06/21/07 04:29 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Beryllium	0.0070	U 0.0070	0.10	1	mg/Kg wet		06/21/07 04:29 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Boron	0.079	B 0.031	1.0	1	mg/Kg wet	A	06/21/07 04:29 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Cadmium	0.0081	U 0.0081	0.10	1	mg/Kg wet		06/21/07 04:29 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Chromium	0.15	0.038	0.10	1	mg/Kg wet		06/21/07 04:29 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Cobalt	0.019	B 0.0061	0.10	1	mg/Kg wet		06/21/07 04:29 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Copper	0.29	B 0.13	1.0	1	mg/Kg wet		06/21/07 04:29 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Iron	47	1.9	5.0	1	mg/Kg wet		06/21/07 04:29 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Manganese	4.1	0.082	1.0	1	mg/Kg wet		06/21/07 04:29 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Mercury	0.073	0.0024	0.010	1	mg/Kg wet		06/15/07 05:29 PM	SW846 M7471	SW846 M7471
							Prep Date/Time: 06/15/07 03:15 PM	Anl By: MSB	
Molybdenum	0.067	B 0.016	1.0	1	mg/Kg wet		06/21/07 04:29 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Nickel	0.34	U 0.34	1.0	1	mg/Kg wet		06/21/07 04:29 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Selenium	0.38	0.045	0.10	1	mg/Kg wet		06/21/07 04:29 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Silver	0.011	U 0.011	0.050	1	mg/Kg wet		06/27/07 12:13 PM	SW846 3050B	SW846 6020
							Prep Date/Time: 06/19/07 11:15 AM	Anl By: AWH	
Strontium	8.9	0.057	1.0	1	mg/Kg wet		06/21/07 04:29 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Zinc	16	1.4	5.0	1	mg/Kg wet		06/21/07 04:29 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Percent Solids	24.8	—	—	1	% wet		07/03/07	SM 2540G M	SM 2540G M
							Prep Date/Time: 07/03/07	Anl By: JAL	

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Analytical Report Number: 884529

Client : FOTH INFRASTRUCTURE & ENVIRONMENT
Project Name : HUMBOLDT LAKE LORY
Project Number : 06W003
Field ID : #9 LAKE LORY

Matrix Type : BIOTA
Collection Date : 06/04/07
Report Date : 07/09/07
Lab Sample Number : 884529-009

INORGANICS

Test	Result	MDL	EQL	Dil.	Units	Code	Anl Date/Time	Prep Method	Anl Method
Aluminum	1.5	B 0.36	5.0	1	mg/Kg wet		06/21/07 04:37 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Antimony	0.0085	U 0.0085	0.10	1	mg/Kg wet		06/27/07 12:17 PM	SW846 3050B	SW846 6020
							Prep Date/Time: 06/19/07 11:15 AM	Anl By: AWH	
Arsenic	0.13	0.013	0.10	1	mg/Kg wet		06/21/07 04:37 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Barium	0.75	0.034	0.10	1	mg/Kg wet		06/21/07 04:37 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Beryllium	0.0070	U 0.0070	0.10	1	mg/Kg wet		06/21/07 04:37 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Boron	0.068	B 0.031	1.0	1	mg/Kg wet	A	06/21/07 04:37 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Cadmium	0.011	B 0.0081	0.10	1	mg/Kg wet		06/21/07 04:37 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Chromium	0.12	0.038	0.10	1	mg/Kg wet		06/21/07 04:37 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Cobalt	0.014	B 0.0061	0.10	1	mg/Kg wet		06/21/07 04:37 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Copper	0.33	B 0.13	1.0	1	mg/Kg wet		06/21/07 04:37 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Iron	70	1.9	5.0	1	mg/Kg wet		06/21/07 04:37 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Manganese	18	0.082	1.0	1	mg/Kg wet		06/21/07 04:37 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Mercury	0.058	0.0024	0.010	1	mg/Kg wet		06/15/07 05:30 PM	SW846 M7471	SW846 M7471
							Prep Date/Time: 06/15/07 03:15 PM	Anl By: MSB	
Molybdenum	0.078	B 0.016	1.0	1	mg/Kg wet		06/21/07 04:37 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Nickel	0.34	U 0.34	1.0	1	mg/Kg wet		06/21/07 04:37 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Selenium	0.47	0.045	0.10	1	mg/Kg wet		06/21/07 04:37 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Silver	0.011	U 0.011	0.050	1	mg/Kg wet		06/27/07 12:17 PM	SW846 3050B	SW846 6020
							Prep Date/Time: 06/19/07 11:15 AM	Anl By: AWH	
Strontium	10	0.057	1.0	1	mg/Kg wet		06/21/07 04:37 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Zinc	15	1.4	5.0	1	mg/Kg wet		06/21/07 04:37 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Percent Solids	24.5	—	—	1	% wet		07/03/07	SM 2540G M	SM 2540G M
							Prep Date/Time: 07/03/07	Anl By: JAL	

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Analytical Report Number: 884529

Client : FOTH INFRASTRUCTURE & ENVIRONMENT
Project Name : HUMBOLDT LAKE LORY
Project Number : 06W003
Field ID : #10 LAKE LORY

Matrix Type : BIOTA
Collection Date : 06/04/07
Report Date : 07/09/07
Lab Sample Number : 884529-010

INORGANICS

Test	Result	MDL	EQL	Dil.	Units	Code	Anl Date/Time	Prep Method	Anl Method
Aluminum	0.85	B 0.36	5.0	1	mg/Kg wet		06/21/07 04:45 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Antimony	0.0085	U 0.0085	0.10	1	mg/Kg wet		06/27/07 12:29 PM	SW846 3050B	SW846 6020
							Prep Date/Time: 06/19/07 11:15 AM	Anl By: AWH	
Arsenic	0.052	B 0.013	0.10	1	mg/Kg wet		06/21/07 04:45 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Barium	0.42	0.034	0.10	1	mg/Kg wet		06/21/07 04:45 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Beryllium	0.0070	U 0.0070	0.10	1	mg/Kg wet		06/21/07 04:45 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Boron	0.049	B 0.031	1.0	1	mg/Kg wet	A	06/21/07 04:45 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Cadmium	0.010	B 0.0081	0.10	1	mg/Kg wet		06/21/07 04:45 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Chromium	0.14	0.038	0.10	1	mg/Kg wet		06/21/07 04:45 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Cobalt	0.011	B 0.0061	0.10	1	mg/Kg wet		06/21/07 04:45 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Copper	0.24	B 0.13	1.0	1	mg/Kg wet		06/21/07 04:45 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Iron	35	1.9	5.0	1	mg/Kg wet		06/21/07 04:45 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Manganese	9.8	0.082	1.0	1	mg/Kg wet		06/21/07 04:45 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Mercury	0.083	0.0024	0.010	1	mg/Kg wet		06/15/07 05:31 PM	SW846 M7471	SW846 M7471
							Prep Date/Time: 06/15/07 03:15 PM	Anl By: MSB	
Molybdenum	0.058	B 0.016	1.0	1	mg/Kg wet		06/21/07 04:45 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Nickel	0.34	U 0.34	1.0	1	mg/Kg wet		06/21/07 04:45 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Selenium	0.47	0.045	0.10	1	mg/Kg wet		06/21/07 04:45 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Silver	0.011	U 0.011	0.050	1	mg/Kg wet		06/27/07 12:29 PM	SW846 3050B	SW846 6020
							Prep Date/Time: 06/19/07 11:15 AM	Anl By: AWH	
Strontium	7.9	0.057	1.0	1	mg/Kg wet		06/21/07 04:45 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Zinc	13	1.4	5.0	1	mg/Kg wet		06/21/07 04:45 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Percent Solids	23.8	—	—	1	% wet		07/03/07	SM 2540G M	SM 2540G M
							Prep Date/Time: 07/03/07	Anl By: JAL	

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Analytical Report Number: 884529

Client : FOTH INFRASTRUCTURE & ENVIRONMENT
Project Name : HUMBOLDT PIT LAKE
Project Number : 06W003
Field ID : #1 PIT LAKE

Matrix Type : BIOTA
Collection Date : 06/05/07
Report Date : 07/09/07
Lab Sample Number : 884631-001

INORGANICS

Test	Result	MDL	EQL	Dil.	Units	Code	Anl Date/Time	Prep Method	Anl Method
Aluminum	0.88	B 0.36	5.0	1	mg/Kg wet		06/21/07 04:52 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM		Anl By: AWH
Antimony	0.026	B 0.0085	0.10	1	mg/Kg wet		06/27/07 02:39 AM	SW846 3050B	SW846 6020
							Prep Date/Time: 06/19/07 11:15 AM		Anl By: AWH
Arsenic	0.075	B 0.013	0.10	1	mg/Kg wet		06/21/07 04:52 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM		Anl By: AWH
Barium	0.32	0.034	0.10	1	mg/Kg wet		06/21/07 04:52 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM		Anl By: AWH
Beryllium	0.0070	U 0.0070	0.10	1	mg/Kg wet		06/21/07 04:52 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM		Anl By: AWH
Boron	0.12	B 0.031	1.0	1	mg/Kg wet	A	06/21/07 04:52 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM		Anl By: AWH
Cadmium	0.0081	U 0.0081	0.10	1	mg/Kg wet		06/21/07 04:52 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM		Anl By: AWH
Chromium	0.11	0.038	0.10	1	mg/Kg wet		06/21/07 04:52 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM		Anl By: AWH
Cobalt	0.069	B 0.0061	0.10	1	mg/Kg wet		06/21/07 04:52 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM		Anl By: AWH
Copper	0.89	B 0.13	1.0	1	mg/Kg wet		06/21/07 04:52 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM		Anl By: AWH
Iron	50	1.9	5.0	1	mg/Kg wet		06/21/07 04:52 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM		Anl By: AWH
Manganese	29	0.082	1.0	1	mg/Kg wet		06/21/07 04:52 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM		Anl By: AWH
Mercury	0.013	0.0024	0.010	1	mg/Kg wet		06/15/07 05:33 PM	SW846 M7471	SW846 M7471
							Prep Date/Time: 06/15/07 03:15 PM		Anl By: MSB
Molybdenum	0.057	B 0.016	1.0	1	mg/Kg wet		06/21/07 04:52 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM		Anl By: AWH
Nickel	0.69	B 0.34	1.0	1	mg/Kg wet		06/21/07 04:52 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM		Anl By: AWH
Selenium	0.54	0.045	0.10	1	mg/Kg wet		06/21/07 04:52 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM		Anl By: AWH
Silver	0.011	U 0.011	0.050	1	mg/Kg wet		06/27/07 02:39 AM	SW846 3050B	SW846 6020
							Prep Date/Time: 06/19/07 11:15 AM		Anl By: AWH
Strontium	8.5	0.057	1.0	1	mg/Kg wet		06/21/07 04:52 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM		Anl By: AWH
Zinc	21	1.4	5.0	1	mg/Kg wet		06/21/07 04:52 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM		Anl By: AWH
Percent Solids	21.3	---	---	1	% wet		07/03/07	SM 2540G M	SM 2540G M
							Prep Date/Time: 07/03/07		Anl By: JAL

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Analytical Report Number: 884529

Client : FOTH INFRASTRUCTURE & ENVIRONMENT
Project Name : HUMBOLDT PIT LAKE
Project Number : 06W003
Field ID : #2 PIT LAKE

Matrix Type : BIOTA
Collection Date : 06/05/07
Report Date : 07/09/07
Lab Sample Number : 884631-002

INORGANICS

Test	Result	MDL	EQL	Dil.	Units	Code	Anl Date/Time	Prep Method	Anl Method
Aluminum	0.92	B 0.36	5.0	1	mg/Kg wet		06/21/07 05:00 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Antimony	0.024	B 0.0085	0.10	1	mg/Kg wet		06/27/07 02:43 AM	SW846 3050B	SW846 6020
							Prep Date/Time: 06/19/07 11:15 AM	Anl By: AWH	
Arsenic	0.061	B 0.013	0.10	1	mg/Kg wet		06/21/07 05:00 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Barium	0.39	0.034	0.10	1	mg/Kg wet		06/21/07 05:00 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Beryllium	0.0070	U 0.0070	0.10	1	mg/Kg wet		06/21/07 05:00 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Boron	0.18	B 0.031	1.0	1	mg/Kg wet	A	06/21/07 05:00 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Cadmium	0.012	B 0.0081	0.10	1	mg/Kg wet		06/21/07 05:00 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Chromium	0.16	0.038	0.10	1	mg/Kg wet		06/21/07 05:00 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Cobalt	0.066	B 0.0061	0.10	1	mg/Kg wet		06/21/07 05:00 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Copper	1.2	0.13	1.0	1	mg/Kg wet		06/21/07 05:00 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Iron	44	1.9	5.0	1	mg/Kg wet		06/21/07 05:00 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Manganese	35	0.082	1.0	1	mg/Kg wet		06/21/07 05:00 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Mercury	0.012	0.0024	0.010	1	mg/Kg wet		06/15/07 05:34 PM	SW846 M7471	SW846 M7471
							Prep Date/Time: 06/15/07 03:15 PM	Anl By: MSB	
Molybdenum	0.044	B 0.016	1.0	1	mg/Kg wet		06/21/07 05:00 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Nickel	0.52	B 0.34	1.0	1	mg/Kg wet		06/21/07 05:00 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Selenium	0.58	0.045	0.10	1	mg/Kg wet		06/21/07 05:00 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Silver	0.011	U 0.011	0.050	1	mg/Kg wet		06/27/07 02:43 AM	SW846 3050B	SW846 6020
							Prep Date/Time: 06/19/07 11:15 AM	Anl By: AWH	
Strontium	11	0.057	1.0	1	mg/Kg wet		06/21/07 05:00 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Zinc	19	1.4	5.0	1	mg/Kg wet		06/21/07 05:00 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Percent Solids	18.6	—	—	1	% wet		07/03/07	SM 2540G M	SM 2540G M
							Prep Date/Time: 07/03/07	Anl By: JAL	

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Analytical Report Number: 884529

Client : FOTH INFRASTRUCTURE & ENVIRONMENT
Project Name : HUMBOLDT PIT LAKE
Project Number : 06W003
Field ID : #3 PIT LAKE

Matrix Type : BIOTA
Collection Date : 06/05/07
Report Date : 07/09/07
Lab Sample Number : 884631-003

INORGANICS

Test	Result	MDL	EQL	Dil.	Units	Code	Anl Date/Time	Prep Method	Anl Method
Aluminum	14	0.36	5.0	1	mg/Kg wet		06/21/07 05:08 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Antimony	0.060	B 0.0085	0.10	1	mg/Kg wet		06/27/07 02:47 AM	SW846 3050B	SW846 6020
							Prep Date/Time: 06/19/07 11:15 AM	Anl By: AWH	
Arsenic	0.83	0.013	0.10	1	mg/Kg wet		06/21/07 05:08 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Barium	0.79	0.034	0.10	1	mg/Kg wet		06/21/07 05:08 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Beryllium	0.0070	U 0.0070	0.10	1	mg/Kg wet		06/21/07 05:08 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Boron	0.12	B 0.031	1.0	1	mg/Kg wet	A	06/21/07 05:08 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Cadmium	0.0081	U 0.0081	0.10	1	mg/Kg wet		06/21/07 05:08 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Chromium	0.25	0.038	0.10	1	mg/Kg wet		06/21/07 05:08 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Cobalt	0.16	0.0061	0.10	1	mg/Kg wet		06/21/07 05:08 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Copper	2.7	0.13	1.0	1	mg/Kg wet		06/21/07 05:08 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Iron	450	1.9	5.0	1	mg/Kg wet		06/21/07 05:08 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Manganese	19	0.082	1.0	1	mg/Kg wet		06/21/07 05:08 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Mercury	0.011	0.0024	0.010	1	mg/Kg wet		06/15/07 05:35 PM	SW846 M7471	SW846 M7471
							Prep Date/Time: 06/15/07 03:15 PM	Anl By: MSB	
Molybdenum	0.14	B 0.016	1.0	1	mg/Kg wet		06/21/07 05:08 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Nickel	1.5	0.34	1.0	1	mg/Kg wet		06/21/07 05:08 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Selenium	0.62	0.045	0.10	1	mg/Kg wet		06/21/07 05:08 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Silver	0.011	U 0.011	0.050	1	mg/Kg wet		06/27/07 02:47 AM	SW846 3050B	SW846 6020
							Prep Date/Time: 06/19/07 11:15 AM	Anl By: AWH	
Strontium	4.7	0.057	1.0	1	mg/Kg wet		06/21/07 05:08 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Zinc	13	1.4	5.0	1	mg/Kg wet		06/21/07 05:08 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Percent Solids	21.1	---	---	1	% wet		07/03/07	SM 2540G M	SM 2540G M
							Prep Date/Time: 07/03/07	Anl By: JAL	

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Analytical Report Number: 884529

Client : FOTH INFRASTRUCTURE & ENVIRONMENT
Project Name : HUMBOLDT PIT LAKE
Project Number : 06W003
Field ID : #4 PIT LAKE

Matrix Type : BIOTA
Collection Date : 06/05/07
Report Date : 07/09/07
Lab Sample Number : 884631-004

INORGANICS

Test	Result	MDL	EQL	Dil.	Units	Code	Anl Date/Time	Prep Method	Anl Method
Aluminum	46	0.36	5.0	1	mg/Kg wet		06/21/07 05:16 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Antimony	0.20	0.0085	0.10	1	mg/Kg wet		06/27/07 02:51 AM	SW846 3050B	SW846 6020
							Prep Date/Time: 06/19/07 11:15 AM	Anl By: AWH	
Arsenic	0.22	0.013	0.10	1	mg/Kg wet		06/21/07 05:16 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Barium	0.72	0.034	0.10	1	mg/Kg wet		06/21/07 05:16 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Beryllium	0.0070	B 0.0070	0.10	1	mg/Kg wet		06/21/07 05:16 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Boron	0.22	B 0.031	1.0	1	mg/Kg wet	A	06/21/07 05:16 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Cadmium	0.010	B 0.0081	0.10	1	mg/Kg wet		06/21/07 05:16 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Chromium	0.20	0.038	0.10	1	mg/Kg wet		06/21/07 05:16 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Cobalt	0.27	0.0061	0.10	1	mg/Kg wet		06/21/07 05:16 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Copper	2.9	0.13	1.0	1	mg/Kg wet		06/21/07 05:16 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Iron	230	1.9	5.0	1	mg/Kg wet		06/21/07 05:16 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Manganese	57	0.082	1.0	1	mg/Kg wet		06/21/07 05:16 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Mercury	0.013	0.0024	0.010	1	mg/Kg wet		06/15/07 05:37 PM	SW846 M7471	SW846 M7471
							Prep Date/Time: 06/15/07 03:15 PM	Anl By: MSB	
Molybdenum	0.15	B 0.016	1.0	1	mg/Kg wet		06/21/07 05:16 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Nickel	3.6	0.34	1.0	1	mg/Kg wet		06/21/07 05:16 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Selenium	0.53	0.045	0.10	1	mg/Kg wet		06/21/07 05:16 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Silver	0.011	U 0.011	0.050	1	mg/Kg wet		06/27/07 02:51 AM	SW846 3050B	SW846 6020
							Prep Date/Time: 06/19/07 11:15 AM	Anl By: AWH	
Strontium	9.1	0.057	1.0	1	mg/Kg wet		06/21/07 05:16 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Zinc	17	1.4	5.0	1	mg/Kg wet		06/21/07 05:16 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Percent Solids	22.7	---	---	1	% wet		07/03/07	SM 2540G M	SM 2540G M
							Prep Date/Time: 07/03/07	Anl By: JAL	

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Analytical Report Number: 884529

Client : FOTH INFRASTRUCTURE & ENVIRONMENT
Project Name : HUMBOLDT PIT LAKE
Project Number : 06W003
Field ID : #5 PIT LAKE

Matrix Type : BIOTA
Collection Date : 06/05/07
Report Date : 07/09/07
Lab Sample Number : 884631-005

INORGANICS

Test	Result	MDL	EQL	Dil.	Units	Code	Anl Date/Time	Prep Method	Anl Method
Aluminum	0.99	B 0.36	5.0	1	mg/Kg wet		06/21/07 05:23 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Antimony	0.0085	U 0.0085	0.10	1	mg/Kg wet		06/27/07 02:56 AM	SW846 3050B	SW846 6020
							Prep Date/Time: 06/19/07 11:15 AM	Anl By: AWH	
Arsenic	0.12	0.013	0.10	1	mg/Kg wet		06/21/07 05:23 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Barium	0.51	0.034	0.10	1	mg/Kg wet		06/21/07 05:23 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Beryllium	0.0070	U 0.0070	0.10	1	mg/Kg wet		06/21/07 05:23 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Boron	0.10	B 0.031	1.0	1	mg/Kg wet	A	06/21/07 05:23 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Cadmium	0.0081	U 0.0081	0.10	1	mg/Kg wet		06/21/07 05:23 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Chromium	0.12	0.038	0.10	1	mg/Kg wet		06/21/07 05:23 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Cobalt	0.052	B 0.0061	0.10	1	mg/Kg wet		06/21/07 05:23 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Copper	0.93	B 0.13	1.0	1	mg/Kg wet		06/21/07 05:23 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Iron	32	1.9	5.0	1	mg/Kg wet		06/21/07 05:23 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Manganese	13	0.082	1.0	1	mg/Kg wet		06/21/07 05:23 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Mercury	0.0064	B 0.0024	0.010	1	mg/Kg wet		06/15/07 05:41 PM	SW846 M7471	SW846 M7471
							Prep Date/Time: 06/15/07 03:15 PM	Anl By: MSB	
Molybdenum	0.041	B 0.016	1.0	1	mg/Kg wet		06/21/07 05:23 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Nickel	0.34	U 0.34	1.0	1	mg/Kg wet		06/21/07 05:23 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Selenium	0.50	0.045	0.10	1	mg/Kg wet		06/21/07 05:23 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Silver	0.011	U 0.011	0.050	1	mg/Kg wet		06/27/07 02:56 AM	SW846 3050B	SW846 6020
							Prep Date/Time: 06/19/07 11:15 AM	Anl By: AWH	
Strontium	6.3	0.057	1.0	1	mg/Kg wet		06/21/07 05:23 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Zinc	22	1.4	5.0	1	mg/Kg wet		06/21/07 05:23 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Percent Solids	17.1	—	—	1	% wet		07/03/07	SM 2540G M	SM 2540G M
							Prep Date/Time: 07/03/07	Anl By: JAL	

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Analytical Report Number: 884529

Client : FOTH INFRASTRUCTURE & ENVIRONMENT
Project Name : HUMBOLDT PIT LAKE
Project Number : 06W003
Field ID : #6 PIT LAKE

Matrix Type : BIOTA
Collection Date : 06/05/07
Report Date : 07/09/07
Lab Sample Number : 884631-006

INORGANICS

Test	Result	MDL	EQL	Dil.	Units	Code	Anl Date/Time	Prep Method	Anl Method
Aluminum	0.95	B 0.36	5.0	1	mg/Kg wet		06/21/07 05:46 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Antimony	0.058	B 0.0085	0.10	1	mg/Kg wet		06/27/07 03:00 AM	SW846 3050B	SW846 6020
							Prep Date/Time: 06/19/07 11:15 AM	Anl By: AWH	
Arsenic	0.10	0.013	0.10	1	mg/Kg wet		06/21/07 05:46 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Barium	0.28	0.034	0.10	1	mg/Kg wet		06/21/07 05:46 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Beryllium	0.0070	U 0.0070	0.10	1	mg/Kg wet		06/21/07 05:46 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Boron	0.24	B 0.031	1.0	1	mg/Kg wet	A	06/21/07 05:46 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Cadmium	0.0081	U 0.0081	0.10	1	mg/Kg wet		06/21/07 05:46 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Chromium	0.12	0.038	0.10	1	mg/Kg wet		06/21/07 05:46 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Cobalt	0.16	0.0061	0.10	1	mg/Kg wet		06/21/07 05:46 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Copper	1.4	0.13	1.0	1	mg/Kg wet		06/21/07 05:46 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Iron	40	1.9	5.0	1	mg/Kg wet		06/21/07 05:46 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Manganese	23	0.082	1.0	1	mg/Kg wet		06/21/07 05:46 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Mercury	0.017	0.0024	0.010	1	mg/Kg wet		06/15/07 05:42 PM	SW846 M7471	SW846 M7471
							Prep Date/Time: 06/15/07 03:15 PM	Anl By: MSB	
Molybdenum	0.091	B 0.016	1.0	1	mg/Kg wet		06/21/07 05:46 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Nickel	1.7	0.34	1.0	1	mg/Kg wet		06/21/07 05:46 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Selenium	0.53	0.045	0.10	1	mg/Kg wet		06/21/07 05:46 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Silver	0.011	U 0.011	0.050	1	mg/Kg wet		06/27/07 03:00 AM	SW846 3050B	SW846 6020
							Prep Date/Time: 06/19/07 11:15 AM	Anl By: AWH	
Strontium	8.8	0.057	1.0	1	mg/Kg wet		06/21/07 05:46 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Zinc	20	1.4	5.0	1	mg/Kg wet		06/21/07 05:46 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Percent Solids	21.6	—	—	1	% wet		07/03/07	SM 2540G M	SM 2540G M
							Prep Date/Time: 07/03/07	Anl By: JAL	

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Analytical Report Number: 884529

Client : FOTH INFRASTRUCTURE & ENVIRONMENT
Project Name : HUMBOLDT PIT LAKE
Project Number : 06W003
Field ID : #7 PIT LAKE

Matrix Type : BIOTA
Collection Date : 06/05/07
Report Date : 07/09/07
Lab Sample Number : 884631-007

INORGANICS

Test	Result	MDL	EQL	Dil.	Units	Code	Anl Date/Time	Prep Method	Anl Method
Aluminum	0.83	B 0.36	5.0	1	mg/Kg wet		06/21/07 05:54 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Antimony	0.011	B 0.0085	0.10	1	mg/Kg wet		06/27/07 03:04 AM	SW846 3050B	SW846 6020
							Prep Date/Time: 06/19/07 11:15 AM	Anl By: AWH	
Arsenic	0.12	0.013	0.10	1	mg/Kg wet		06/21/07 05:54 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Barium	0.32	0.034	0.10	1	mg/Kg wet		06/21/07 05:54 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Beryllium	0.0070	U 0.0070	0.10	1	mg/Kg wet		06/21/07 05:54 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Boron	0.11	B 0.031	1.0	1	mg/Kg wet	A	06/21/07 05:54 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Cadmium	0.0081	U 0.0081	0.10	1	mg/Kg wet		06/21/07 05:54 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Chromium	0.13	0.038	0.10	1	mg/Kg wet		06/21/07 05:54 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Cobalt	0.042	B 0.0061	0.10	1	mg/Kg wet		06/21/07 05:54 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Copper	0.54	B 0.13	1.0	1	mg/Kg wet		06/21/07 05:54 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Iron	39	1.9	5.0	1	mg/Kg wet		06/21/07 05:54 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Manganese	12	0.082	1.0	1	mg/Kg wet		06/21/07 05:54 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Mercury	0.0068	B 0.0024	0.010	1	mg/Kg wet		06/15/07 05:43 PM	SW846 M7471	SW846 M7471
							Prep Date/Time: 06/15/07 03:15 PM	Anl By: MSB	
Molybdenum	0.041	B 0.016	1.0	1	mg/Kg wet		06/21/07 05:54 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Nickel	0.34	U 0.34	1.0	1	mg/Kg wet		06/21/07 05:54 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Selenium	0.37	0.045	0.10	1	mg/Kg wet		06/21/07 05:54 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Silver	0.011	U 0.011	0.050	1	mg/Kg wet		06/27/07 03:04 AM	SW846 3050B	SW846 6020
							Prep Date/Time: 06/19/07 11:15 AM	Anl By: AWH	
Strontium	8.1	0.057	1.0	1	mg/Kg wet		06/21/07 05:54 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Zinc	22	1.4	5.0	1	mg/Kg wet		06/21/07 05:54 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Percent Solids	22.2	—	—	1	% wet		07/03/07	SM 2540G M	SM 2540G M
							Prep Date/Time: 07/03/07	Anl By: JAL	

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Analytical Report Number: 884529

Client : FOTH INFRASTRUCTURE & ENVIRONMENT
Project Name : HUMBOLDT PIT LAKE
Project Number : 06W003
Field ID : #8 PIT LAKE

Matrix Type : BIOTA
Collection Date : 06/05/07
Report Date : 07/09/07
Lab Sample Number : 884631-008

INORGANICS

Test	Result	MDL	EQL	Dil.	Units	Code	Anl Date/Time	Prep Method	Anl Method
Aluminum	0.66	B 0.36	5.0	1	mg/Kg wet		06/21/07 06:01 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Antimony	0.0085	U 0.0085	0.10	1	mg/Kg wet		06/27/07 03:08 AM	SW846 3050B	SW846 6020
							Prep Date/Time: 06/19/07 11:15 AM	Anl By: AWH	
Arsenic	0.092	B 0.013	0.10	1	mg/Kg wet		06/21/07 06:01 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Barium	0.33	0.034	0.10	1	mg/Kg wet		06/21/07 06:01 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Beryllium	0.0070	U 0.0070	0.10	1	mg/Kg wet		06/21/07 06:01 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Boron	0.17	B 0.031	1.0	1	mg/Kg wet	A	06/21/07 06:01 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Cadmium	0.0081	U 0.0081	0.10	1	mg/Kg wet		06/21/07 06:01 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Chromium	0.096	B 0.038	0.10	1	mg/Kg wet		06/21/07 06:01 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Cobalt	0.041	B 0.0061	0.10	1	mg/Kg wet		06/21/07 06:01 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Copper	0.85	B 0.13	1.0	1	mg/Kg wet		06/21/07 06:01 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Iron	46	1.9	5.0	1	mg/Kg wet		06/21/07 06:01 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Manganese	9.4	0.082	1.0	1	mg/Kg wet		06/21/07 06:01 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Mercury	0.012	0.0024	0.010	1	mg/Kg wet		06/15/07 05:45 PM	SW846 M7471	SW846 M7471
							Prep Date/Time: 06/15/07 03:15 PM	Anl By: MSB	
Molybdenum	0.19	B 0.016	1.0	1	mg/Kg wet		06/21/07 06:01 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Nickel	0.37	B 0.34	1.0	1	mg/Kg wet		06/21/07 06:01 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Selenium	0.48	0.045	0.10	1	mg/Kg wet		06/21/07 06:01 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Silver	0.011	U 0.011	0.050	1	mg/Kg wet		06/27/07 03:08 AM	SW846 3050B	SW846 6020
							Prep Date/Time: 06/19/07 11:15 AM	Anl By: AWH	
Strontium	14	0.057	1.0	1	mg/Kg wet		06/21/07 06:01 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Zinc	14	1.4	5.0	1	mg/Kg wet		06/21/07 06:01 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Percent Solids	19.9	—	—	1	% wet		07/03/07	SM 2540G M	SM 2540G M
							Prep Date/Time: 07/03/07	Anl By: JAL	

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Analytical Report Number: 884529

Client : FOTH INFRASTRUCTURE & ENVIRONMENT
Project Name : HUMBOLDT PIT LAKE
Project Number : 06W003
Field ID : #9 PIT LAKE

Matrix Type : BIOTA
Collection Date : 06/05/07
Report Date : 07/09/07
Lab Sample Number : 884631-009

INORGANICS

Test	Result	MDL	EQL	Dil.	Units	Code	Anl Date/Time	Prep Method	Anl Method
Aluminum	1.2	B 0.36	5.0	1	mg/Kg wet		06/21/07 06:09 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Antimony	0.0085	U 0.0085	0.10	1	mg/Kg wet		06/27/07 03:12 AM	SW846 3050B	SW846 6020
							Prep Date/Time: 06/19/07 11:15 AM	Anl By: AWH	
Arsenic	0.27	0.013	0.10	1	mg/Kg wet		06/21/07 06:09 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Barium	0.41	0.034	0.10	1	mg/Kg wet		06/21/07 06:09 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Beryllium	0.0070	U 0.0070	0.10	1	mg/Kg wet		06/21/07 06:09 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Boron	0.13	B 0.031	1.0	1	mg/Kg wet	A	06/21/07 06:09 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Cadmium	0.0081	U 0.0081	0.10	1	mg/Kg wet		06/21/07 06:09 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Chromium	0.099	B 0.038	0.10	1	mg/Kg wet		06/21/07 06:09 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Cobalt	0.064	B 0.0061	0.10	1	mg/Kg wet		06/21/07 06:09 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Copper	0.75	B 0.13	1.0	1	mg/Kg wet		06/21/07 06:09 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Iron	80	1.9	5.0	1	mg/Kg wet		06/21/07 06:09 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Manganese	9.1	0.082	1.0	1	mg/Kg wet		06/21/07 06:09 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Mercury	0.016	0.0024	0.010	1	mg/Kg wet		06/15/07 05:46 PM	SW846 M7471	SW846 M7471
							Prep Date/Time: 06/15/07 03:15 PM	Anl By: MSB	
Molybdenum	0.043	B 0.016	1.0	1	mg/Kg wet		06/21/07 06:09 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Nickel	0.52	B 0.34	1.0	1	mg/Kg wet		06/21/07 06:09 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Selenium	0.46	0.045	0.10	1	mg/Kg wet		06/21/07 06:09 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Silver	0.011	U 0.011	0.050	1	mg/Kg wet		06/27/07 03:12 AM	SW846 3050B	SW846 6020
							Prep Date/Time: 06/19/07 11:15 AM	Anl By: AWH	
Strontium	9.7	0.057	1.0	1	mg/Kg wet		06/21/07 06:09 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Zinc	20	1.4	5.0	1	mg/Kg wet		06/21/07 06:09 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Percent Solids	20.4	—	—	1	% wet		07/03/07	SM 2540G M	SM 2540G M
							Prep Date/Time: 07/03/07	Anl By: JAL	

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Analytical Report Number: 884529

Client : FOTH INFRASTRUCTURE & ENVIRONMENT
Project Name : HUMBOLDT PIT LAKE
Project Number : 06W003
Field ID : #10 PIT LAKE

Matrix Type : BIOTA
Collection Date : 06/05/07
Report Date : 07/09/07
Lab Sample Number : 884631-010

INORGANICS

Test	Result	MDL	EQL	Dil.	Units	Code	Anl Date/Time	Prep Method	Anl Method
Aluminum	0.93	B 0.36	5.0	1	mg/Kg wet		06/21/07 06:16 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Antimony	0.028	B 0.0085	0.10	1	mg/Kg wet		06/27/07 03:16 AM	SW846 3050B	SW846 6020
							Prep Date/Time: 06/19/07 11:15 AM	Anl By: AWH	
Arsenic	0.089	B 0.013	0.10	1	mg/Kg wet		06/21/07 06:16 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Barium	0.44	0.034	0.10	1	mg/Kg wet		06/21/07 06:16 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Beryllium	0.0070	U 0.0070	0.10	1	mg/Kg wet		06/21/07 06:16 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Boron	0.14	B 0.031	1.0	1	mg/Kg wet	A	06/21/07 06:16 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Cadmium	0.0081	U 0.0081	0.10	1	mg/Kg wet		06/21/07 06:16 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Chromium	0.13	0.038	0.10	1	mg/Kg wet		06/21/07 06:16 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Cobalt	0.096	B 0.0061	0.10	1	mg/Kg wet		06/21/07 06:16 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Copper	1.1	0.13	1.0	1	mg/Kg wet		06/21/07 06:16 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Iron	56	1.9	5.0	1	mg/Kg wet		06/21/07 06:16 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Manganese	44	0.082	1.0	1	mg/Kg wet		06/21/07 06:16 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Mercury	0.0096	B 0.0024	0.010	1	mg/Kg wet		06/15/07 05:47 PM	SW846 M7471	SW846 M7471
							Prep Date/Time: 06/15/07 03:15 PM	Anl By: MSB	
Molybdenum	0.076	B 0.016	1.0	1	mg/Kg wet		06/21/07 06:16 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Nickel	1.2	0.34	1.0	1	mg/Kg wet		06/21/07 06:16 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Selenium	0.56	0.045	0.10	1	mg/Kg wet		06/21/07 06:16 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Silver	0.011	U 0.011	0.050	1	mg/Kg wet		06/27/07 03:16 AM	SW846 3050B	SW846 6020
							Prep Date/Time: 06/19/07 11:15 AM	Anl By: AWH	
Strontium	11	0.057	1.0	1	mg/Kg wet		06/21/07 06:16 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Zinc	19	1.4	5.0	1	mg/Kg wet		06/21/07 06:16 PM	SW846 M3050	SW846 6020
							Prep Date/Time: 06/19/07 10:47 AM	Anl By: AWH	
Percent Solids	23.4	---	---	1	% wet		07/03/07	SM 2540G M	SM 2540G M
							Prep Date/Time: 07/03/07	Anl By: JAL	

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Lab Number	TestGroupID	Field ID	Comment
884529-	M-B-B	All Samples	A - Analyte is detected in the method blank at a concentration of 0.062 mg/kg wet.
884529-	M-SB-B	All Samples	Internal standard limits of 30-140% used. All QC within limits.

Pace Analytical Services, Inc.

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Lab Number	TestGroupID	Field ID	Comment
884631-	M-B-B	All Samples	A - Analyte is detected in the method blank at a concentration of 0.062 mg/kg wet.
884631-	M-SB-B	All Samples	Internal standard limits of 30-140% used. All QC within limits.

Qualifier Codes

Flag	Applies To	Explanation
A	Inorganic	Analyte is detected in the method blank. Method blank criteria is evaluated to the laboratory method detection limit. Additionally, method blank acceptance may be based on project specific criteria or determined from analyte concentrations in the sample and are evaluated on a sample by sample basis.
B	Inorganic	The analyte has been detected between the method detection limit and the reporting limit.
B	Organic	Analyte is present in the method blank. Method blank criteria is evaluated to the laboratory method detection limit. Additionally, method blank acceptance may be based on project specific criteria or determined from analyte concentrations in the sample and are evaluated on a sample by sample basis.
C	All	Elevated detection limit.
D	All	Analyte value from diluted analysis or surrogate result not applicable due to sample dilution.
E	Inorganic	Estimated concentration due to matrix interferences. During the metals analysis the serial dilution failed to meet the established control limits of 0-10%. The sample concentration is greater than 50 times the IDL for analysis done on the ICP or 100 times the IDL for analysis done on the ICP-MS. The result was flagged with the E qualifier to indicate that a physical interference was observed.
E	Organic	Analyte concentration exceeds calibration range.
F	Inorganic	Due to potential interferences for this analysis by Inductively Coupled Plasma techniques (SW-846 Method 6010), this analyte has been confirmed by and reported from an alternate method.
F	Organic	Surrogate results outside control criteria.
G	All	The result is estimated because the concentration is less than the lowest calibration standard concentration utilized in the initial calibration. The method detection limit is less than the reporting limit specified for this project.
H	All	Preservation, extraction or analysis performed past holding time.
HF	Inorganic	This test is considered a field parameter, and the recommended holding time is 15 minutes from collection. The analysis was performed in the laboratory beyond the recommended holding time.
J	All	Concentration detected equal to or greater than the method detection limit but less than the reporting limit.
K	Organic	Detection limit may be elevated due to the presence of an unrequested analyte.
L	All	Elevated detection limit due to low sample volume.
M	Organic	Sample pH was greater than 2
N	All	Spiked sample recovery not within control limits.
O	Organic	Sample received overweight.
P	Organic	The relative percent difference between the two columns for detected concentrations was greater than 40%.
Q	All	The analyte has been detected between the limit of detection (LOD) and limit of quantitation (LOQ). The results are qualified due to the uncertainty of analyte concentrations within this range.
S	Organic	The relative percent difference between quantitation and confirmation columns exceeds internal quality control criteria. Because the result is unconfirmed, it has been reported as a non-detect with an elevated detection limit.
U	All	The analyte was not detected at or above the reporting limit.
V	All	Sample received with headspace.
W	All	A second aliquot of sample was analyzed from a container with headspace.
X	All	See Sample Narrative.
Z	Organics	This compound was separated in the CCV standard but it did not meet the resolution criteria as set forth in SW846.
&	All	Laboratory Control Spike recovery not within control limits.
*	All	Precision not within control limits.
+	Inorganic	The sample result is greater than four times the spike level: therefore, the percent recovery is not evaluated.
<	All	The analyte was not detected at or above the reporting limit.
1	Inorganic	Dissolved analyte or filtered analyte greater than total analyte; analyses passed QC based on precision criteria.
2	Inorganic	Dissolved analyte or filtered analyte greater than total analyte; analyses failed QC based on precision criteria.
3	Inorganic	BOD result is estimated due to the BOD blank exceeding the allowable oxygen depletion.
4	Inorganic	BOD duplicate precision not within control limits. Due to the 48 hour holding time for this test, it is not practical to reanalyze and try to correct the deficiency.
5	Inorganic	BOD result is estimated due to insufficient oxygen depletion. Due to the 48 hour holding time for this test, it is not practical to reanalyze and try to correct the deficiency.
6	Inorganic	BOD laboratory control sample not within control limits. Due to the 48 hour holding time for this test, it is not practical to reanalyze and try to correct the deficiency.
7	Inorganic	BOD result is estimated due to complete oxygen depletion. Due to the 48 hour holding time for this test, it is not practical to reanalyze and try to correct the deficiency.
8	Inorganic	Sample was received unpreserved. Sample was preserved either at the time of receipt or at the time of sample preparation.
9	Inorganic	Sample was received with insufficient preservation. Acid was added either at the time of receipt or at the time of sample preparation.

Test Group Name	884529-001	884529-002	884529-003	884529-004	884529-005	884529-006	884529-007	884529-008	884529-009	884529-010
ALUMINUM	B	B	B	B	B	B	B	B	B	B
ANTIMONY	B	B	B	B	B	B	B	B	B	B
ARSENIC	B	B	B	B	B	B	B	B	B	B
BARIUM	B	B	B	B	B	B	B	B	B	B
BERYLLIUM	B	B	B	B	B	B	B	B	B	B
BIOTA PREP	B	B	B	B	B	B	B	B	B	B
BORON	B	B	B	B	B	B	B	B	B	B
CADMIUM	B	B	B	B	B	B	B	B	B	B
CHROMIUM	B	B	B	B	B	B	B	B	B	B
COBALT	B	B	B	B	B	B	B	B	B	B
COPPER	B	B	B	B	B	B	B	B	B	B
IRON	B	B	B	B	B	B	B	B	B	B
MANGANESE	B	B	B	B	B	B	B	B	B	B
MERCURY	B	B	B	B	B	B	B	B	B	B
MOLYBDENUM	B	B	B	B	B	B	B	B	B	B
NICKEL	B	B	B	B	B	B	B	B	B	B
PERCENT SOLIDS	B	B	B	B	B	B	B	B	B	B
SELENIUM	B	B	B	B	B	B	B	B	B	B
SILVER	B	B	B	B	B	B	B	B	B	B
STRONTIUM	B	B	B	B	B	B	B	B	B	B
ZINC	B	B	B	B	B	B	B	B	B	B

Code	MI Certification
B	Not Certified

Test Group Name	884631-001	884631-002	884631-003	884631-004	884631-005	884631-006	884631-007	884631-008	884631-009	884631-010
ALUMINUM	B	B	B	B	B	B	B	B	B	B
ANTIMONY	B	B	B	B	B	B	B	B	B	B
ARSENIC	B	B	B	B	B	B	B	B	B	B
BARIUM	B	B	B	B	B	B	B	B	B	B
BERYLLIUM	B	B	B	B	B	B	B	B	B	B
BIOTA PREP	B	B	B	B	B	B	B	B	B	B
BORON	B	B	B	B	B	B	B	B	B	B
CADMIUM	B	B	B	B	B	B	B	B	B	B
CHROMIUM	B	B	B	B	B	B	B	B	B	B
COBALT	B	B	B	B	B	B	B	B	B	B
COPPER	B	B	B	B	B	B	B	B	B	B
IRON	B	B	B	B	B	B	B	B	B	B
MANGANESE	B	B	B	B	B	B	B	B	B	B
MERCURY	B	B	B	B	B	B	B	B	B	B
MOLYBDENUM	B	B	B	B	B	B	B	B	B	B
NICKEL	B	B	B	B	B	B	B	B	B	B
PERCENT SOLIDS	B	B	B	B	B	B	B	B	B	B
SELENIUM	B	B	B	B	B	B	B	B	B	B
SILVER	B	B	B	B	B	B	B	B	B	B
STRONTIUM	B	B	B	B	B	B	B	B	B	B
ZINC	B	B	B	B	B	B	B	B	B	B

Code	MI Certification
B	Not Certified

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436
Fax: 920-469-8827

QC Summary

SDG: 884529
Lab Section: METALS
QC Batch Number: 21903
Prep Method: SW846 M7471A
Analytical Method: SW846 M7471A

QC Type	Client Sample ID	Lab Sample ID
MB	MBBMTG2216-24	MBBMTG2216-24
LCS	LCSBMTG2216-24	LCSBMTG2216-24
MS	#1 LAKE LORYMS	884529-001MS
MSD	#1 LAKE LORYMSD	884529-001MSD

Client Sample ID	Lab Sample ID	MB ID
#1 LAKE LORY	884529-001	MB
#3 LAKE LORY	884529-003	MB
#5 LAKE LORY	884529-005	MB
#7 LAKE LORY	884529-007	MB
#9 LAKE LORY	884529-009	MB
#1 PIT LAKE	884631-001	MB
#3 PIT LAKE	884631-003	MB
#5 PIT LAKE	884631-005	MB
#7 PIT LAKE	884631-007	MB
#9 PIT LAKE	884631-009	MB

Client Sample ID	Lab Sample ID	MB ID
#2 LAKE LORY	884529-002	MB
#4 LAKE LORY	884529-004	MB
#6 LAKE LORY	884529-006	MB
#8 LAKE LORY	884529-008	MB
#10 LAKE LORY	884529-010	MB
#2 PIT LAKE	884631-002	MB
#4 PIT LAKE	884631-004	MB
#6 PIT LAKE	884631-006	MB
#8 PIT LAKE	884631-008	MB
#10 PIT LAKE	884631-010	MB

Test Name	Method Blank Result Conc	LCS Spiked Conc	LCS Recovery Conc	%	C	LCSD Spiked Conc	LCSD Recovery Conc	%	C	LCS/LCSD RPD	%	C	LCS/LCSD Control Limits LCL %	UCL %	RPD %	Parent Sample Number	Parent Result Conc	MS Spiked Conc	MS Recovery Conc	%	C	MSD Spiked Conc	MSD Recovery Conc	%	C	MS/MSD RPD	%	C	MS/MSD Control Limits LCL %	UCL %	RPD %
Mercury	< 0.0024	0.25	0.2	80.0		—	—	—		—			75	110	10	884529-001	0.086	0.25	0.29	82.3		0.25	0.27	74.0		7.3			70	110	10

Conc = mg/Kg unless otherwise noted
C = QC Code, see Qualifer Sheet
Parent Result is reported down to MDL in order to allow Validation of this worksheet
The %R and RPD results are calculated from raw data values with more significant figures than are reported on this form.

Report Date: 7/9/2007
QC Batch Number: 21903

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436
Fax: 920-469-8827

QC Summary

SDG: 884529
Lab Section: METALS
QC Batch Number: 22006
Prep Method: SW846 3050B
Analytical Method: SW846 6020

QC Type	Client Sample ID	Lab Sample ID
MB	MBBMTG1143-81	MBBMTG1143-81
LCS	LCSBMTG1143-81	LCSBMTG1143-81
MS	#1 LAKE LORYMS	884529-001MS
MSD	#1 LAKE LORYMSD	884529-001MSD

Client Sample ID	Lab Sample ID	MB ID
#1 LAKE LORY	884529-001	MB
#3 LAKE LORY	884529-003	MB
#5 LAKE LORY	884529-005	MB
#7 LAKE LORY	884529-007	MB
#9 LAKE LORY	884529-009	MB
#1 PIT LAKE	884631-001	MB
#3 PIT LAKE	884631-003	MB
#5 PIT LAKE	884631-005	MB
#7 PIT LAKE	884631-007	MB
#9 PIT LAKE	884631-009	MB

Client Sample ID	Lab Sample ID	MB ID
#2 LAKE LORY	884529-002	MB
#4 LAKE LORY	884529-004	MB
#6 LAKE LORY	884529-006	MB
#8 LAKE LORY	884529-008	MB
#10 LAKE LORY	884529-010	MB
#2 PIT LAKE	884631-002	MB
#4 PIT LAKE	884631-004	MB
#6 PIT LAKE	884631-006	MB
#8 PIT LAKE	884631-008	MB
#10 PIT LAKE	884631-010	MB

Test Name	Method Blank Result	Conc	LCS Spiked Conc	LCS Recovery Conc	%	C	LCSD Spiked Conc	LCSD Recovery Conc	%	C	LCS/LCSD RPD %	C	LCS/LCSD Control Limits LCL %	UCL %	RPD %	Parent Sample Number	Parent Result	Conc	MS Spiked Conc	MS Recovery Conc	%	C	MSD Spiked Conc	MSD Recovery Conc	%	C	MS/MSD RPD %	C	MS/MSD Control Limits LCL %	UCL %	RPD %
Antimony	<	0.0085	20.0	16.4	81.9		—	—	—		—		75	125	20	884529-001	<	0.0085	20.0	16.8	83.8		20.0	16.6	82.8		1.2		75	125	20
Silver	<	0.011	10	8.5	85.5		—	—	—		—		75	125	20	884529-001	<	0.011	10	8.4	84.0		10	8.2	82.3		2.1		75	125	20

Conc = mg/Kg unless otherwise noted
C = QC Code, see Qualifer Sheet
Parent Result is reported down to MDL in order to allow Validation of this worksheet
The %R and RPD results are calculated from raw data values with more significant figures than are reported on this form.

Report Date: 7/9/2007
QC Batch Number: 22006

Pace Analytical Services, Inc.

1241 Bellevue Street
Green Bay, WI 54302
920-469-2436
Fax: 920-469-8827

QC Summary

SDG: 884529
Lab Section: METALS
QC Batch Number: 22007
Prep Method: SW846 M3050B
Analytical Method: SW846 6020

QC Type	Client Sample ID	Lab Sample ID
MB	MBBMTG2126-30	MBBMTG2126-30
LCS	LCSBMTG2126-30	LCSBMTG2126-30
MS	#1 LAKE LORYMS	884529-001MS
MSD	#1 LAKE LORYMSD	884529-001MSD

Client Sample ID	Lab Sample ID	MB ID
#1 LAKE LORY	884529-001	MB
#3 LAKE LORY	884529-003	MB
#5 LAKE LORY	884529-005	MB
#7 LAKE LORY	884529-007	MB
#9 LAKE LORY	884529-009	MB
#1 PIT LAKE	884631-001	MB
#3 PIT LAKE	884631-003	MB
#5 PIT LAKE	884631-005	MB
#7 PIT LAKE	884631-007	MB
#9 PIT LAKE	884631-009	MB

Client Sample ID	Lab Sample ID	MB ID
#2 LAKE LORY	884529-002	MB
#4 LAKE LORY	884529-004	MB
#6 LAKE LORY	884529-006	MB
#8 LAKE LORY	884529-008	MB
#10 LAKE LORY	884529-010	MB
#2 PIT LAKE	884631-002	MB
#4 PIT LAKE	884631-004	MB
#6 PIT LAKE	884631-006	MB
#8 PIT LAKE	884631-008	MB
#10 PIT LAKE	884631-010	MB

Test Name	Method Blank Result	Conc	LCS Spiked Conc	LCS Recovery Conc	%	C	LCSD Spiked Conc	LCSD Recovery Conc	%	C	LCS/LCSD RPD	%	C	LCS/LCSD Control Limits LCL %	UCL %	RPD %	Parent Sample Number		Parent Result Conc	MS Spiked Conc	MS Recovery Conc	%	C	MSD Spiked Conc	MSD Recovery Conc	%	C	MS/MSD RPD	%	C	MS/MSD Control Limits LCL %	UCL %	RPD %
Aluminum	<	0.36	1000	883.3	88.3		—	—	—		—			75	125	20	884529-001		16.76	1000	805.8	78.9		1000	813.6	79.7		1.0			75	125	20
Arsenic	<	0.013	20.0	18.6	93.2		—	—	—		—			75	125	20	884529-001		0.0930	20.0	17.6	87.7		20.0	17.3	86.2		1.7			75	125	20
Barium	<	0.034	20.0	16.3	81.5		—	—	—		—			75	125	20	884529-001		0.911	20.0	17.1	80.9		20.0	17	80.4		0.5			75	125	20
Beryllium	<	0.007	20.0	17.1	85.4		—	—	—		—			75	125	20	884529-001		8.00E-3	20.0	16.2	81.0		20.0	16.1	80.6		0.5			75	125	20
Boron	J	0.062	20.0	16.5	82.7		—	—	—		—			75	125	20	884529-001		0.190	20.0	14.7	72.6	N	20.0	14.8	73.3	N	0.9			75	125	20
Cadmium	<	0.0081	20.0	17.1	85.7		—	—	—		—			75	125	20	884529-001		0.0170	20.0	16.1	80.3		20.0	16	80.1		0.3			75	125	20
Chromium	<	0.038	20.0	17.3	86.4		—	—	—		—			75	125	20	884529-001		0.239	20.0	16.3	80.4		20.0	16.2	79.8		0.7			75	125	20
Cobalt	<	0.0061	20.0	17.1	85.7		—	—	—		—			75	125	20	884529-001		0.0350	20.0	15.6	77.8		20.0	15.6	77.7		0.1			75	125	20
Copper	<	0.13	20.0	17.3	86.7		—	—	—		—			75	125	20	884529-001		0.663	20.0	15.9	76.2		20.0	16.1	77.2		1.2			75	125	20
Iron	<	1.9	1000	881.4	88.1		—	—	—		—			75	125	20	884529-001		94.96	1000	938.6	84.4		1000	889.8	79.5		5.3			75	125	20
Manganese	<	0.082	20.0	17.5	87.4		—	—	—		—			75	125	20	884529-001		19.0	20.0	35.5	82.3		20.0	30.5	57.2	N	15.2			75	125	20
Molybdenum	<	0.016	20.0	15.9	79.5		—	—	—		—			75	125	20	884529-001		0.124	20.0	15.6	77.4		20.0	15.8	78.2		1.0			75	125	20
Nickel	<	0.34	20.0	17.1	85.3		—	—	—		—			75	125	20	884529-001	<	0.34	20.0	15.9	79.3		20.0	15.8	78.9		0.4			75	125	20
Selenium	<	0.045	20.0	18.5	92.4		—	—	—		—			75	125	20	884529-001		0.584	20.0	18	86.9		20.0	17.5	84.7		2.4			75	125	20
Strontium	<	0.057	20.0	16	80.2		—	—	—		—			75	125	20	884529-001		17.2	20.0	31.6	71.6	N	20.0	31.3	70.3	N	0.8			75	125	20
Zinc	<	1.4	50.0	41.5	83.1		—	—	—		—			75	125	20	884529-001		18.7	20.0	33.2	72.3	N	20.0	31.1	61.8	N	6.6			75	125	20

Conc = mg/Kg unless otherwise noted
C = QC Code, see Qualifer Sheet
Parent Result is reported down to MDL in order to allow Validation of this worksheet
The %R and RPD results are calculated from raw data values with more significant figures than are reported on this form.

Report Date: 7/9/2007
QC Batch Number: 22007

Sample Condition Upon Receipt

Pace Analytical

Client Name: Fth Infrastructure Project # 884529

Courier: ☐ Fed Ex ☒ UPS ☐ USPS ☐ Client ☐ Commercial ☐ Pace Other _____

Tracking #: _____

Custody Seal on Cooler/Box Present: ☐ yes ☒ no Seals intact: ☐ yes ☒ no

Packing Material: ☐ Bubble Wrap ☐ Bubble Bags ☐ None ☒ Other poly bags

Thermometer Used JB Type of Ice: (Wet) Blue None ☒ Samples on ice, cooling process has begun

Cooler Temperature 1.0°C Biological Tissue is Frozen: Yes No

Temp should be above freezing to 6°C

Date and Initials of person examining contents: 6-6-07 MWT 6/6/07

Comments:

Chain of Custody Present:	☒Yes	☐No	☐N/A	1.
Chain of Custody Filled Out:	☒Yes	☐No	☐N/A	2.
Chain of Custody Relinquished:	☒Yes	☐No	☐N/A	3.
Sampler Name & Signature on COC:	☒Yes	☐No	☐N/A	4.
Samples Arrived within Hold Time:	☒Yes	☐No	☐N/A	5.
Short Hold Time Analysis (<72hr):	☐Yes	☒No	☐N/A	6.
Rush Turn Around Time Requested:	☐Yes	☒No	☐N/A	7.
Sufficient Volume:	☒Yes	☐No	☐N/A	8.
Correct Containers Used:	☒Yes	☐No	☐N/A	9. Poly Bags
-Pace Containers Used:	☐Yes	☒No	☐N/A	
Containers Intact:	☒Yes	☐No	☐N/A	10.
Filtered volume received for Dissolved tests	☐Yes	☐No	☒N/A	11.
Sample Labels match COC:	☒Yes	☐No	☐N/A	12.
-Includes date/time/ID/Analysis Matrix: B				
All containers needing preservation have been checked.	☐Yes	☐No	☒N/A	13.
All containers needing preservation are found to be in compliance with EPA recommendation.	☐Yes	☐No	☒N/A	
exceptions: VOA, coliform, TOC, O&G, WI-DRO (water)	☐Yes	☒No		Initial when completed / Lot # of added preservative
Samples checked for dechlorination:	☐Yes	☐No	☒N/A	14.
Headspace in VOA Vials (>6mm):	☐Yes	☐No	☒N/A	15.
Trip Blank Present:	☐Yes	☒No	☐N/A	16.
Trip Blank Custody Seals Present	☐Yes	☐No	☒N/A	
Pace Trip Blank Lot # (if purchased): _____				

Client Notification/ Resolution: Field Data Required? Y / N

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: _____

Project Manager Review: MAT for Todd N. **Date:** 7-9-07

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers)

(Please Print Clearly)

Company Na	FOTH INFRASTRUCTURE
Branch/Location:	
Project Contact:	ANDREA MARTIN
Phone:	
Project Number:	
Project Name:	HUMBOLDT LAKELORY
Project State:	MICHIGAN
Sampled By (Print):	DOUG WORKMAN
Sampled By (Sign):	Doug Work
PO #:	
Regulatory Program:	

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UPPER MIDWEST REGION
MN: 612-607-1700 WI: 920-469-2436

Page 1 of 32

COC No. 022165

CHAIN OF CUSTODY

*Preservation Codes
A=None B=HCL C=H2SO4 D=HNO3 E=DI Water F=Methanol G=NaOH
H=Sodium Bisulfate Solution I=Sodium Thiosulfate J=Other

FILTERED? (YES/NO)
PRESERVATION (CODE)*

Analyses Requested

Quote #:	
Mail To Contact:	
Mail To Company:	
Mail To Address:	
Invoice To Contact:	
Invoice To Company:	
Invoice To Address:	
Invoice To Phone:	

Data Package Options (billable)
- ☐ EPA Level III
- ☐ EPA Level IV

MS/MSD
- ☐ On your sample (billable)
- ☐ NOT needed on your sample

Matrix Codes
A = Air, B = Biota, C = Charcoal, O = Oil, S = Soil, SI = Sludge, W = Water, DW = Drinking Water, GW = Ground Water, SW = Surface Water, WW = Waste Water, WP = Wipe

PACE LAB #	CLIENT FIELD ID	COLLECTION DATE	COLLECTION TIME	MATRIX	Analyses Requested	CLIENT COMMENTS	LAB COMMENTS (Lab Use Only)	Profile #
001	#1 LAKELORY	6-4	8:15pm				1 poly bag	
002	#2 LAKELORY	6-4	8:30pm					
003	#3 LAKELORY	6-4	9:15pm					
004	#4 LAKELORY	"	9:56pm					
005	#5 LAKELORY	"	10:30pm					
006	#6 LAKELORY	"	10:32pm					
007	#7 LAKELORY	"	10:32pm					
008	#8 LAKELORY	"	10:41pm					
009	#9 LAKELORY	"	11:02pm					
010	#10 LAKELORY	"	11:15pm					

Rush Turnaround Time Requested - Prelims
(Rush TAT subject to approval/surcharge)
Date Needed:

Transmit Prelim Rush Results by (complete what you want):

Email #1:	
Email #2:	
Telephone:	
Fax:	

Samples on HOLD are subject to special pricing and release of liability

Relinquished By:	Date/Time:	Received By:	Date/Time:
Doug Work	6-5-07 9:15am		
UPS	6-6-07 0935	Mark N. Gaske	6-6-07 0935

PACE Project No. 884529

Receipt Temp = 1.0 °C

Sample Receipt pH OK / Adjusted

Cooler Custody Seal
Present / Not Present
Intact / Not Intact

Version 6.0 06/14/06 ORIGINAL

Sample Condition Upon Receipt

Pace Analytical

Client Name: Foth I+E Project # 884631

Courier: ☐ Fed Ex ☒ UPS ☐ USPS ☐ Client ☐ Commercial ☐ Pace Other _____

Tracking #: _____

Optional
Proj. Due Date:
Proj. Name:

Custody Seal on Cooler/Box Present: ☐ yes ☐ no Seals intact: ☐ yes ☐ no

Packing Material: ☐ Bubble Wrap ☐ Bubble Bags ☐ None ☒ Other Zip Locks

Thermometer Used JB Type of Ice: (Wet) Blue None ☒ Samples on ice, cooling process has begun

Cooler Temperature 25 Biological Tissue is Frozen: Yes (No)

Temp should be above freezing to 6°C

Date and Initials of person examining contents: 6-7-07 CY NZ 6-7-07

		Comments:
Chain of Custody Present:	☒Yes ☐No ☐N/A	1.
Chain of Custody Filled Out:	☒Yes ☐No ☐N/A	2.
Chain of Custody Relinquished:	☒Yes ☐No ☐N/A	3.
Sampler Name & Signature on COC:	☒Yes ☐No ☐N/A	4.
Samples Arrived within Hold Time:	☒Yes ☐No ☐N/A	5.
Short Hold Time Analysis (<72hr):	☐Yes ☒No ☐N/A	6.
Rush Turn Around Time Requested:	☐Yes ☒No ☐N/A	7.
Sufficient Volume:	☒Yes ☐No ☐N/A	8.
Correct Containers Used:	☒Yes ☐No ☐N/A	9.
-Pace Containers Used:	☐Yes ☒No ☐N/A	
Containers Intact:	☒Yes ☐No ☐N/A	10.
Filtered volume received for Dissolved tests	☐Yes ☐No ☒N/A	11.
Sample Labels match COC:	☒Yes ☐No ☐N/A	12. No dates or times on coc or samples. CY 6-7-07
-Includes date/time/ID/Analysis Matrix: B		
All containers needing preservation have been checked.	☐Yes ☐No ☒N/A	13.
All containers needing preservation are found to be in compliance with EPA recommendation.	☐Yes ☐No ☒N/A	
exceptions: VOA, coliform, TOC, O&G, WI-DRO (water)	☐Yes ☐No	Initial when completed / Lot # of added preservative
Samples checked for dechlorination:	☐Yes ☐No ☒N/A	14.
Headspace in VOA Vials (>6mm):	☐Yes ☐No ☒N/A	15.
Trip Blank Present:	☐Yes ☒No ☐N/A	16.
Trip Blank Custody Seals Present	☐Yes ☐No ☒N/A	
Pace Trip Blank Lot # (if purchased): _____		

Client Notification/ Resolution: Field Data Required? Y / N

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: _____

Project Manager Review: MAT for Tod N **Date:** 7.9.07

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers)

F-ALLC003rev.3, 11September2006

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Page 1 of

COC No. 022166

CHAIN OF CUSTODY

*Preservation Codes
A=None B=HCL C=H2SO4 D=HNO3 E=DI Water F=Methanol G=NaOH
H=Sodium Bisulfate Solution I=Sodium Thiosulfate J=Other

Company Name:	FIBER INFRASTRUCTURE
Branch/Location:	
Project Contact:	ANDREA MARTIN
Phone:	920 496 6854
Project Number:	HUMBOLDT, BIT LAKE
Project Name:	
Project State:	Michigan
Sampled By (Print):	Doug Workman
Sampled By (Sign):	Doug Work
PO #:	
Regulatory Program:	

Quote #:	
Mail To Contact:	
Mail To Company:	
Mail To Address:	
Invoice To Contact:	
Invoice To Company:	
Invoice To Address:	
Invoice To Phone:	

Data Package Options (billable)
☐ EPA Level III
☐ EPA Level IV

MS/MSD
☐ On your sample (billable)
☐ NOT needed on your sample

Matrix Codes

A = Air	W = Water
B = Biota	DW = Drinking Water
C = Charcoal	GW = Ground Water
O = Oil	SW = Surface Water
S = Soil	WW = Waste Water
SI = Sludge	WP = Wipe

PACE LAB #	CLIENT FIELD ID	COLLECTION DATE	COLLECTION TIME	MATRIX	FILTERED? (YES/NO) Y/N	PRESERVATION (CODE)* Pick Letter	Analyses Requested	CLIENT COMMENTS	LAB COMMENTS (Lab Use Only)	Profile #
001	#1 BIT LAKE								1 - Zip lock	
002	#2 " "									
003	#3									
004	#4									
005	#5									
006	#6									
007	#7									
008	#8									
009	#9									
010	#10									

Rush Turnaround Time Requested - Prelims
(Rush TAT subject to approval/surcharge)
Date Needed:

Transmit Prelim Rush Results by (complete what you want):

Email #1:	
Email #2:	
Telephone:	
Fax:	

Samples on HOLD are subject to special pricing and release of liability

Relinquished By:	Date/Time:	Received By:	Date/Time:
Doug Work	6-6-07 12:00 pm	UPS	
UPS	6-7-07 11:00	Pace	6-7-07 11:00

PACE Project No.
8846631

Receipt Temp = 2.5 °C

Sample Receipt pH
OK / Adjusted

Cooler Custody Seal
Present / ~~Not Present~~
Intact / Not Intact

Version 6.0 08/14/06

ORIGINAL

D-5

Humboldt Mill Project,
Aquatic Survey of Wetland EE Complex

ADVANCED ECOLOGICAL MANAGEMENT
2692 165th Avenue - Morley, MI 49336
(231) 856-7707

Date: October 25, 2007

To: Andrea Martin, Foth Infrastructure & Environment, LLC

From: R. Douglas Workman, Ph.D., Advanced Ecological Management, LLC

Memo: Humboldt Mill Project, Aquatic Survey of Wetland EE Complex

INTRODUCTION

Advanced Ecological Management, LLC (AEM) conducted an environmental baseline aquatic survey in the vicinity of the Humboldt Mill Project site on October 11 and 12, 2007 for Kennecott Eagle Minerals Company under contract to Foth Infrastructure & Environment, LLC. The project is located approximately 25 miles west of Marquette, Michigan as shown on Figure 1. The aquatic survey included an investigation of fish and aquatic macroinvertebrate communities in a wetland complex located north of the Humboldt Mill between the Humboldt Tailings Disposal Facility (HTDF) and the Middle Branch of the Escanaba River (Figure 2). The wetland complex encompasses Wetland EE, a wetland within the project boundary. Wetland EE was evaluated by King & MacGregor Environmental, Inc in 2007 (KME, 2007). The work herein complements the aquatic surveys performed in 2006 and 2007 by AEM on the Humboldt Mill site as documented in the Humboldt Mill Aquatic Survey Report 2006 (AEM, 2007a) and the Aquatic Survey of the Humboldt Tailings Disposal Facility (AEM, 2007b).

The wetland complex is predominantly comprised of emergent and scrub-shrub wetland vegetation, including cattails (*Typha* sp.) and speckled alder (*Alnus rugosa*). Water generally moves through the wetland complex in a northerly direction from the vicinity of the HTDF towards U. S. Highway 41 and to the Middle Branch of the Escanaba River. The hydrology of the wetland complex is influenced by the presence of U.S. Highway 41 and a rail bed, both of which bisect the wetland from east to west and direct water movement through numerous culverts (Figure 2).

A small drain (stream) and a ponded area were investigated within the wetland complex to assess the aquatic community. Both locations appeared to have a consistent water

supply and each location had notably different hydrology characteristics (e.g., visibly flowing in the drain versus standing surface water in the pond). The stream, which drains flow along the right-of-way of Wolf Road, (Marquette County Road FX) approximately 1,200 feet south of the Middle Branch of the Escanaba River, was sampled as part of this survey and appears to convey a portion of the water moving through the wetland complex down-gradient towards the river (Figure 2). Photos 1 and 2 show the downstream and upstream extents near the sampling location.

The pond is within Wetland EE and is located 175 feet north of the HTDF. It appeared to be one of the larger surface water areas in upper portion of the Wetland EE complex (Figure 2). The surface area of the pond is approximately 1.8 acres. Photos 3 and 4 show two pond views.

METHODS

The stream was sampled according to the Michigan Department of Environmental Quality's Surface Water Quality Division Great Lakes and Environmental Assessment Section (GLEAS) *Procedure #51 Survey Protocols for Wadable Rivers* (MDEQ, 2002) to characterize the quality of the stream. The GLEAS Procedure 51 (P-51) is a rapid bioassessment protocol that is used to evaluate stream quality based on fish, macroinvertebrates, and stream habitat characteristics.

Because the P-51 approach is intended for wadable streams and rivers, this approach was not used to sample the pond. However, the pond was sampled to characterize the fish community and to provide a general characterization of the surface water aquatic habitat. The stream and pond were both sampled using a combination of aquatic sampling gear, including a backpack shocker and D-framed kick-nets.

Fish Community

Fish were collected using a Smith-Root LR-24® backpack electroshocker. In the stream, a single pass was conducted in an upstream direction and the duration of electroshocking charge time was recorded. In the pond habitat, one pass was conducted along a representative portion of the pond shoreline. Stunned fish were placed in a live well for identification and enumeration. Following collection and fish identification, the enumerated fish were released in the vicinity of their capture.

The stream fish data were analyzed according to P-51 metrics to produce a "fish score," that score could be used to rate the fish community as poor, neutral (acceptable), or excellent quality. There are ten metrics used to evaluate fish community diversity. The score for each metric can range from -1 to +1 and are described as follows:

- -1 indicates the community is performing outside of (minus) two standard deviations from the average conditions found at excellent sites;
- 0 indicates the community is performing between the average condition and (minus) two standard deviations from the average condition found at excellent sites, and;
- +1 indicates the community is performing better than the average condition found at excellent sites.

The criteria for classifying a site as excellent, neutral, or poor were predetermined and are listed in the P-51 methodology (Creel et al., 1998). The summation of the fish scores can range from -10 to +10 using these metrics. Streams that score from +5 to +10 are considered excellent. Streams that score from -5 to -10 are considered poor, while streams that score from -5 to +5 (including zero) are considered acceptable in fish community diversity (Creel et al., 1998).

As part of the enumeration process, the species, length, weight, and number of fish captured were recorded. One representative of each species that was not identifiable in the field was placed in a voucher jar containing 10% formalin for later identification. Each voucher jar was labeled according to the sample location and date. Fish were identified to species using various taxonomic references (Eddy and Underhill, 1978; Becker, 1983; Page and Burr, 1991; Pflieger, 1997; Coon, 2001). The Michigan County Element List (MNFI, 2007) was reviewed to determine if any threatened, endangered, or special concern aquatic species were present.

Aquatic Macroinvertebrate Community

Aquatic macroinvertebrate sampling was conducted within each location using a D-framed kick-net. The stream and pond habitat were each sampled for 45 minutes using two kick-nets (total sample time = 1.5 hours) in all habitat types within each location.

Collected specimens were stored in 500 ml plastic wide-mouth jars containing 70% ethanol, and were identified using various taxonomic references (Merritt et al., 2008; Bright, 2007; McCafferty, 1998; Cummings and Mayer, 1992; Pennak, 1990; Peckarsky et al., 1990).

Stream Habitat Evaluation

The stream habitat was qualitatively described based on stream morphology, including run/riffle/pool/shallow pool configurations, substrate, substrate embeddedness, instream cover, vegetation, flow stability, and bank stability. Stream habitat was rated as excellent, good, marginal, or poor based on P-51 scores interpreted from 10 habitat metrics. Stream habitat was rated according to the following P-51 habitat scores (MDEQ, 2002):

Habitat Characterization	Total Point Score
1. Excellent	> 154
2. Good	105 – 154
3. Marginal	56 – 104
4. Poor	< 56

Photographs were taken at each sample location to illustrate the conditions during the sampling period. Water temperature, pH, dissolved oxygen, and conductivity were measured within the stream and pond as part of the aquatic habitat evaluation. For comparative purposes, water quality was measured from the shoreline of the north end of the HTDF. These water quality parameters were measured using a Yellow Springs Instrument Model YSI 556 water quality meter.

RESULTS AND DISCUSSION

Fish Community

A total of 45 fish and five different taxa were collected on October 12, 2007 from the wetland complex (Table 1). Central mudminnows (*Umbra limi*) were the most frequently collected fish from the stream and pond, and the majority of fish were collected from the pond. No threatened, endangered, or special concern fish species were collected within the wetland complex.

The stream sampled for this survey is located in a region that is classified as a Northern Lakes and Forests ecoregion (Creel et al., 1998), and the P-51 scoring was based on

metrics that relied on typical data from this ecoregion. If fewer than 50 fish are collected from a warmwater or coolwater stream that is evaluated using P-51, then the site is considered "poor" quality with respect to fish (MDEQ, 2002). Since only three fish were collected from the stream, the stream is considered "poor" quality for fish community.

Aquatic Macroinvertebrate Community

Aquatic macroinvertebrate sampling was conducted on October 12, 2007 within each location. A total of 37 macroinvertebrates were collected from the stream and a total of 184 macroinvertebrates were collected from the pond (Table 2). Sow bugs (Isopoda) and caddisflies (Trichoptera) were the most frequently observed macroinvertebrates in the stream, and mayflies (Ephemeroptera) and dragonflies (Odonata) were the most frequently observed macroinvertebrates in the pond (Table 2).

The stream macroinvertebrate community was rated as "acceptable" according to the P-51 methodology (Table 3). No threatened, endangered, or special concern macroinvertebrates were observed in the stream or pond.

The total number of macroinvertebrates that were collected from the stream were low based on the amount of time spent sampling the stream and compared to other streams of similar size sampled by AEM personnel in Marquette County. The relatively low numbers of macroinvertebrates within the stream may be inherent to this system, may be attributed to seasonal fluctuations, or possibly low water conditions that may have occurred from drought conditions within Marquette County. Although stream flow has not been monitored in the reach investigated for this report, monthly total precipitation in Marquette County was well below normal in six of nine months from January through September 2007 (National Weather Service, 2007). In addition, the project vicinity had been experiencing dryer-than-normal conditions for as many as seven months prior to January 2007. September 2007 was marked by above normal precipitation, which resulted in drought relief according to the National Weather Service (2007).

Aquatic Habitat

The stream appeared to be a small drain with a dredge spoil pile evident along the east side of the stream. The average stream width was 5.4 feet (standard deviation, s = 0.8 feet; number of observations, n = 3) and the average depth was 0.6 feet (s = 0.2; n = 6). The streambanks were well vegetated with speckled alder overhanging the stream

channel, and the predominant herbaceous component was reed canarygrass (*Phalaris arundinacea*, Figures 3 and 4). The substrate of the stream was predominantly comprised of sand, silt, and organic matter.

According to the P-51 protocol, stream habitat was evaluated as a "glide/pool" habitat and was rated as "good" based on the total habitat metric score (Table 4). Dissolved oxygen level within the stream was 8.4 mg O_2/L and the conductivity was 285 microSiemens per cm (µS/cm, Table 5). The pH within the stream was 5.7 and the water temperature was 5.3 ºC. Among sampling locations, both pH and water temperature were lowest in the stream (Table 5).

Most of the pond was surrounded by a dense stand of cattails (Figure 5). Submerged vegetation within the pond was predominantly musk grass (*Chara* sp.), with some red algae observed during the survey. Sparse woody debris was present along the shoreline and within the pond (Figure 6).

The dissolved oxygen within the pond was 7.8 mg O_2/L and the conductivity was 365 µS/cm (Table 5). The conductivity within the north end of the HTDF, which was only 175 feet south of the pond, was 440 µS/cm on October 12, 2007. There appeared to be a gradient of increasing conductivity from the stream through the wetland complex up to the HTDF. The conductivity within the wetland complex and the HTDF are higher than values that have been measured by AEM in other sample locations around the Humboldt Mill (AEM, 2007a).

Baraga

Michigamme Twp

Champion Twp

Powell Twp

Ishpeming Twp

Marquette Twp

Negaunee Twp

Ely Twp

Marquette

US 41

Marquette

Lake Superior

~24 Miles

US 41

Ishpeming

Negaunee

Humboldt Mill
Project Location

CR 601

US 95

Republic Twp

Sands Twp

Chocolay Twp

Tilden Twp

Richmond Twp

Humboldt Twp

West Branch Twp

Skandia Twp

NOTES

1. Horizontal datum based on NAD 83/94.
   Horizontal coordinates based on UTM Zone 16.
2. All base information downloaded from Michigan Center of Geographic Information (http://www.michigan.gov/cgi).
3. Site Location - Project Site within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.

LEGEND

- Counties
- Minor Civil Divisions
- Lakes and Rivers
- KEMC Project Location
- Highways
- Major Roads
- Minor Roads
- Railroads

N

ADVANCED ECOLOGICAL MANAGEMENT

Foth Infrastructure & Environment, LLC

M:\06w003\mxd\AEM\EE\kmc_humboldt_ProjectLocation_11x17.mxd October 26, 2007

Foth Infrastructure & Environment, LLC			
REVISED	DATE	BY	DESCRIPTION
CHECKED BY: AKM			DATE: OCT. '07
APPROVED BY: SVD1			DATE: OCT. '07
APPROVED BY:			DATE:

Kennecott Eagle Minerals

FIGURE 1

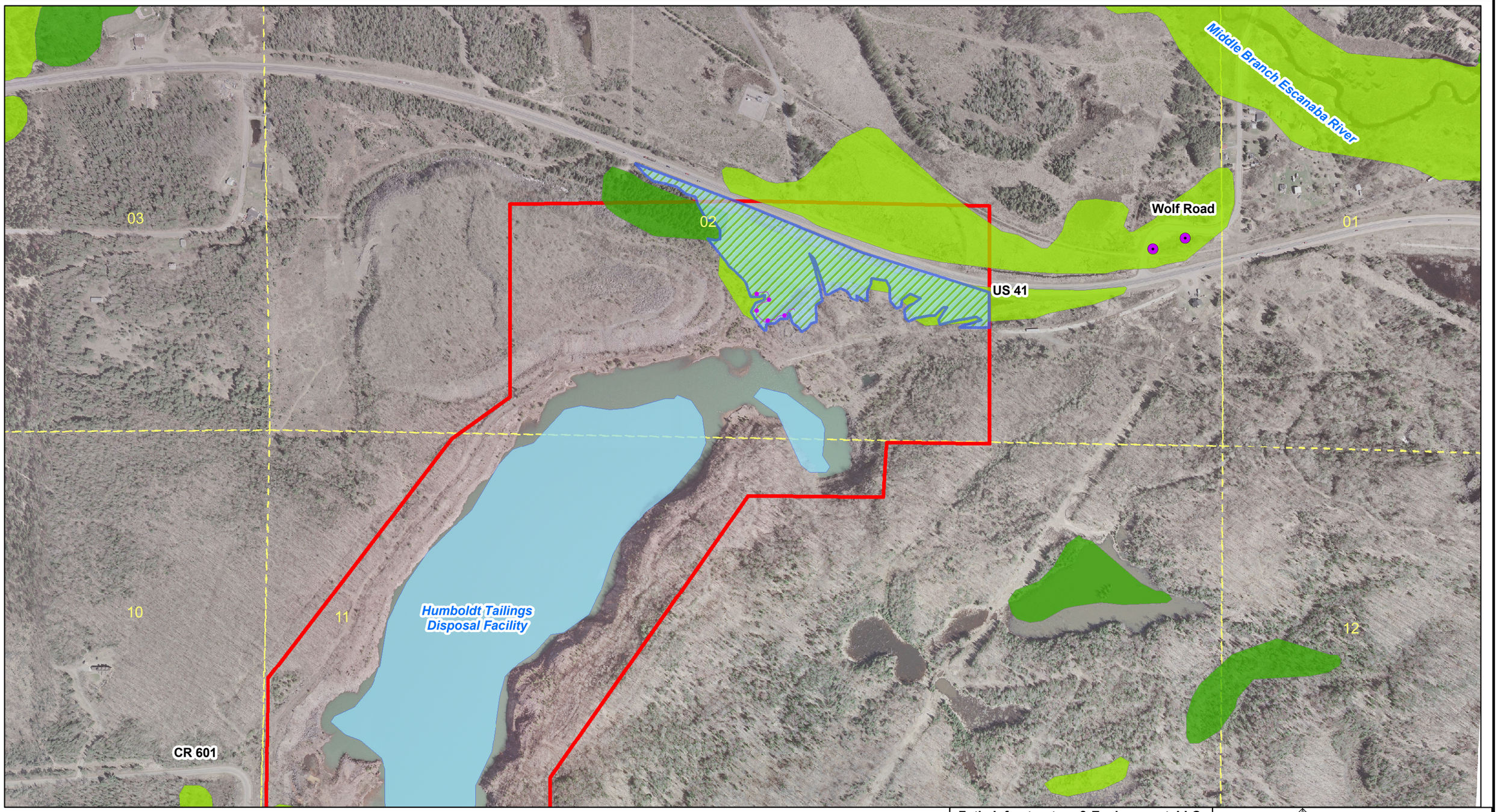
HUMBOLDT MILL PROJECT
PROJECT LOCATION

Scale: 0 1.5 3 Miles

Date: OCTOBER 2007

Prepared by: DAT

Project No: 06W003



NOTES

1. Orthophotography supplied by Aero-Metric Engineering, Sheboygan, Wisconsin. Date of photography: April 27, 2006.
2. Horizontal datum based on NAD 83/94. Horizontal coordinates based on UTM Zone 16.
3. Site Location - Project Site within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.

M:\06w003\mxd\AEM\EE\kmc_humboldt_AquaticSurvey_11x17.mxd October 26, 2007

LEGEND

- PLSS Sections
- KEMC Project Location
- Flagged Wetland Boundary (Area approximately 11.8 acres)

2007 Survey
- Stream Location
- Pond Backpack Transect

Marquette County NWI
- Emergent
- Scrub-Shrub
- Forested
- Open Water/Unknown Bottom

N

ADVANCED ECOLOGICAL MANAGEMENT

Foth Infrastructure & Environment, LLC

Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	AKM	DATE: OCT. '07	
APPROVED BY:	SVD1	DATE: OCT. '07	
APPROVED BY:		DATE:	

Kennecott Eagle Minerals

FIGURE 2
HUMBOLDT MILL PROJECT WETLAND EE AQUATIC SURVEY LOCATIONS

Scale: 0 250 500 Feet

Date: OCTOBER 2007

Prepared by: DAT

Project No: 06W003

Table 1. List of fish collected from wetland complex during October, 2007.

Scientific Name	Common Name	Location	Number Collected
Culaea inconstans	brook stickleback	Pond	1
Lepomis macrochirus	bluegill	Pond	4
Notropis atherinoides	emerald shiner	Pond	2
Umbra limi	central mudminnow	Pond	35
Semotilus atromaculatus	creek chub	Stream	1
Umbra limi	central mudminnow	Stream	2
		Total Collected	45

Table 2. List of macroinvertebrates collected from the Wetland EE Complex during October, 2007.

Order	Family	Stream Genus	Species	Life Stage	Total Collected
Annelida	Glossiophoniidae			N/A	1
Coleoptera	Dytiscidae	*Agabus*	sp.	Larvae	2
Diptera	Ceratopogonidae	*Monohelea*	sp.	Larvae	1
Diptera	Tipulidae	*Tipula*	sp.	Larvae	5
Isopoda	Asellidae			N/A	12
Lepidoptera	Crambidae			Larvae	2
Odonata	Cordulegasteridae	*Cordulegaster*	*maculata*	Nymph	1
Odonata	Corduliidae	*Somatochlora*	sp.	Nymph	1
Trichoptera	Limnephilidae	*Onocosmeocus*	sp.	Larvae	3
Trichoptera	Limnephilidae	*Platycentropus*	sp.	Larvae	9
				Total	**37**

Order	Family	Pond Genus	Species	Life Stage	Total Collected
Ephemeroptera	Siphlonuridae	*Siphlonurus*	sp.	Nymph	10
Ephemeroptera	Baetidae	*Callibaetis*	sp.	Nymph	16
Ephemeroptera	Caenidae	*Caenis*	sp.	Nymph	30
Odonata	Coenagrionidae	*Enallagma*	sp.	Nymph	17
Odonata	Libellulidae	*Tramea*	sp.	Nymph	1
Odonata	Libellulidae	*Pachydiplax*	sp.	Nymph	4
Odonata	Libellulidae	*Leucorrhina*	sp.	Nymph	16
Odonata	Aeshnidae	*Aeshna*	sp.	Nymph	9
Trichoptera	Limnephilidae	*Nemotaulius*	*hostilis*	Larvae	1
Trichoptera	Psycomyiidae			Larvae	1
Coleoptera	Hydrophilidae	*Tropisternus*	sp.	Adult	2
Coleoptera	Dytiscidae	*Agabus*	sp.	Larvae	2
Hemiptera	Corixidae	*Arctocorisa*	sp.	Adult	5
Hemiptera	Corixidae	*Callicorixa*	sp.	Adult	17
Hemiptera	Notonectidae	*Notonecta*	*lunata*	Adult	12
Hemiptera	Nepidae	*Ranatra*	sp.	Adult	2
Amphipoda	Hyalellidae	*Hyalella*	sp.	N/A	4
Diptera	Chironomidae			Larvae	18
Diptera	Tipulidae	*Tipula*	sp.	Larvae	1
Diptera	Ceratopogonidae			Larvae	1
Oligochaeta	Naididae			N/A	3
Gastropoda	Planorbidae			N/A	10
Gastropoda	Physidae			N/A	1
Pelecypoda	Uneonidae	*Pisidium*	sp.	N/A	1
				Total	**184**

Table 3. Procedure 51 macroinvertebrate score and community rating for the stream sampled by AEM during October 2007.

METRIC	Value	Score
TOTAL NUMBER OF TAXA	9	0
NUMBER OF MAYFLY TAXA	0	0
NUMBER OF CADDISFLY TAXA	1	-1
NUMBER OF STONEFLY TAXA	0	-1
PERCENT MAYFLY COMPOSITION	0.00	-1
PERCENT CADDISFLY COMPOSITION	32.43	1
PERCENT CONTROLLING DOMINANT TAXON	32.43	-1
PERCENT ISOPOD, SNAIL, LEECH	32.43	-1
PERCENT SURFACE. AIR BREATHERS	8.11	0
TOTAL SCORE		**-4**
MACROINVERTEBRATE COMMUNITY RATING		**ACCEPTABLE**

Table 4. Procedure 51 habitat score and rating for the stream sampled by AEM during October 2007.

Habitat Metric	Station 5 glide/pool
Substrate and Instream Cover	
Epifaunal Substrate/Available Cover	13
Pool Substrate Characterization	13
Pool Variability	6
Sediment Deposition	14
Channel Morphology	
Maintained Flow Volume	7
Flashiness	9
Channel Alteration	9
Channel Sinuosity	5
Riparian and Bank Structure	
Bank Stability (L)	9
Bank Stability (R)	9
Vegetative Protection (L)	10
Vegetative Protection (R)	10
Riparian Vegetation Zone Width (L)	8
Riparian Vegetation Zone Width (L)	9
Total Score	**131**
Habitat Rating	**Good**

Table 5. Water quality parameters sampled near the Humboldt Mill by AEM during October 2007.

Location	Date	Time	Temp (ºC)	pH	Conductivity (µS/cm)	Dissolved Oxygen (mg O_2/L)	%DO
Stream	10/12/2007	9:22	5.3	5.74	285	8.4	66.3
Pond	10/12/2007	10:47	7.4	8.26	365	7.8	64.8
HTDF	10/12/2007	10:44	13.4	8.34	440	9.5	91.9

Photo 1. Downstream extent of stream. View to the south looking upstream. Photograph collected by AEM on 12 October 2007.

Photo 2. Upstream extent of stream. View to the north looking downstream. Photograph collected by AEM on 12 October 2007.

Photo 3. Pond that was sampled by AEM on 12 October 2007. View to the northeast. Photograph collected by AEM.

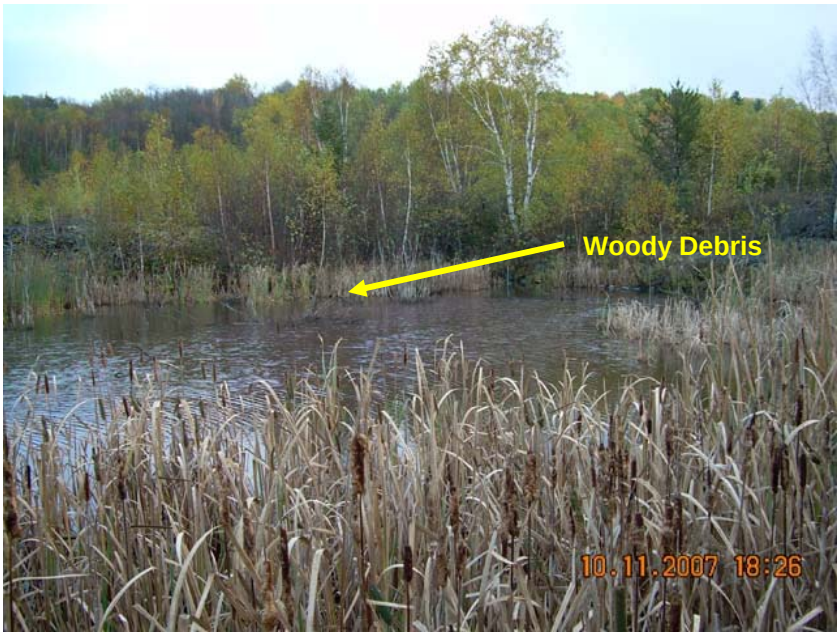


Photo 4. Pond that was sampled by AEM on 12 October 2007. View to the north. Photograph collected by AEM 11 October 2007.

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Appendix E

Phase I Cultural Resource Survey for Kennecott Eagle Minerals Company Humboldt Mill Project in Marquette County, Michigan

PHASE I CULTURAL RESOURCE SURVEY FOR KENNECOTT EAGLE MINERALS COMPANY HUMBOLDT MILL PROJECT IN MARQUETTE COUNTY, MICHIGAN

April 2007

Prepared by
URS Corporation
Engineers, Architects, Planners
36 East Seventh Street, Suite 2300
Cincinnati, Ohio 45202

Phone: 513-651-3440 Fax: 513-651-3452

Report Prepared by:

_____

Christopher Bergman, Ph.D., RPA

Principal Investigator

ABSTRACT

This report details the background research, field strategy, and results of a Phase I cultural resource survey in Marquette County, Michigan. The area surveyed totals approximately 99 acres. The cultural resource work was conducted by personnel from URS Corporation's Cincinnati, Ohio office under contract to Foth Infrastructure & Environment, LLC of Green Bay, Wisconsin.

The purpose of the cultural resource investigation was to locate and identify cultural resources within the project Area of Potential Effect (APE) using a sampling strategy approved by the Michigan State Historic Preservation Office (MISHPO) and Michigan Office of the State Archaeologist (OSA). During the Phase I survey, a literature search was initiated to locate previously recorded cultural resources within or near the APE, to identify investigations that had previously taken place, and to provide information on the expected types and location parameters of sites in the vicinity.

Due to the extensive disturbance identified at the former Humboldt facility, the survey focused primarily on prior development and areas that were likely to contain intact soils. Thus, the study was concentrated within areas around the perimeter of the existing mill buildings. One isolated find of a possible prehistoric quartz flake (Site 20Mq248) and an area containing a suspected historic structure (Site 20Mq249) were identified.

URS

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ABBREVIATIONS

APE	Area of Potential Effect
MISHPO	Michigan State Historic Preservation Office
OSA	Office of State Archaeology
NRHP	National Register of Historic Places

1.0 INTRODUCTION

1.1 INTRODUCTION

This report details the background research, field strategy, and results of a Phase I cultural resource survey in Marquette County, Michigan. The project is located in Humboldt Township as shown in Figure 1. The area surveyed totals approximately 99 acres. The cultural resource work was conducted by personnel from URS Corporation's Cincinnati, Ohio office under contract to Foth Infrastructure & Environment, LLC of Green Bay, Wisconsin.

The purpose of the cultural resource investigation was to locate and identify cultural resources within the project Area of Potential Effect (APE) using a sampling strategy approved by the Michigan State Historic Preservation Office (MISHPO) and Michigan Office of the State Archaeologist (OSA). During the Phase I survey, a literature search was initiated to locate previously recorded cultural resources within or near the APE, to identify investigations that had previously taken place, and to provide information on the expected types and location parameters of sites in the vicinity.

To complete the investigation, several research strategies were employed:

- Background research, specifically a literature and physiographic review, at local libraries, historic research centers, the MISHPO, and the OSA;
- Interviews with local historians, archaeologists, and personnel of the MISHPO and OSA (Ms. Barbara Mead); and
- Field reconnaissance of the project area, which included surface inspection of exposed soils and fixed-interval shovel testing.

1.2 PROJECT DESCRIPTION

This survey addresses the existing facilities at the Humboldt Mill, near the town of Humboldt, Michigan. KEMC is considering purchasing the mill and adjacent property and refurbishing the mill for possible future operations. Besides the refurbished mill operation, other facilities may be included such as ore crushing, the construction of a lined and covered tailings storage facility, storm water retention ponds, and upgrading of the site roads for ore transportation and shipment of the concentrate to a railhead. Figure 2 shows a plan for the facility.

Powell Twp
Michigamme Twp
Champion Twp
Ishpeming Twp
Marquette Twp
Negaunee Twp
Marquette
Lake Superior
Ely Twp
~24 Miles
US 95
US 41
M 28
Negaunee
Ishpeming
Humboldt Mill
Project Location
Republic Twp
Humboldt Twp
CR 601
Tilden Twp
Richmond Twp
Sands Twp
Chocolay Twp

NOTES

1. Horizontal datum based on NAD 83/94.
   Horizontal coordinates based on UTM Zone 16.
2. All base information downloaded from Michigan Center of Geographic Information (http://www.michigan.gov/cgi).
3. Site Location - Project Site within Section 11, T47N, R29W, Town of Humboldt, Marquette County, Michigan.

LEGEND

- Counties
- Minor Civil Divisions
- Lakes and Rivers
- Highways
- Major Roads
- Minor Roads

N

Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	CED1	DATE: JUN. '07
APPROVED BY:	SVD1	DATE: JUN. '07
APPROVED BY:		DATE:

Kennecott Eagle Minerals

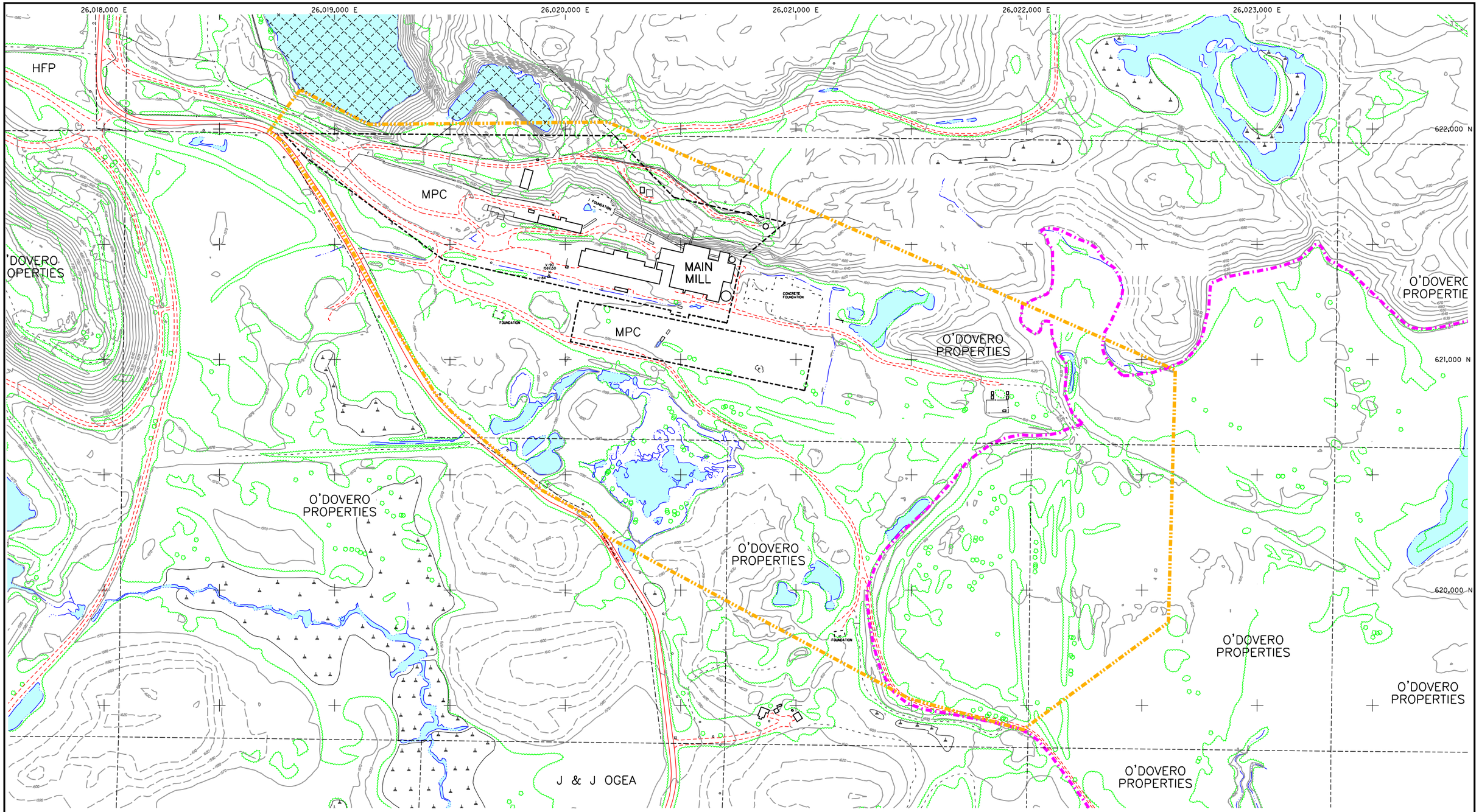
FIGURE 1

HUMBOLDT MILL PROJECT
PROJECT LOCATION

Scale: 0 1.5 3 Miles | Date: JUNE 2007

Prepared by: DAT | Project No: 06W003

M:\06w003\mxd\\kmc_humboldt_ursarcheology_11x17.mxd June 29, 2007



LEGEND

- EXISTING ELEV. CONTOUR IN FEET
- PAVED ROAD
- UNPAVED ROAD
- TRAIL
- TREE
- TREE LINE
- FENCE
- SURFACE WATER
- SWAMP/WETLAND
- STREAM/LAKE
- BUILDING
- FORMER HUMBOLDT MINE SITE
- APPROXIMATE LIMITS OF PRE-EXISTING TAILINGS DISPOSAL FACILITY
- ARCHEOLOGICAL STUDY AREA
- MPC PROPERTY BOUNDARY
- PROPERTY BOUNDARY

NOTES:

1. TOPOGRAPHIC AND PLANIMETRIC DATA SUPPLIED BY AERO-METRIC ENGINEERING, SHEBOYGAN, WISCONSIN. DATE OF PHOTOGRAPHY: APRIL 27, 2006.
2. CONTOUR INTERVAL BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. HORIZONTAL DATUM BASED ON NAD 83/96. HORIZONTAL COORDINATES BASED ON MICHIGAN STATE PLANE.
3. SITE LOCATION: PROJECT SITE WITHIN SECTIONS 1, 2, 3, 10, 11, 12, 13, 14 & 15, T47N, R29W, TOWN OF HUMBOLDT, MARQUETTE COUNTY, MICHIGAN.
4. CONTOUR INTERVAL SHOWN IS 10 FOOT.

Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	AKM	DATE: APR. '07
APPROVED BY:	SVD	DATE: APR. '07
APPROVED BY:		DATE:

Kennecott Eagle Minerals

FIGURE 2

HUMBOLDT MILL - SITE OVERVIEW

Scale: 0 200' 400'

Date: APRIL, 2007

Prepared By: DAT

Project No. 06W003

L:\06w003\drawings\SPN feet\6w03 URS Archeological Study Area.dgn
4/13/2007 dat

The Humboldt Mill was constructed and operated by Cleveland Cliffs and partners in 1954 to process iron ore. The ore was mined from the Humboldt Pit, an open pit mine located directly northwest of the mill. Pit mining was discontinued in 1973 and the pit filled with water, (Figure 2). The mill continued processing iron ore from another mine until 1979. Operations resumed in 1984 under Callahan Mining Corporation, who converted the mill to process gold ore from the Ropes Mine. During this period, tailings were pumped to the Humboldt pit (Humboldt Tailings Disposal Facility {HTDF}). In 1991, Coeur d'Alene Mines Corporation purchased Callahan, the Ropes Mine, and the Humboldt Mill facilities and continued the gold mining and processing until 1995 when mill facilities were purchased by Minerals Processing Corporation (MPC). MPC conducts limited dry ball milling operations at the Humboldt site.

1.3 DEFINITION OF AREA OF POTENTIAL EFFECT

For the purposes of this study, the APE has been subdivided into an area of direct effect and an area of indirect or view shed effect. The zone of direct effect, involving ground disturbance related to ground disturbing construction activities, is generally confined within the existing facility boundaries (Figure 2). Aside from the existing mill buildings, no structures are visible from the Humboldt facility which is surrounded by dense mixed forests and hills; consequently, view shed or indirect effects are non-existent.

1.4 PROJECT PERSONNEL AND SCHEDULE

The analysis and report preparation were the responsibility of Principal Investigator Christopher A. Bergman, Ph.D., RPA. Background Research was completed by Dr. Bergman by telephone during the project. The archaeological and Architectural History field reconnaissance of the project APE was supervised by Dr. Bergman between September 17-19, 2006, under optimal weather conditions.

1.5 REPORT ORGANIZATION

The following report is organized according to the outline suggested by the MISHPO. As such, the report begins with an examination of the various research questions that the Phase I survey attempts to address (Chapter 1). This is followed by a discussion of the environmental and historical factors present within Marquette County, including an overview of the known archaeological record for this region (Chapter 2 and Appendix A). Chapter 3 describes the literature search supporting this study. The field and laboratory methods and the results of the fieldwork are discussed in Chapter 4 and 5. Chapter 6 presents the results and recommendations. Figures, such as historic mapping of the project area and graphical representation of the survey coverage, are interspersed throughout the document where appropriate. A detailed cultural

overview appears as Appendix A, while a map depicting the results of the 2006 investigation appears on page 23.

1.6 RESEARCH QUESTIONS

The project area undergoing investigation has a long history of industrial activity and a high degree of disturbance. Had any artifacts been present when the first human activity occurred, the ensuing disturbance most likely will have prevented a current discovery of a recoverable artifact. The project area, for the purposes of this study, is regarded as containing a low potential for cultural material due to the extent of previous disturbance. The most effective method for testing the APE could be a 15 meter (m) test interval supplemented by visual inspection in areas where there is minimal or no ground disturbance. The investigation is designed to conservatively confirm the absence of cultural artifacts in the project area. Specific research questions to guide the survey and maximize the research potential of the study include:

- What types of prehistoric sites can be found within the project area and if identified, how do the prehistoric resources fit into the archaeological record of the region?
- The presence of several Paleo-Indian sites in the project region is suggestive of a focus for activity in the area during the early settlement of the Upper Great Lakes. Are there additional Paleo-Indian sites in the project area?
- Historic-era mapping of the area reveals that a number of logging camps were located within the county, several of which may have been situated within or near the project. Is there any archaeological footprint of these occupations, and was there any additional historic activity in the remainder of the area?
- Are there any cultural resources within the project area that are potentially eligible for inclusion on the National Register of Historic Places?

2.0 ENVIRONMENTAL OVERVIEW

The following narrative describes the prehistoric and historic environmental setting of the project area in order to develop a context for understanding the location and preservation of cultural resources. Environmental conditions, including climate, and the related floral and faunal communities significantly influenced the type and extent of historic and prehistoric settlement and subsistence patterns.

2.1 PREHISTORIC AND MODERN ENVIRONMENT

The following floral and faunal reconstructions are based on palynological assessments and archaeological data. Palynological data indicate types and frequencies of floral species present in an assemblage, including archaeological samples, while the early historic records provide evidence of distribution of natural forest types at the time of initial European settlement. For example, the earliest vegetational patterns of the post-glacial succession, as well as shifts in climax forest constituents, are derived primarily from palynological evidence. On the other hand, the forest types present during the Woodland cultural periods (especially those directly preceding European contact) are assumed to be similar to those present during the advent of the historic period, as evidenced in the vast compendium of ethnohistoric data recorded for the region in the 17th and 18th centuries.

Three paleoecological sites have been analyzed in the region, all within the northwestern corner of Marquette County. The Camp 11 Lake, Lost Lake, and Yellow Dog Pond sites have all been instrumental in assessing the Late Pleistocene and Early to Mid-Holocene environment of the Upper Peninsula in general, and Marquette County in particular. The area that would eventually become Marquette County was covered by glacial ice during the last peak of glacial advance (21,000 to 14,000 B.P.), when the vast Laurentide ice sheets extended south of present-day Michigan to the Ohio River (Dorr and Eschman 1970:161). During this glacial advance (known as the Late Wisconsinan), the ice sheet was several thousands of feet thick. Marquette County was first deglaciated during the Carey-Port Huron interval (13,300 to 13,000 B.P.), when a rise in worldwide temperature caused the ice sheet to retreat to the north of the Keweenaw Peninsula. During this relatively short period, the leading edge of the ice sheet extended to within 75 miles north of the project area. This period ended quickly, as the ice advanced across the northern portion of the state, leaving Marquette County effectively covered by ice through to the end of the glacial era in Michigan, around 11,000 B.P.

According to Mason (1981:68), geologists and palynologists estimate a 160 to 320 km wide zone of park tundra-like ground extending south from the leading edge of the glacier, which would gradually shift north during the Holocene as the glacial ice retreated. The boundary of this zone

was most likely sinuous, and was interlaced with the advancing coniferous forest, which dominated the environments immediately to the south. Studies in Michigan and the surrounding areas indicate that this tundra-like vegetation became established in the Upper Peninsula with the retreat of the ice shield to the north of Sault Ste. Marie.

At some point near 9900 B.P., the ice shield again descended across glacial Lake Michigan (which encompassed Lake Superior and the upper reaches of Lake Huron), partially covering the northern extent of Marquette County (Kapp 1999:50-51). Known as the Marquette Advance, this event meant that a tundra-like setting most likely dominated the region of the project area until approximately 8500 B.P. At that time, a mixed pine and deciduous forest became established in Marquette County, a biome that, in a limited way, is still extant in the remote portions of Marquette County (including the project region).

The project area is currently situated within the Canadian Biotic Province (Mason 1981:58-60). The forest type is referred to as Lake Forest, which is typified by a wide variety of coniferous and deciduous trees. Among the species present in this environment are black spruce, white spruce, balsam fir, jack pine, tamarack, red pine, white aspen, basswood, willow, and sugar maple. This variety of vegetation, in addition to shrubs and other plants, provided a broad range of natural resources that would have been readily available for exploitation by both prehistoric and historic peoples. Mason (1981:59) notes that at least 373 native plant species are known to have been utilized by native societies of the Upper Great Lakes region at the time of contact. He believes there probably were as many as 500 species that may actually have been exploited by these cultures.

The modern climate of Marquette County is heavily influenced by the proximity of Lake Superior to the north and, to a lesser degree, Lake Michigan to the south. The Great Lakes produce a moderating effect, resulting in a cooler summer and warmer winter than a land mass at the same latitude with no major body of water nearby. The length of the growing season varies from year to year, typically averaging 80 to 100 days annually (Sommers, 1977). The average high temperature during the summer months is an extremely mild 75 degrees Fahrenheit, while the winter months are into the low teens.

Precipitation occurs sporadically throughout the year, with a slight increase in annual rainfall in early summer and autumn (Sommers, 1977). During the long winter months, the region averages between 140 to 160 inches of snow, with at least 120 days of at least one inch of snow cover. Like most of the Upper Great Lakes, the first snows of the winter typically set in during the two weeks around the end of the October.

The relatively poor soils and severe climate have severely restricted agricultural activity in this region. Historically, mining and forestry have been the main industrial pursuits in rural Marquette County (including the area of the project). The modern era has seen a significant rise in the exploitation of the land for recreational purposes, as evidenced by the increasing number of vehicle trails, parks, and campgrounds.

2.2 GEOLOGY, SOIL CORINGS AND SOILS

The geology of the Humboldt mine and mill area was mapped in detail by the U.S.G.S in 1975 as part of the Republic Quadrangle. Bedrock in this area consists of Archean granitic gneiss in fault contact with younger, Lower Proterozoic sediments that have been folded and metamorphosed. Nearly all of the mill buildings are situated on the south side of the fault, constructed over the gneiss. The metamorphosed sedimentary rocks form the high ridges to the north of the mill buildings. These sedimentary rocks include quartzite, iron formation and minor slate and host the deposit that was mined from the Humboldt Pit.

The bedrock is overlain by a complex sequence of unconsolidated material that is generally thinner over the Lower Proterozoic rocks to the north of the mill buildings and thicker where it occurs over the Archean rocks, south of the mill buildings. Previous published and unpublished reports have documented the presence of a buried swamp, or wetland in the area south of the mill buildings. A recent subsurface investigation has completed eighty soil borings in the vicinity of the mill buildings and the area up to 1,200 feet to the east, south, and west of the facility. The preliminary findings of that investigation indicate a complex assemblage of glacial till, glacial outwash and at least one peat horizon that may be more that ten feet thick. There are two large tailings basins surrounded by man-made stone berms, located southeast of the mill buildings. The subsurface investigation identified a wedge of tailings more than fifty feet thick overlying in situ peat, sand and gravel outwash and till.

The relationship between these unconsolidated formations is complicated by the extensive backfilling of low areas prior to and during construction of the Humboldt Mine and Mill. The backfill consists of fine to coarse sand, gravel and rock from previously existing deposits on the property that were leveled and transported to low-lying areas, and waste rock taken out of the mine. In many cases, it is difficult to distinguish sand gravel and rock that has been used as fill from similar material that is found in place. However, without exception, all of the soil borings intersected disturbed soils on the surface, at all locations that were tested.

A review of soils information for the project area indicates the soils are generally spodosols with humic and albic horizons and an ochric epipedon. These soils generally form in forests.

2.3 ABBREVIATED CULTURAL OVERVIEW

The following section presents an abbreviated overview of cultural development in the project region. A more detailed version of this section may be found in Appendix A.

The Upper Peninsula of Michigan has a long history of occupation. As climatic conditions began to improve at the end of the last Ice Age, prehistoric Paleoindian groups visited localities south of the project area at Silver Lake and Negaunee. Later, during the Archaic Period, perhaps as early as 6000 years ago, the importance of the region's mineral resources was first recognized as evidenced by the extensive exploitation of native copper. Native Americans participating in what became known as the Old Copper Complex used copper for the manufacture of awls, axe blades, socketed spear points, fish hooks, as well as ornaments. As the prehistoric period drew to a close, new natural resource procurement strategies developed to include harvesting wild rice and, along the southern portion of the peninsula, use of deep water fisheries in the Mackinac straits. Interest in the natural resources and scenic beauty of the region continued into historic times with the burgeoning logging industry and establishment of recreational camps.

3.0 LITERATURE SEARCH

3.1 LITERATURE SEARCH

Ms. Barbara Mead of the MISHPO was contacted on September 20, 2006, regarding previously recorded sites and cultural resource surveys within the project boundaries located on the Republic, Michigan 7.5 minute USGS Quadrangle. No previously recorded sites or structures were identified in the state site files.

4.0 FIELD AND LABORATORY METHODS

4.1 FIELD METHODS

Following Michigan State Historic Preservation Office (MISHPO) guidelines, the field survey encompassed systematic surface inspection combined with the use of shovel test pit transects using intervals spaced no more than 15 meters apart. Each shovel test measured roughly 50 centimeters x 50 centimeters and was excavated to the base of Holocene soils. Excavated soils were screened through ¼ inch wire mesh and examined for evidence of cultural materials. Profiles were described for each shovel test and notes were recorded concerning the soil stratigraphy and any cultural resources encountered. All shovel tests were assigned a unique designation that was then mapped with sub-meter accurate GPS equipment. Aside from the Humboldt facilities built in the middle to late 1950's, no above ground resources exist within, or within the view shed of, the survey area.

4.2 LABORATORY METHODS

4.2.1 Introduction

Once collected in the field, the artifact was bagged by provenience unit (a shovel test in this instance). The bag was labeled with the project number, project title, site number, sample locus type and number, stratigraphic unit of recovery, elevation of recovery, and the date of excavation. This information was then transferred to a log and the bag was labeled with an individual number. Upon return to the laboratory, the artifact was washed in warm water. The artifact was then air dried, rebagged in a clean receptacle, and data entered into an Excel spreadsheet that was used for analysis.

4.2.2 Prehistoric Lithic Classification

Terminology Related to Debitage

Blank: When a flake is detached from a block of raw material it may be regarded as waste, utilized without modification, or used as a 'blank' to be retouched into a tool (e.g., a scraper or denticulate).

Chip: This term, introduced by Newcomer and Karlin (1987), describes tiny flakes (<1 cm in length) which are detached during several different types of manufacturing trajectories. First, they can result from the preparation of a core or biface edge by abrasion, a procedure that strengthens the platform prior to the blow of the hammer. During biface manufacture, chips are detached when the edge is 'turned' and a platform is created in order to remove longer, more

invasive flakes. Tiny flakes of this type are also removed during the manufacture of tools like end-scrapers.

Core: A core is a block of raw material, other than a biface preform, from which flakes have been detached. Cores may be produced by careful preparation or consist of a block of material from which only a few flakes have been detached.

Debitage: The French term debitage has two related meanings: 1) it refers to the act of intentionally flaking a block of raw material to obtain its products, and 2) it refers to those products themselves. Commonly, the term debitage is used by prehistorians to describe flakes that have not been modified by secondary retouch and made into tools.

Flake: A flake is a product of debitage that has a length/width ratio of 1:1 (de Sonneville-Bordes, 1961). In this report, there are two separate categories of flakes and the first is for those pieces to which a specific reduction sequence cannot be assigned. With these pieces, it is impossible to tell whether they have been detached during simple core reduction or biface manufacture. For example, cortical flakes initially removed from a block of raw material can appear similar in both core and biface reduction.

The second group of flakes results from biface reduction and is described as follows:

Biface initial reduction flakes are typically thick, have cortex on part of their dorsal surfaces, and have large plain or simply faceted butts. There are relatively few dorsal scars, but these may show removals from the opposite edge of the biface.

The thinning/shaping flakes result from shaping the biface, while its thickness is reduced. These flakes generally lack cortex, are relatively thin, have narrow, faceted butts, multidirectional dorsal scars, and curved profiles. Thinning flakes are typically produced by percussion flaking.

The finishing or trimming flakes are produced during the preparation of the edge of the tool. These flakes are similar in some respects to thinning flakes, but are generally smaller and thinner and can be indistinguishable from tiny flakes resulting from other processes such as platform preparation. Biface finishing flakes may be detached by either percussion or pressure flaking.

The categories used to describe biface reduction follow in a broad sense those proposed by Newcomer (1971), Callahan (1979), and Bradley and Sampson (1986). It should be noted, however, that rigid schemes of reduction such as those cited, which break up into stages, a process that is in fact an unbroken continuum from raw material selection to the final abandonment of the tool, can only approximate the course of a manufacturing trajectory used by prehistoric knappers. Thus, the classificatory results provided in the text below, at least at the

level of individual artifacts, should be regarded as "informed opinion" rather than hard fact *per se*. While individual flakes may be subjected to misidentification, the author has demonstrated through experimentation that larger assemblages can be characterized to a level of between 70% and 80% accuracy.

Janus flake: These flakes are a debitage type produced during the initial reduction of a flake blank (Tixier et al., 1980). The removal of a flake from the ventral surface of a larger flake results in a flake the dorsal surface of which is completely or partially composed of the ventral surface of the larger flake blank.

Percussion and pressure flaking: In the case of flintknapping, percussion flaking involves the use of a hammer or percussor to strike a piece of chert in order to detach a flake. This hammer can be of a relatively hard material, such as a quartzite hammerstone, or a softer organic material such as a deer antler. Direct percussion is a flaking technique which involves the delivery of the blow directly on to the striking platform, while indirect percussion utilizes an intermediary or 'punch'. Pressure flaking, as suggested by the name, involves the chipping of stone by pressure. Flakes are 'pressed off' with the use of a pointed tool such as a deer or elk antler tine.

Platform abrasion: When the blow of the percussor is aimed close to the edge of the piece being flaked (marginal flaking), it is necessary to prepare and strengthen that edge. The edge is usually prepared by abrasion that entails rubbing the striking platform area with a hammerstone and detaching a series of tiny flakes (chips) from the surface where the flake will be removed. Evidence of platform abrasion is usually clearly visible on biface thinning flakes at the intersection between the butt and dorsal surface.

Shatter: Shatter can either be produced during the knapping process or through natural agents. Naturally occurring shatter is usually the result of a thermal action shattering a block of chert. During debitage, shatter results from an attempt to flake a piece of chert with internal flaws and fracture lines. For the purposes of this volume, shatter is defined as a piece of chert that shows no evidence of being humanly struck, but may nonetheless be a waste product from a knapping episode.

Terminology Related to Retouched Tools

Biface: A biface is any retouched tool, partially completed or finished, which has been flaked by percussion or pressure flaking over both of its surfaces.

Retouch: This term is taken from the French *retouchee* and refers to the modification of a block of raw material (biface manufacture) or flake by a single removal or series of removals, thus transforming the piece into a 'tool'. Retouch shapes the original blank and its edges and can take

the form of invasive bifacially detached flakes on a projectile point or small, tiny flakes on the edge of an end-scraper. Retouch may also be caused unintentionally due to utilization; in this case retouch forms as a result of an activity and not by a process of intentional modification before use. Utilization retouch is typically discontinuous along an edge.

Retouched flake or piece: This category of retouched tool is represented by flakes, or badly broken artifacts, which have limited amounts of retouch and are not standardized tool forms. The retouch on these artifacts is highly varied in type, inclination, and position.

Tool: For the purposes of typological description only, a tool is any flake that has been shaped and modified by secondary retouch. In the case of biface manufacture, a block of raw material may be transformed directly by retouch into a tool such as a knife or projectile point. The term tool, therefore, is used only for descriptive purposes to separate those artifacts which have been retouched from the debitage or unretouched pieces. Finally, it should be recognized that the latter group of objects may well have functioned as tools, for example unretouched flakes with good cutting edges are effective for skinning and butchery, but this is difficult to determine without a microwear analysis.

Method of Lithic Analysis

The first level of analysis involves separating retouched tools, flakes, cores, and fragments (shatter and 'chunks' of raw material) and listing the presence or absence of features such as cortex. The tools are divided into subclasses including bifaces/preforms, projectile points, knives, scrapers, and miscellaneous tools. The flakes are then further subdivided, in as much as is possible, into groups that would more specifically identify the reduction sequence to which they belonged. The list below presents each of the major artifact categories with its subclasses.

1) Retouched tools
    - A) Points
    - B) Knives
    - C) Bifaces/Preforms
        1. Early reduction (thick, cortical)
        2. Later reduction (thinned, finished)
    - D) Flake Tools
    - E) Miscellaneous Tools
2) Debitage
    - A) Flakes
        1. Initial reduction - all reduction sequences

2. Flakes - undetermined reduction sequence
3. Biface initial reduction flakes
4. Biface thinning flakes
5. Biface finishing flakes - probably including edge sharpening
6. 'Chips' - complete and between 5 mm and 1 cm
7. Microdebitage <5 mm
8. Janus Flakes

For the purposes of analysis, to facilitate sorting and the display of information in tables, and to characterize assemblages, each type of debitage is assigned a class number. These classes were as follows:

Class 1 - Initial reduction flake

Class 2 - Flake (unspecified reduction sequence)

Class 3 - Biface initial reduction flake

Class 4 - Biface thinning flake

Class 5 - Biface finishing flake

Class 6 - Chip

Class 7 - Shatter

Class 8 - Microdebitage

Class 9 - Janus flake

Current approaches to the analysis of lithic artifacts include a study of the systematic procedures utilized by prehistoric knappers to make tools. The term used to describe this process is referred to as *chaine operatoire* or reduction strategy. The production of any class of stone tools involves a process that must begin with the selection of suitable raw materials. The basic requirements of any raw material to be used to make flaked stone artifacts include the following: 1) that it can be easily worked into a desirable shape; and 2) that sharp, durable edges can be produced during flaking. Raw material selection involves a careful process of decision-making and includes consideration of the properties of specific materials, especially their ability to be easily flaked and hold an edge. For example, obsidian is ideal for producing cutting implements such as projectile points, but it is not as suitable for tasks involving heavy chopping.

Once a raw material is selected and an adequate source is located, the process of tool manufacture begins. Two different strategies can be utilized and these involve the reduction of a material block directly into a tool form, like a biface, or the production of a core. The second reduction process involves the preparation of a block of raw material so that flakes of a suitable shape and size can be detached. These blanks are then flaked by percussion or pressure flaking into a variety of tool types including scrapers, bifacial knives, or projectile points.

Biface reduction can proceed along two different manufacturing trajectories, one of which involves the reduction of blocks of raw material, while the other involves the reduction of a flake blank. Experimental work has shown that the former manufacturing strategy, involving a block of raw material, begins with the detachment of flakes with cortical or natural surfaces. This stage is accomplished by direct percussion, usually involving a hard hammer that more effectively transmits the force of the blow through the outer surface. Having removed a series of flakes and thus created suitable striking platforms, the knapper begins the thinning and shaping stage. The majority of the knapping is done with a soft hammer using marginal flaking. The pieces detached tend to be invasive, extending into the midsection of the biface. A later stage of thinning may follow, which consists of further platform preparation and the detachment of invasive flakes with progressively straighter profiles in order to obtain a flattened cross-section. By the end of this stage, the biface has achieved a lenticular or bi-convex cross-section. Finally, the tool's edge is prepared by a combination of fine percussion work and pressure flaking if desired. It should be noted that flakes deriving from biface reduction are sometimes selected for tool manufacture as discussed above. Thus, the biface can, in some instances during the reduction cycle, be treated as a core.

The second manufacturing trajectory, utilizing a flake, begins with core reduction and the manufacture of a suitable flake blank. The advantages of utilizing a flake blank for biface reduction include the following: 1) flakes are generally lightweight and can be more easily transported in large numbers than blocks of material; and 2) producing flakes to be used for later biface reduction allows the knapper to assess the quality of the material, avoiding transport of poorer-grade cherts.

The initial series of flakes detached from a flake blank may or may not bear cortex. However, they will display portions of the original dorsal or ventral surfaces of the flake from which they were struck. It should be noted that primary reduction flakes from this manufacturing sequence can be wholly non-cortical. Thus, the use of the presence of cortex alone to define initial reduction is of limited value. Biface reduction on a flake involves the preparation of the edges of the piece in order to create platforms for the thinning and shaping stages that follow. In most other respects, the reduction stages are similar to those described above, except that a flake blank often needs additional thinning at the proximal or bulbar end of the piece to reduce the pronounced swelling.

4.2.3 Curation

All artifacts recovered will be temporarily stored at URS Corporation’s CRM laboratory in Cincinnati, Ohio, until the materials are returned to the landowner or housed permanently at a state-approved facility. All artifacts and documentary materials (field notes, laboratory notes,

analysis forms, photographs, etc.) were processed, cataloged, analyzed, and prepared in accordance with 36 CFR Parts 79 and 800.

5.0 PHASE I SURVEY RESULTS

5.1 SURVEY RESULTS

Due to the somewhat unique nature of the study area, consisting of an abandoned mining and processing facility and tailings barriers, both disturbed and undisturbed areas are present. The survey methodology complemented the particular area being investigated. In general, this approach involved land adjacent to the mine structures and open ground illustrated in Figure 2. Aside from the shovel testing, visual inspection of the ground surface was conducted throughout the property, noting obvious ground disturbance as illustrated in Plates 1-6.

An ongoing subsurface investigation performed at the time of the archaeological survey by Foth Infrastructure & Environmental sampled eighty soil borings in the vicinity of the mill buildings and the area up to 1,200 feet to the east, south, and west of the facility. The preliminary findings of that investigation (Foth, 2007) indicate a complex assemblage of glacial till, glacial outwash and at least one peat horizon that may be more that ten feet thick. There are two large tailings basins surrounded by man-made stone berms, located southeast of the mill buildings. The subsurface investigation identified a wedge of tailings more than fifty feet thick overlying in situ peat, sand and gravel outwash and till. The relationship between these unconsolidated formations is complicated by the extensive backfilling of low areas prior to and during construction of the Humboldt Mine and Mill. The backfill consists of fine to coarse sand, gravel and rock from previously existing deposits on the property that were leveled and transported to low-lying areas, and waste rock taken out of the mine. In many cases, it is difficult to distinguish sand gravel and rock that has been used as fill from similar material that is found in place. However, without exception, all of the soil borings intersected disturbed soils on the surface, at all locations that were tested.

A total of six different areas were subjected to shovel testing as follows (see Figure 3):

Segment AA-DD: Shovel testing on these segments were situated on a low rise adjacent to a lake, due south of the mining facilities. The landform consists of a small hill with mixed forest and bedrock outcrops visible on the surface. Tree falls associated with beaver activity litter the surface of the hill and adjacent sideslopes. The following table lists the survey transects and results.

Table 5.1 Survey Transects and Results

Sample Loci Type	Number	Number of Positive Sample Loci	Sites
Surface Inspection			
Shovel Test	11	1	Possible isolated milk quartz flake (Site 20Mq248)
Slope	5		
Wet			
Disturbed			
Total	**16**		

A total of 16 sample loci were recorded in Segment AA-DD and the majority of these consisted of negative shovel tests. A typical soil profile for this portion of the project area (SL CC1) consisted of a 0-5 cm 10YR3/1 humic layer, 5-31 cm 10YR5/4 sand, and 31-60 cm 10YR5/4 sand.

The prehistoric origin of the milk quartz unspecified reduction flake (Site 20Mq248) is not considered unequivocal; identification as an artifact is primarily based upon morphology and the fact that no other raw material of this type was noted previously. Additional investigation of the area surrounding the find, which consisted of hill slopes leading down to the lake, resulted in no further artifacts. Therefore, the flake is regarded as isolated and is not considered eligible to the National Register of Historical Places (NRHP).

Segment EE: Segment EE consisted of a single shovel test excavated south of the main access road into the Humboldt facility. The shovel test was mottled and full of gravel. Push piles and an artificial berm were noted south of SL EE1 and the entire area appears to be disturbed.

Segment FF: A total of five shovel tests (SL FF1 – FF5) were excavated on this segment that lies to the east of Segment AA-DD and south of a small concrete foundation along an access road of the facility. SL FF1 was situated south of the foundation and had rock debris on the surface preventing deep excavation. Shovel test FF3 displayed a humic layer, 0-8 cm deep, above 7 cm of a 10YR4/4 silt. At SL FF5 the remains of a berm and doorway associated with a suspected historic era structure (Site 20Mq249) were recorded.

The function of the structure is unknown and it may have been associated with recreational activities or, perhaps, logging. No artifacts were recovered within the bermed area or adjacent landsurfaces. This site is not considered eligible to the NRHP and it lies outside of the area of the proposed ground disturbing activity.

Segment GG: Segment GG is situated on a forested hill to the north of the main buildings of the Humboldt facility. Two negative shovel tests were excavated in this area and SL GG2 displayed 0-15 cm of 10YR3/3 silt above 15-32 cm of 10YR6/6 silt.

Segment HH: Segment HH coincided with a forested hill directly overlooking the mill buildings to the south and two negative shovel tests were excavated. The third 15 meter sample locus was associated with a bedrock outcrop. Sample locus HH2 displayed 0-8 10YR3/1 silt, 8-12 cm 10YR7/2 silt, and 12-25 cm 10YR6/6 silt.

Segment JJ: Segment JJ consisted of six 15 meter interval sample loci and all of these were negative. The shovel tests were located on a small, forested bench and saddle. A typical soil profile (SL JJ3) consisted of 0-10 cm 10YR4/6 silt, 10-22 cm 10YR7/2 silt, and 22-35 cm 10YR4/6 silt.

NOTES

1. Orthophotography supplied by Aero-Metric Engineering, Sheboygan, Wisconsin. Date of photography: April 27, 2006.
2. Horizontal datum based on NAD 83/96. Horizontal coordinates based on Michigan State Plane North.
3. Site Location - Project Site within Section 11, T47N, R29W, Town of Humboldt, Marquette County, Michigan.
4. Archeological GPS data supplied by URS via email.

LEGEND

- Pedestrian
- Positive Shovel Test
- Shovel Test
- Slope
- Archeological Study Area

cc1 = 20MQ248 - Possible Isolated Prehistoric Quartz Flake
ff5 = 20 MQ249 - Suspected Historic Structure

N

Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	AKM	DATE: APR. 07	
APPROVED BY:	SVD1	DATE: APR. 07	
APPROVED BY:		DATE:	

Kennecott
Eagle Minerals

FIGURE 3
AERIAL VIEW WITH SAMPLE POINTS AND CULTURAL RESOUCE LOCATIONS
HUMBOLDT MILL SITE

Scale: 0 250 500 Feet	Date: APRIL 2007
Prepared by: DAT	Project No: 06W003

M:\06w003\mxd\kmc_humboldt_urs2006aerial_11x17.mxd April 4, 2007

Plate 1. General View of Mining Facilities

Plate 2. General View of Mining Facilities Illustrating Disturbance

Plate 3. General View of Disturbance.

Plate 4. General View of Mining Facilities and Disturbance.

Plate 5. General View of Project Area Showing Large Open Area of Disturbance.

Plate 6. General View of Project Area Showing Large Open Area of Disturbance.

6.0 RESULTS AND RECOMMENDATIONS

The purpose of the cultural resource investigation was to locate and identify cultural resources within the project APE using a sampling strategy approved by the MISHPO and OSA. During the Phase I survey, a literature search was initiated to locate previously recorded cultural resources within or near the APE, to identify investigations that had previously taken place, and to provide information on the expected types and location parameters of sites in the vicinity.

Due to the extensive disturbance identified at the Humboldt facility, the survey was conducted only within areas that were likely to contain intact soils. Thus, the study was concentrated within areas around the perimeter of the facility's buildings. One isolated find of a possible prehistoric quartz flake (Site 20Mq248) and an area containing a suspected historic structure (Site 20Mq249) were identified. Neither of these resources is considered eligible to the NRHP.

The results of the survey indicate that a low level of prehistoric and historic activity took place within the APE. The historic period is represented by the remnants of a small structure, possibly related to recreational activity or logging. This find is not unexpected given similar sites identified in Marquette County. The single isolated prehistoric flake evidences low level occupation and probably the significant modern disturbance to the parcel.

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APPENDIX A

CULTURAL OVERVIEW

URS

CULTURAL OVERVIEW

The following chapter provides a discussion of the currently accepted prehistoric and historic landscape of the Great Lakes region, in general, and Michigan in particular. The chronological sequence of prehistoric occupations in Michigan is divided into four subphases referred to as the Paleoindian, Archaic, Woodland, and Upper Mississippian/Oneota (Table 1). These, in turn, are subdivided into Early, Middle, and Late stages, a common practice in eastern North American prehistory. The following narrative discusses each of these temporal phases and provides a context for evaluating the results of the Phase I investigations.

Table 1
Chronological Sequence of Michigan's Prehistoric Cultures

Temporal Period	Dates, B.P.
Paleoindian	Before 11,000 – ca. 10,400 B.P.
Early Archaic	ca. 9,500 – 8000 B.P.
Middle Archaic	ca. 8000 – 5000 B.P.
Late Archaic	ca. 5000 – 2500 B.P.
Early Woodland	ca. 2500 – 2000 B.P.
Middle Woodland	ca. 2000 – 1600 B.P.
Late Woodland	ca. 1600 – 1492 A.D.

PREHISTORIC MICHIGAN

PALEOINDIAN PERIOD (BEFORE 11,000 B.P. – 10,400 B.P.)

The Paleoindian cultural tradition in the eastern United States has been recognized as part of a widespread, homogeneous New World culture, typified by a distinctive lithic assemblage. The most distinctive members of this assemblage are lanceolate-shaped, typically fluted, projectile points fashioned from a wide range of material. Artifact types, which remain fairly consistent across a wide geographic range of sites, represent tools utilized in the processes of hunting, butchering, and hideworking activities.

Most of what is currently known about this earliest of cultural developments in the New World is, by nature, inferred from the sporadic and opportunistic recovery of artifacts, typically from a surficial context and manifest as the ubiquitous diagnostic, fluted projectile point (Dorwin 1971; Prufer and Baby, 1963). These data have been analyzed in conjunction with geochronological and paleoecological data to make generalized assumptions about the earliest Early Holocene inhabitants. Adaptive strategies employed during this epoch were focused on surviving with a predominantly harsh, unstable environment. Paleoindian sites generally reflect areas where

small bands of people gathered to perform specific, short-duration tasks, often geared towards resource procurement. By nature, this type of site becomes manifest archaeologically within an extremely narrow footprint that can be problematic to effectively identify and analyze. It has been argued that the earliest subsistence strategies in North America were not typified by a hunting bias towards megafauna (such as mastodon), but were instead characterized by a balanced hunting economy based on the exploitation of migratory game (especially caribou) and supplemented by extensive gathering (Fitting, 1965; Ritchie and Funk, 1973; Agenbroad, 1988).

Any informed discussion of the prehistoric landscape of eastern North America before 10,000 B.P. begins, of necessity, with an examination of the known environmental and climatic factors present across the continent at that time. The Upper Peninsula is no exception; in fact, the climatic conditions present across this region can be said to have been in a near-constant state of flux during the Late Pleistocene and Early Holocene (see Section 2.1 for a detailed discussion of the environmental forces at work during these epochs). The advance and retreat of the various glacial ice sheets between 13,000 and 9000 B.P. alternately covered the region under hundreds (and, often, thousands) of feet of ice and exposed a harsh, tundra-like landscape that extended south from the leading edge of the ice sheets. As such, the identification of Paleoindian sites in the Upper Peninsula is a problematic exercise at best, since the region was, at various times, either inhospitable or unattainable for human habitation.

In spite of the mitigating environmental factors at play in the region, the past three decades of archaeological research have produced a better understanding of the Paleoindian landscape of the region in general and Marquette County in particular. Unlike the situation in the Lower Peninsula of Michigan, which has a documented Paleoindian cultural efflorescence beginning as early as 12,000 B.P. and represented by several large occupations, the Upper Peninsula has produced a handful of Paleoindian sites scattered across the region. For the Upper Peninsula, Buckmaster and Paquette (1996) suggest a possible Paleoindian chronology (based entirely on projectile point typologies) divided into three distinct temporal periods: Agate Basin (10,500 to 10,000 B.P.), Hell Gap (10,000 to 9500 B.P.) and Great Lakes Cody Complex (9400 to 9000 B.P.).

Buckmaster and Paquette (1996) suggested that with the appearance of the Agate Basin tradition, the first groups of people arrived in the region. This corresponds with the recession of the Greatlakean ice sheet north past the current southern shoreline of Lake Superior, an event which opened a large area to exploitation by Paleoindian peoples from the south. Sites such as Silver Lake, Negaunee, Deer Lake, and Lost Lake were all found to contain material that may be related to this time period (Anderton, 2003), see Illustration 1. The ubiquitous fluted bifaces seen throughout eastern North America on Paleoindian sites are present as well in the Upper Peninsula, typically fashioned from quartzite, a material that occurs in great abundance across the region.

The subsequent traditions identified by Buckmaster and Paquette, the Hell Gap and Cody traditions, are viewed by many as completely disparate occupations of the region during major environmental epochs, and distinct from the cultural lifeway represented in the Upper Peninsula by the Agate Basin tradition. Between 10,000 and 9,500 B.P., the Marquette Advance ice sheet covered much of the northern Upper Peninsula in several hundred feet of ice, pushing southwards the tundra-like environment seen in the region over the preceding 500 years. The retreat of this ice sheet after 9,500 B.P. opened the region again for prehistoric occupation, and a variety of sites began to appear across the landscape. Of particular interest is the Gorto site (20Mq39), an extensive Plano Horizon occupation that contained both Late Paleoindian material and Early Archaic artifacts (the main period of the Plano Horizon). Both the Hell Gap and Cody traditions fall within the broader Plano Horizon, which have been identified across the Great Lakes.

Contemporaneous sites from southern Ontario, located to the southeast of the project area, are generally small-sized occupations of relatively short duration. A handful of sites, however, may possibly represent localities that were repeatedly visited by hunting or resource procurement expeditions. The Fisher site, by way of example, is situated atop a knoll overlooking an abandoned shoreline of the glacial lake predecessor of Lake Algonquin, in Simcoe County. The lithic assemblage identified on this site consisted of fluted points, end-scrapers, gravers, and debitage (including numerous channel flakes). A second example of a Paleoindian site on the shore of Lake Algonquin occurs near the town of Parkhill, in Middlesex County (Ellis and Deller, 2000). The Parkhill site, which yielded some 80 fluted points, probably was occupied by 45 to 75 individuals (Mason, 1981).

The Late Paleoindian period in the Great Lakes region is perhaps best represented at the Holcombe site (20Mb30), located in southeastern Michigan. This site, apparently occupied by 20 to 50 people, consisted of five to eight discrete areas of cultural debris, surrounded by an open, central area. Faunal remains were recovered at Holcombe, including bone fragments of barren ground caribou. The lithic assemblage recovered at Holcombe consisted of projectile points that have been clearly fluted, as well as examples which are basally thinned lanceolates. This latter group of artifacts displays links with types that, in western North America, are referred to as Plano points (Fitting et al, 1966).

Illustration 1 - Important Paleoindian Sites in the State of Michigan.

ARCHAIC PERIOD (10,000 B.P. – 2500 B.P.)

Early Archaic Period (9500 B.P. – 8000 B.P.)

Delineating the boundary between the Paleoindian and Early Archaic periods is a problematic exercise. At some ill-defined point between 10,000 and 8,000 B.P., a transition was made across eastern North America between the Paleoindian cultures that had dominated the landscape for the better part of 3000 years (an abbreviated 1500 in the Upper Peninsula) and a new, displacing tradition. The difficulty in effectively differentiating Early Archaic sites from Late Paleoindian sites is exacerbated in the broader context, as the Late Paleoindian era in the Great Lakes is contemporaneous with the early stages of the Early Archaic in other portions of eastern North America. In addition, the shorelines of the Early Holocene Great Lakes, especially Lake Superior and Lake Huron, were strikingly different during the Early Archaic from their current configuration. The recession of the last ice sheets left behind a relatively low water level, opening up landforms for occupation that would eventually reside at the bottom of the current Great Lakes. As a result, it can be conjectured that a significant number of sites from the period have been rendered inaccessible for systematic archaeological investigations, if they have even been preserved at all.

Identifying the advent of the Early Archaic in the upper Great Lakes is based primarily on the sudden absence of fluted bifaces from lithic assemblages of the period, which has been referred to as the Plano Horizon. The toolkits recovered from Plano Horizon sites transcend the arbitrary boundary between the Late Paleoindian and Early Archaic periods, having been identified from both contexts at sites across Michigan, including the aforementioned Holcombe and Gorto sites. The Early Archaic Plano Horizon in Michigan encompassed a variety of different projectile point types, all of which have been theorized to fall within two major lithic tool traditions: the Agate Basin and Eden-Scottsbluff. Both traditions extend across the division between Late Paleoindian and Early Archaic, and points related to both have been recovered from sites in the Upper Peninsula.

The projectile point that is most indicative of a Plano Horizon occupation is the Hi-Lo biface, a lanceolate point that has been identified in archaeological deposits from the western Great Lakes east to the upper Atlantic Coast (Justice, 1987:46). It has been conjectured that these points are representative of a hunting focus, centered on exploitation of the Early Holocene caribou population that would have thrived along the tundra-like environments recently exposed by the retreating glaciers. The Hi-Lo type has also been viewed as a distinctive upper Great Lakes manifestation of a much larger shift in tool manufacture across eastern North America (Shott, 1999:75). In fact, current archaeological thinking places the Hi-Lo within a broad tradition that is contemporaneous with the widely recognized Early Archaic Dalton Horizon, which

predominates on Early Archaic sites across southeastern North America from 10,000 to 9,000 B.P. (Ellis and Deller, 1982).

Around 9500 B.P., a new Early Archaic typology begins to appear in archaeological deposits across North America east of the Mississippi River. Represented by the presence of a new form of tool, the stemmed and/or notched biface, the Kirk Horizon defines the end of the morphological traditions dating back to the Paleoindian period. Gone are the lanceolate forms that dominate the prehistoric toolkits from the advent of human occupation of North America, replaced by a completely different style of lithic manufacture.

The Kirk Horizon in Michigan is represented by a variety of distinct tool types and forms, all of which have been identified from sites as far away as the southeastern Atlantic Coast. These include the Kirk Stemmed, Kirk Corner-Notched, Thebes, and Decatur. Early specimens of these point types were typically worked from exotic chert sources, especially those found in the Allegheny Plateau region of eastern Ohio. Over time, the utilization of non-local materials diminished, which some archaeologists view as suggestive of a reduction in group territorial range (Shott, 1999: 78).

While a thorough analysis of the settlement patterns across the state represented by the known Early Archaic sites has not yet been fully undertaken (perhaps due, in part, to the absence of any systematic archaeological investigations on a Kirk horizon site, in spite of their abundance within the state), recent research has begun to shed light on the character of the Early Archaic landscape. The early stages of archaeological research in Michigan formulated a distinct view of the Early Archaic landscape as one of small, dispersed bands of hunters scattered across the terrain, utilizing and re-utilizing areas maximal to resource procurement locations. In this hypothesis, the population densities were seen as extremely low, with only a handful of groups occupying the frozen tundra left behind by the retreat of the glaciers. Recent research controverts these theories, as new hypotheses have been developed, based primarily upon a better understanding of the regional geological forces at work during the era. The paucity of sites inferred in early research could not take into account the fluctuating water levels of the surrounding lakes; as the glacial ice sheets receded to the north, the lake basins slowly began to fill, a process that exposed a fluctuating shoreline and, by logical extension, prehistorically attractive adjacent landforms. As the current levels of Lake Superior and Huron have effectively eradicated the Early Archaic shorelines, the sites that would most likely have been located in close proximity have, likewise, been inundated.

The unfortunate truth, however, is that the current dearth of knowledge about the era precludes a more informed evaluation of the cultural landscape of the Early Archaic. There is simply no way of accurately assessing such basic cultural data as population size, density, and economy, due to

the paucity of material recovered and the lack of a systematic program of excavation of Early Archaic sites.

The Gorto site is indicative of the type of Early Archaic site that may be found in the Upper Peninsula (Buckmaster and Paquette, 1988). Strikingly similar to a contemporaneous site on Lake Michigan in northern Wisconsin (the Renier site), the Gorto site contains material from the Agate Basin and Eden-Scottsbluff traditions, as well as notched bifaces possibly representative of the later Early Archaic Kirk Horizon. The Eden-Scottsbluff bifaces recovered from Gorto were fashioned from heat-treated material found in northern Wisconsin (Hixton silicified sandstone), highly suggestive of a relationship between the Gorto and Renier sites. (Shott, 1999:75) conjectures that this pair of sites has strong ties to other Plano Horizon sites in the western Great Lakes and Great Plains.

Middle Archaic Period (8000 B.P. – 5000 B.P.)

If the current state of archaeological research and, by extension, knowledge of the Early Archaic in Michigan suffers from a lack of systematic testing of the known sites, the situation in the Middle Archaic stands at the opposite end of the spectrum. In Michigan, as in most of eastern North America, the interval between the heavily Paleo-influenced Early Archaic cultures and the first vestige of settled, agrarian communities in the Late Archaic is poorly represented, and poorly understood, within the archaeological record. While the dearth of archaeological data for the Middle Archaic in certain parts of Michigan (the Upper Peninsula, in particular) has prevented a detailed picture of the prehistoric landscape from being developed, what can be said with some degree of certainty is that the period was witness to a dramatic change in climatic and environmental conditions, so much so that the paucity of sites from the Middle Archaic has been conjectured to be resultant from the fluctuating environment.

Between 8500 and 5100 B.P., a wide-ranging climatic shift began to take hold in the Great Lakes region. Known as the Hypsithermal Interval, this change would inaugurate a new epoch in human habitation of the Great Lakes. Following the retreat of the glacial ice sheets to the north of present-day Lake Superior, the climate and vegetation patterns of the Upper and Lower Peninsulas were strongly influenced by the still-active glacial mass. Prevailing winds out of the north during the Paleoindian and Early Archaic eras maintained the spruce-pine forests that trailed along the southern edge of the glacier, retarding the ability of prehistoric cultures to effectively exploit the native vegetation. This established boreal forest environment was not conducive to either floral or faunal development, and the stagnation of the environment may have been a mitigating factor behind the decline of site frequency, size, and density during the early stages of the Middle Archaic.

The Hypsithermal Interval radically changed the prevailing ecological conditions of the previous 4000 years since the introduction of human populations into the region. The warming trend

experienced across eastern North America profoundly affected the Great Lakes region. The circulation shift off of the glacial north fostered the development of broadleaf forest communities, a habitat much more conducive to human habitation and utility. Aquatic resources began to flourish as the water levels rose, both in the Great Lakes and the ancillary rivers. These factors may have been enough to trigger a rise in human occupation of the region, but the trend from south to north meant that the Upper Peninsula experienced these forces well after the Lower Peninsula.

Unfortunately, the archaeological record from the Middle Archaic in the Upper Peninsula is sparse at best, with an extremely limited sample of sites that may date to the era. The rapid climatic changes in southern Michigan, which brought on a distinct Middle Archaic cultural efflorescence (especially in the Saginaw River watershed) were not experienced in the Upper Peninsula until relatively late; evidence of boreal forests have been identified in northern parts of the Upper Peninsula as late as 5000 B.P. Given these conditions, it is likely that either the majority of the Middle Archaic sites in the Upper Peninsula either rest at the bottom of Lake Superior (as the shorelines were much further north than their present configuration), or are actually represented within Kirk Horizon assemblages (most of which have never been systematically analyzed and georeferenced), or are simply not present in any quantity in the Upper Peninsula. Whatever the case may be, it is enough to know that, for the moment, the Middle Archaic era in the Upper Peninsula is under-represented in the archaeological record.

Late Archaic (5000 B.P. – 2500 B.P.)

The Late Archaic period in Michigan, much like other portions of the Great Lakes, has been viewed as an antecedent to the vast cultural changes experienced by native societies during the Early Woodland. By 4500 B.P., the majority of the landforms in the state were covered by the vegetational patterns documented by early European visitors to the area, over 5000 years into the future. The severe weather patterns of the previous 6000 years across the region gave way to a moderate, stable climactic environment that was ideally suited to prehistoric occupation and utility.

Arbitrarily dated in the state between 5000 and 2000 B.P., Late Archaic sites tend to be larger and more complex occupations, focused more on exploiting the natural resources in a specific area over a longer period of time than sporadically across a large prehistoric landscape. The recognized cultural differentiation of the Late Archaic was based primarily on the development of stabilized regional and local environments that made “the maximum use of all resources within restricted areas” (Dragoo, 1976:11). This trend towards a greater exploitational economy, begun towards the end of the Middle Archaic in the Lower Peninsula, culminated in the Late Archaic with what Caldwell (1958) defines as “primary forest efficiency”: a complete and effective adaptation to and utilization of a forest-edge environment.

Late Archaic sites, in stark contrast to earlier occupations, are often of relatively large size and represent a longer-duration settlement. These settlement systems reflect the necessity for altering resource procurement strategies as a response to shifting seasonal availability of different resources. During the spring and early summer, for instance, the exploitation of lacustrine resources (such as shellfish, fish, turtles, and migratory birds) produced sites above and adjacent to water courses. The autumn harvest of nuts and vegetables took place at sites that can be characterized as small camps on slight knolls and terraces. Winter camp sites were situated above stream valleys for the exploitation of upland mammalian resources, such as deer and, in the Upper Peninsula, caribou.

While the Late Archaic trends seen on the Lower Peninsula represented a relatively swift march towards the cultural dynamism of the Early Woodland, the distinct biomes of the Upper Peninsula fostered a different, and less obsequious, cultural efflorescence. Important Late Archaic sites in the Upper Peninsula region are shown in Illustration 2. The abundance of Late Archaic sites in the Lower Peninsula, especially those that contain sealed archaeological deposits that have produced diagnostic tools in context with radiocarbon dates (such as the Brandt site on Lake Huron in Iosco County), is not mirrored in the Upper Peninsula. Only a handful of the already scant Late Archaic sites in the Upper Peninsula region have produced radiocarbon dates in association with diagnostic artifacts. The North Manitou 3 site (20Lu38) and Screaming Loon site (20Em23), both located at the upper extent of the Lower Peninsula (and distinctly separate from the extensive Late Archaic populations of the southern Lower Peninsula), contained lithic material not seen in the southern Lower Peninsula and associated with radiocarbon dates between 3630 and 2830 B.P. The square-based, small side-notched points recovered from these sites have strong morphological correlates with points identified from Late Archaic sites within the northern Lake Huron basin (Robertson et al., 1999: 104).

Illustration 2 - Important Late Archaic sites in the Upper Peninsula region.

In the Lake Superior basin, one of the local expressions of the Late Archaic was termed the Old Copper Complex. Focused in Wisconsin and on Isle Royale (located approximately 45 miles north of the Upper Peninsula shoreline in northern Lake Superior), the Old Copper Complex includes a variety of distinct cultural features, most significantly the exploitation of natural copper resources at these locations. While the native copper had been a known quantity at least as far back as the Early Archaic in the western Lake Superior basin (Martin, 1999:153), the Late Archaic period was witness to a sharp upswing in the mining and utility of copper. Data from mining pits on Isle Royale indicate that the procurement of copper at that location dates to at least the Middle Archaic, and sites on the island during that time period include a small amount of copper artifacts within the assemblage (Martin, 1999:155).

Late Archaic artifacts related to the Old Copper Complex include awls, tanged knives, axe/hatchet blades, gouges, socketed spear points, tanged points, fish hooks, and gorgets. Some of these artifacts bear striking resemblance to material recovered from the Maritime and Laurentian Archaic traditions, located in the eastern Great Lakes region. The material culture of the Laurentian Brewerton phase included copper tools and ornaments, which suggests that a native trade economy in the Great Lakes may have been expanding during the Late Archaic. In addition, typical Laurentian side-notched projectile points have been recovered in direct association with copper artifacts excavated from burials of the Old Copper Complex (Mason, 1981:166). The presence of such imported raw materials as copper in Brewerton assemblages, as well as the appearance of similar lithic artifact types, hints at an incipient, yet wide-ranging, exchange network of a scale not seen in the Great Lakes region prior to this era, and on par with that of the later Middle Woodland.

The only well-documented Old Copper Complex site excavated in the Upper Peninsula is the Riverside Cemetery site, situated atop a sand dune overlooking the Menominee River near the Lake Michigan shoreline. Excavation of this site over the past thirty years has identified at least fifty-four distinct, Late Archaic internments. These burials included not only a variety of copper artifacts, but other items fashioned from locally unavailable materials. The estimated date for these features has been affixed to a 600-year span at the terminal end of the Late Archaic, between 3000 and 2400 B.P. (Martin, 1999:162-163).

In spite of the extensive utilization of copper documented across the upper Great Lakes during the Late Archaic, recent research may suggest that there is no direct correlation between sites in upper Lake Superior (on Isle Royale) and sites on the Upper Peninsula (Clark, 1996:130). The Shield Archaic appears to have developed in the upper Great Lakes, which is more of a blanket term for Late Archaic-era sites of the region that have not displayed diagnostic evidence of one of the more robust traditions of the Lower Peninsula and the western Great Lakes. These sites preserve features that resemble an earlier Archaic tradition, including lithic material similar to the lanceolate types of the much earlier Plano horizon.

On the Upper Peninsula itself, there are relatively few Late Archaic sites currently recognized as distinguishable to the Late Archaic. The paucity of the available data for the Late Archaic in the region (a situation mirrored in every temporal period on the Upper Peninsula up to the well-documented Contact Period) is exacerbated by the lack of sealed archaeological deposits that contain datable material in context with an extensive assemblage of diagnostic artifacts. This situation prevents a detailed analysis of Late Archaic lifeways, such as the large volume of work published on Late Archaic cultures of southern Michigan. What we can infer from the data available, however, is that Late Archaic settlement patterns in the Upper Peninsula exploited both coastal areas and inland landforms. The majority of the Late Archaic sites in the region (such as the Riverside Cemetery site, Miner's Beach site, and the cluster of sites on Isle Royale) are situated on landforms above and adjacent to a lacustrine environment, and as such can be conjectured to represent a spring/summer/autumn occupation (Robertson et al., 1999). These sites have been identified both on the Lake Superior and Lake Michigan shorelines of the Upper Peninsula land mass, as well as on the various small islands within both lakes. Some of the better examples of these site types in the region are the Popper and Trout Run sites on Grand Island (situated in Lake Superior, approximately 3 miles off of the Upper Peninsula shore), and the cluster of sites on Isle Royale.

Sites 20Mq90 and 20Mq91 are Late Archaic sites representative of a winter (and, according to the data, possibly mid-summer) inland occupation focused away from exploiting lacustrine resources. This pair of sites (dated to between 3710 and 2890 B.P.) contain relatively small artifact assemblages composed of quartz, quartzite, and chert tool manufacture debris, as well as non-diagnostic tools (predominantly bifaces and biface fragments). The function of each site has been conjectured to be markedly different, however. The archaeological deposit at 20Mq90 is suggestive of a small camp, utilized sporadically over a number of years and serving a variety of different resource procurement functions. Site 20Mq91, however, is situated to exploit an adjacent swamp conifer habitat, and the character of the archaeological deposit is suggestive of a small group hunting camp (Robertson et al., 1999).

The terminal end of the Archaic tradition in the Great Lakes is represented by the introduction of ceramic technology, manifest in artifact assemblages as early as 4000 B.P. in the southern Great Lakes. On the Upper Peninsula, however, the utilization of ceramics (and the complementary increase in community organization most often implied by that utility) does not appear until well after the onset of the Early Woodland on the southern Lower Peninsula. The current archaeological record of the region suggests that, while societies of the Lower Peninsula began to develop into the larger-scale societies seen elsewhere in eastern North America, the traditional Late Archaic lifeway remained the prevailing characteristic of the peoples on the Upper Peninsula.

WOODLAND PERIOD (2500 B.P.-1100 B.P.)

Early Woodland (2500 B.P. – 2000 B.P.)

Typically defined by the widespread introduction of a new native technology, ceramics, the Early Woodland period across the lower Great Lakes and eastern seaboard of North America is a well-defined stage in what has been seen as an inexorable march of indigenous populations from the semi-nomadic Archaic lifeways to the large-scale settlements of the Mississippian and Late Woodland periods (Garland and Geld, 1999). For the Upper Peninsula of Michigan, however, this easily discerned epoch is not so well defined, as the appearance of a local ceramic technology is contemporaneous with Middle Woodland-era sites on the Lower Peninsula and elsewhere. Therefore, it has come into vogue for prehistorians to condense the archaeological record for the Upper Peninsula between 2500 and 1100 B.P. into one, initial, Woodland era. For the purposes of this study, the Early Woodland in the Upper Peninsula is considered to be an extension of the Late Archaic, and the next major shift in cultural dynamics (manifest in archaeological deposits) is the Middle Woodland.

Middle Woodland (2000 B.P. – 1600 B.P.)

The introduction of a local ceramic industry in the upper Great Lakes ushered in a new era, one which mirrored the developments seen in the lower Great Lakes during the Early Woodland, but temporally contemporaneous with the Middle Woodland. As Brose and Hambacher aptly summarized (1999:173), the Middle Woodland culture on the "Upper Peninsula… is a ceramic assemblage." While it may be an oversimplification to append an entire societal shift to a single technological advance, the appearance of ceramics in the archaeological assemblages after 2000 B.P. are a strong indicator of a different lifeway, distinctly separate from that seen in the Upper Peninsula over the previous 5000 years. Termed by Fitting (1975:98-99) as the Lake Forest Middle Woodland, this lifeway (subdivided into several regional variants) profoundly altered the cultural landscape of the upper Great Lakes.

The Middle Woodland period in eastern North America was witness to a wide variety of different societal groups, developing complementary technologies while interacting in a large economic sphere that indirectly linked the Atlantic seaboard with the major watershed of the continental interior, the Mississippi River. The presence of exotic materials in Middle Woodland assemblages (including the native copper of upstate Michigan, which has been recovered in archaeological deposits across the east coast) is a leading indicator of the active interaction between different cultural groups. Almost all Middle Woodland sites east of the Mississippi contain evidence of a local ceramic industry, relatively stable settlement patterns, and an elaboration of burial practices. The most widely-recognized, and, perhaps, influential Middle Woodland culture is the Hopewell, centered in modern-day Ohio and extending out into the surrounding regions, including southern Michigan. The overtly elaborate mounds and

earthworks are emblematic of the era, and represent one of the most distinctive cultural efflorescences of North American prehistory.

It was, therefore, on the periphery of this dynamic cultural environment that the Lake Forest Middle Woodland developed across the upper Great Lakes. Situated at the northern fringe of the Hopewellian sphere of influence (which extended north into the central Lower Peninsula) and to the east of several similar prehistoric cultures, the Lake Forest maintained autonomy during a period of high cultural interactivity. While there are several regionalized complexes within the Lake Forest, the expansive mortuary practices and distinct ceramic and lithic technologies of the neighboring societies failed to make a profound impact on Lake Forest society. Regional complexes within the overarching Lake Forest tradition include the Green Bay/Bay du Noc, Menominee River, Copper Country, Southeast Lake Superior Shore/Naomikong Point, St. Mary's River, Traverse Corridor, Straits of Mackinac, and Goodwinian (Brose and Hambacher 1999:178-189). While all of these complexes display a certain degree of local variation, there are commonalities in artifact type, settlement/subsistence patterns, and mortuary practices.

It has been postulated that Lake Forest Middle Woodland cultures focused on exploiting riverine resources, including, for what may have been the first time, seasonally spawning fish populations (Brose and Hambache,r 1999:177). Cleland (1974), among others, viewed Middle Woodland settlement patterns as slightly modified variants of Late Archaic lifeways, with the emphasis on large inland camps and a near-abandonment of the lake shorelines. This view has been contested by data from large, coastal sites, like the Summer Island site on the northern Lake Michigan coast, which Brose (1970) has suggested is representative of a sustained occupation designed to exploit coastal resources. What cannot be disputed through an examination of the archaeological record is the dependence of Lake Forest peoples on fishing, whether on the coastal shorelines, above the various rivers, or adjacent to inland lakes on the Upper Peninsula (Brose and Hambacher, 1999:178).

Artifact assemblages recovered from Lake Forest Middle Woodland sites have produced a variety of materials. Primarily, however, most of these sites contained the ubiquitous Lake Forest ceramics (or regional variations thereof), lithic tools and debris manufactured from local sources (predominantly quartz and quartzite), a small amount of copper artifacts, and faunal remains consistent with the supposition that the majority of Lake Forest sites were used for lacustrine resource procurement (fishing). The main ceramic type of the Lake Forest, as described by Brose and Hambacher (1999:173), is "a reduced-firing subconoidal pottery made of tenoned coils (and) oblique or horizontal panels of massed simple motifs of stamped elements." These ceramics contained designs and manufacturing techniques that were uniquely distinct from the motifs seen in Hopewellian sites to the south and west. Projectile points recovered from these sites are also unique, although southern styles have been identified from Lake Forest

contexts (such as Cleland's identification of Snyders Cluster points from the Spider Cave site in Delta County, on the northern shoreline of Lake Michigan [Cleland and Peske, 1968]).

The prehistoric utilization of copper, which had been a component of archaeological deposits in the Upper Peninsula for over 6000 years, was manifest on sites not only across the Upper Peninsula during the Middle Woodland, but was also disseminated across eastern North America during the era. While it is unclear exactly what role copper played in the Lake Forest cultures, the copper mined in the Lake Superior basin eventually found its way into Hopewellian burial mounds across Ohio, fashioned into iconic works of native art. The copper that has been found in Middle Woodland contexts on the Upper Peninsula has typically been in the form of tools, either supplanting or accompanying the lithic tool kit. While many of these copper implements have been sourced back to the Lake Superior basin, as of yet there has not been a Middle Woodland-era mining site identified on the major copper source, Isle Royale. This may suggest that the mining of copper was conducted by small groups of people at sporadic intervals, rather than a concerted effort at an economic system dependant upon the trade and utility of copper (Martin, 1999).

While no extensive Middle Woodland-era sites have been identified in proximity to the project area, several Lake Forest occupations have been excavated over the past twenty years on the southern shores of Lake Superior in the region. Sites 20Ar348, 20Ar338, Lac LaBelle, and Trout Point 1 are all Middle Woodland sites situated on, or adjacent to, the coastal shore of Lake Superior within 40 miles of modern-day Marquette County. The location of these sites are shown in Illustration 3. These sites all produced Laurel-tradition ceramics (a western variant of Lake Forest), quartz and/or quartzite tools, and evidence of fishing activities (Brose and Hambache,r 1999:183-184). In addition, the Lac LaBelle site (20Ke20) contained a plethora of copper artifacts, suggestive of the utility of copper in close proximity to the source mines, most likely on Isle Royale (Martin, 1999:173).

Illustration 3 - Selected Middle Woodland sites in the Upper Peninsula.

Late Woodland (1600 B.P. – 1492 A.D.)

By the mid-point of the first millennium of the modern era, the cultures of the Upper Peninsula had adapted to a changing climate, both in terms of ambient weather patterns and neighboring cultures. Six hundred years of what can be called a "Woodland" lifeway (ill-defined as a seasonally-shifting settlement pattern designed to exploit natural resources, primarily fish, while developing a ceramic technology) had produced cultures that were as similar as they were at variance. Unlike the sweeping changes brought on by the rise of the Hopewell societies to the south, the peoples of the Upper Peninsula appear to have incorporated native technologies into an existing, Late Archaic lifeway. The Late Woodland period, however, would bring about a shift towards the cultures that would occupy the region when European contact ended the prehistoric era of the upper Great Lakes in the 17th century.

Elsewhere in eastern North America, the Late Woodland was witness to a denouement of the elaborate social organization that was the Hopewellian sphere of influence. All but gone are the elaborate mortuary practices of the Hopewell world, which had reached an apex with the construction of the anthropomorphic and geometric mound complexes of the lower Great Lakes. The large villages of the Middle Woodland were dramatically reduced in size and distribution, and the social stratification represented by distribution of wealth (manifest primarily in burial goods) becomes less distinct.

For the cultures of the Upper Peninsula, living on the periphery of this Hopewellian world, the Late Woodland can be viewed as a relatively stable era with a trend towards incorporating new natural resource procurement strategies, perhaps to replace the copper trade economy that may have flourished during the Middle Woodland. Across the Upper Peninsula, known Late Woodland sites exhibit a set of shared, distinctive characteristics that were representative of a cultural dynamic that focused on exploiting both faunal resources as well as wild rice habitats. This incorporation of wild rice into the native diet, seen most clearly on sites at the western end of the peninsula (and mirroring neighboring sites in upper Wisconsin), marks a profound shift in native lifeways that will alter the settlement and subsistence patterns for people of the Upper Peninsula through to the Historic Period. Site distribution will now focus on exploiting not just profitable riverine resource locales (such as the seasonally spawning fish sites of the Middle Woodland), but wild rice habitats as well (Brashler et al., 1997:565; Martin, 1999: 221-222).

The introduction of wild rice was slow to take hold in the eastern portion of the Upper Peninsula during the Late Woodland. Instead, sites during the period exhibit a tendency towards heavy reuse, as the cultures intently focused on particular fish species. Late Woodland archaeological

deposits on the eastern end of the peninsula become larger, more intensively utilized, and appear to have begun to shift off of the Lake Superior shoreline south towards the Mackinac Straits. It has been postulated (Brashler et al., 1999:565) that this movement was an attempt to exploit deep water fisheries of the Straits, as a possible climatic warming trend during the period may have impacted the effectiveness of exploiting the shallow, cold water environments of the north.

The known archaeological record for the Upper Peninsula during the Late Woodland relies heavily on data from sites at the periphery: at the eastern end, a cluster of occupations on the northern shores of Lake Michigan towards the Mackinac Straits; and at the western end, excavations of sites on Isle Royale and the Door Peninsula of Wisconsin. Sites within each of these regions display locally distinctive artifact assemblages in context with material closely related to artifacts recovered from sites across the entirety of the Upper Peninsula. A good example of this heterogeneity of material across the region is the presence of ceramics from neighboring cultures (especially those of upper Wisconsin) at sites within both the Lake Superior and Lake Michigan basins (Martin 1999:222).

The classic Late Woodland ceramic style that developed across the entirety of the Upper Peninsula has come to be known as the Juntunen ceramic complex. Illustration 4 shows selected late Woodland occupations in the Upper Peninsula. Known for its homogeneity (McPherron, 1967), these ceramics have been found in archaeological deposits from as early as 800 B.P., and Juntunen ceramics have been recovered on Native American sites in association with European trade goods (for instance, at the Gros Cap site, which dates roughly to the mid- to late seventeenth century [Martin, 1979]). McHale Milner (1991, 1994) has defined two distinct sub phases to the Juntunen complex, the early phase (extending from the introduction of the style up to approximately the mid-fifteenth century) and the late phase (from the mid-fifteenth through to the development of historic Native American culture following European contact). Localized stylistic variations to the Juntunen ceramic template are seen to mimic styles of neighboring cultures, which has been postulated to represent strong regional interaction with neighboring groups (Brashler et al., 1999:566).

There is a variety of known Late Woodland occupations across the Upper Peninsula, focused primarily at the eastern and western extremity of the region. Known colloquially as the Lakes Phase, sites across the region exhibit many shared characteristics, both in terms of artifact assemblages and site distribution and density. A plethora of sites have been systematically excavated along the northern shoreline of Lake Michigan and the Straits of Mackinac, including Juntunen (the site type for the eponymous ceramics of the Late Woodland), Gros Cap (a seventeenth century occupation) and Scott Point. Of particular interest to the current project is the Sand Point site, located within Baraga County west of the project site. This site, which was occupied between 900 and 600 B.P., contains a diverse assemblage of artifacts, which mirrors

that seen across the region during the period. The diversity of ceramics recovered from the site, which includes not only the ubiquitous Juntunen style but styles from outlying regions, including Ramsey incised (an Upper Mississippian style), is highly suggestive of an active trade network with neighboring cultures across the upper Great Lakes during the Late Woodland. Faunal and floral remains recovered from the site suggest a diverse subsistence pattern that included the exploitation of small mammals, fish, and a variety of berries and acorns.

The Late Woodland period across the upper Great Lakes effectively marks the end of the prehistoric era for the region. While the outward push of the Mississippian cultures from the southeastern portion of North America can be seen by the increased presence of these types of ceramics in archaeological deposits on the Upper Peninsula, the settlement and subsistence patterns demonstrated by early Late Woodland sites are conjectured to be markedly similar to those documented by European visitors towards the end of the seventeenth century. As a result, it is tempting to utilize contact-era ethnohistoric sources to describe the cultural and societal patterns of the Upper Peninsula that become manifest as archaeological deposits. As problematic as this exercise inherently is, it may be likely that the tribal moieties documented by early European chroniclers were mirrored during the long intervening years of the Late Woodland.

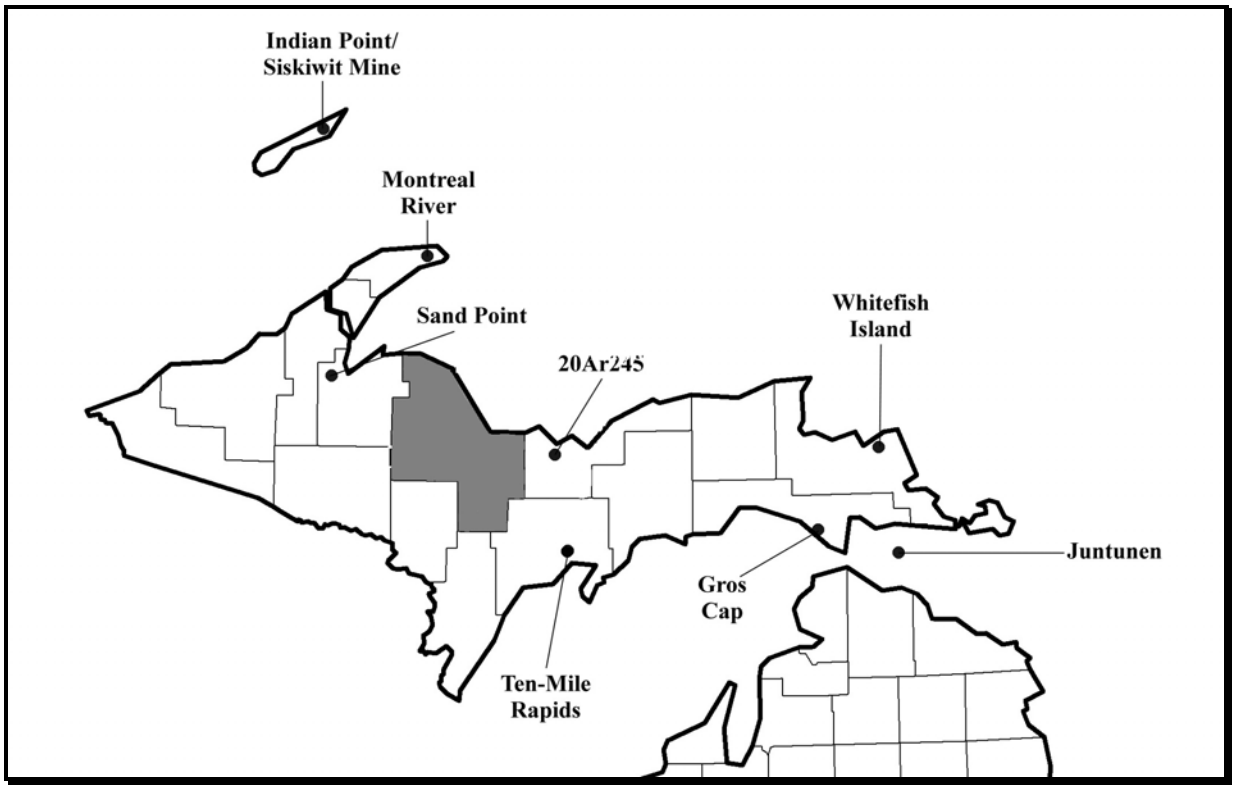

Illustration 4 - Selected Late Woodland occupations on the Upper Peninsula.

HISTORIC MICHIGAN

The nebulous, and often speculative, boundaries between prehistoric temporal periods in eastern North America stand in sharp contrast to the division between the prehistoric and historic eras for the upper Great Lakes. While there is a somewhat hazy interregnum between the two blocks of time (often referred to as the Protohistoric Period), the arrival of Europeans into the region was a clear harbinger of the profound changes that would, over the relatively short course of two hundred years, transform the Lake Superior and Michigan watersheds into an industrial and commercial center for the American empire. The discussion below attempts to provide a framework for this tumultuous era, during which the indigenous societies of the region would be replaced by the modern villages, towns, and cities of the industrialized West.

Protohistoric (1492 A.D. – 1670 A.D.)

Similar to most of eastern North America, there is apocryphal evidence for European interaction with native North American societies that predates the advent of what has become known as the era of European Exploration. From Nordic adventurers in the northeast to Chinese treasure fleets, these various accounts have yet to be proven within the archaeological record. What can be ascertained, with some degree of certainty is that, as early as the mid-fifteenth century, Europeans began to appear off the Atlantic Coast of the North American landmass. Over the course of the next two hundred years, different groups of European peoples exploited the advantageous position provided by a disparity in technology and, even more importantly, immunity to airborne pathogens, to encroach into the margins of the North American mainland.

It is extremely difficult to affix a date to the first encounter between a European and the people of the Upper Peninsula, and even more problematic to attempt to estimate when items of European manufacture reached the upper Great Lakes. It seems likely that the encroachment of French-speaking peoples into the watershed of the St. Lawrence River, which began as early as Cartier's expedition of 1535, would have introduced a variety of material into the exchange economy of the upper Great Lakes that may have reached people on the Upper Peninsula. There are currently no sites, however, which date to the sixteenth century on the Upper Peninsula that have produced non-native material from a sealed archaeological deposit. Cleland (1999:280) posits that the first historic-period site in Michigan is the Cloudman site, located on Drummond Island at the extreme eastern end of the Upper Peninsula near the northern entrance to the Mackinac Straits. This site produced a variety of Late Woodland artifacts in context with European material (a handful of iron scraps, glass beads, and a copper knife fashioned into a French form). It has been hypothesized that the historic component on this site, which most likely dates to

between 1615 and 1630, represents an Ottawa settlement, and the European artifacts were obtained from trade with more eastern moieties, such as the Huron (Branstner, 1991).

As the small French settlements in the St. Lawrence watershed constituted the most proximal group of Europeans to the upper Great Lakes, it should come as no shock that the cultural groups across the region would come to be known through a Gallic filter. While only "official" (government-sanctioned) expeditions into the upper Great Lakes were recorded, it seems likely that individuals or small groups of French would have ventured out into the lakes. Certainly, the missionary work of French Jesuits to the Huron of the eponymous lake and Georgian Bay brought Europeans into close proximity to the Upper Peninsula between 1630 and 1650.

It was during this period that the names assigned to the peoples of the upper Great Lakes would become affixed for posterity. Most of the early ethnohistoric information recorded for the peoples of the upper Great Lakes was collected by Jean Nicolet, a Frenchman who lived with a variety of groups of the region as early as 1618. The French identified two distinct linguistic groups across the region, which they referred to as the Iroquoian and Algonquian. The groups within the Algonquian sphere included the various peoples of the western Great Lakes, including those described by Nicolet in the Lake Superior basin. Nicolet lists three groups as occupying the Lake Superior basin of the Upper Peninsula prior to 1650: the Saulteaur (also known as the *Pahouitingwach Irini*, or people of the falls), the Mikinac (turtle people), and the Nouquet (bear people). These three groups are all ascribed to different portions of the Upper Peninsula. The Saulteaur occupied the eastern portion of the peninsula, centered above the falls on the St. Mary's River. To the south, Mikinac lands encompassed what would become known as the Mackinac Straits. The lesser-known Nouquet were described as occupying the central portion of the Upper Peninsula (and would therefore be the closest group to the project area). Little else besides place-names was provided by Nicolet for these groups, but they have been accepted as the forerunners of the Ojibwa, or Chippewa, peoples of the historic period (Cleland, 1992 :86).

In addition to the native moieties discussed above, the Menominee occupied the northern coastline of Lake Michigan on the Upper Peninsula. The Menominee, whose name derived from the native word for "wild rice" (*Oumalouminek*, or *manomin*) in the Algonquian tongue, occupied the area around the watershed that would become known by the same name at the time of Nicolet's journeys across Lake Michigan (in 1634-35 A.D.). During the seventeenth century, the Menominee occupied villages stretching across the entirety of the northern shoreline of Lake Michigan, from the Mackinac Straits

in the east around to the entrance to Green Bay in the west (an area that roughly corresponds to modern-era Menominee settlements in northeastern Wisconsin).

At some point between 1640 and 1650, bands of Iroquois-speaking peoples from modern-day New York State conducted a devastating series of raids into the country of the Huron, perhaps in an effort to replenish a population devastated by the introduction of European pathogens, carried into the center of Iroquois communities by French missionaries and entrepreneurs. Armed with modern guns supplied by (or taken from) the French of Quebec and the Dutch of the New Netherlands, Iroquois warriors invaded the heartland of the Huron country in search of captives, and most likely not the monopoly of the fur trade that was once conjectured to be at the heart of the conflict. These "mourning-wars" would almost certainly have disrupted native trade networks of the upper Great Lakes, as the Huron moved west to escape the depredations of the Iroquois. The longer-reaching impact of the conflict on the peoples of the upper Great Lakes was the rapid displacement of Huron and Ottawa from their traditional lands around Lake Huron and the Georgian Bay (present-day southern Ontario) westward into portions of the Upper and Lower Peninsulas, and eventually as far west as Green Bay. This movement led the Iroquois to venture further out in search of captives, which effectively depopulated the Lower Peninsula for the next fifty years. French accounts of an Iroquoian war band raiding into the Saulteaur country on the eastern end of the Upper Peninsula intimate that the Saulteaur decimated their attackers to such an extent that Iroquois attention was turned southwards during the remainder of the period (Cleland, 1992:87-90). Incidental to the project area, groups of displaced Huron (known in the accounts as Ottawa and Petun) had settled as far west as Chequamegon Bay, on the southern Lake Superior shoreline in modern-day Wisconsin.

There are an extremely small number of protohistoric sites known in Michigan, and an even smaller sample from the Upper Peninsula. The vast majority have been identified within, or directly adjacent to, the Mackinac Straits, a location that would become a focal point for both European and indigenous activity during the next century. Incidental to the project area, there are no known contact sites in Marquette.

Historic Indian/European Imperial Period (1670 A.D. – 1815 A.D.)

In 1671, an entrepreneur (and sometime diplomat) in the employ of Quebec visited the mission at St. Mary's, located adjacent to the village of the Saulteaur. Known as Saint Lusson, he attended, in the name of the King of France, a large gathering of different native groups and laid official claim to the Lake Superior basin for the French. And so, unlike traditional European acquisition of land that required a war of conquest to secure

the desired territory, the upper Great Lakes were brought within the imperial arms of the French monarchy by the pronouncement of a minor colonial functionary to an assembly of native warriors who did not even speak the language.

The vast depredations of the Iroquois during the 1650's and 1660's profoundly altered the cultural dynamic of the upper Great Lakes. Over the course of the next fifty years, the lands once occupied by the Huron Confederacy (a loose conglomeration of peoples in the Iroquoian language group) and the lands of the Lower Peninsula of Michigan were left predominantly vacant, apart from small bands of hunters who exploited game across the region. The Huron had been scattered across eastern North America, either incorporated into the Iroquois world of the southern Great Lakes or splintered into smaller groups on the shores of the western upper Great Lakes. It was into this environment that the Fleur-de-Lis of imperial France was planted, ushering in the advent of the historic era to the Lake Superior and Lake Michigan basin.

The near-total eradication of the Huron meant that the French Jesuit missions had to move deeper into the upper Great Lakes in search of converts to the cross. As a result, new missions were founded in close proximity to villages of the western Great Lakes, including several on the Upper Peninsula. Proselytizing efforts were directed at the Saulteaur near the falls of St. Mary's (Raymbault, the site of the first Jesuit mission in the Lake Superior basin, founded in 1641), at the conglomerate settlements around the Mackinac Straits, and along the southern shoreline of Lake Superior at the mixed Huron refugee community of Chequamagon Bay. In addition, a short-lived mission to the Nouquet was established at St. Michel in 1659. The attempt to incorporate European belief systems into the native cultural mores did not always take, and the majority of the upper Great Lakes Jesuit missions were quickly abandoned. The mission located at the Mackinac Straits, known as St. Ignace by the French, did, however, gain a foothold into the interior of the Great Lakes that would soon be exploited by the government of New France.

Over the next fifty years, the small native settlement at the straits grew in size, bolstered by the migration of displaced Hurons from the east, seasonal hunting bands looking to turn a profit, and an influx of French traders, officials, and soldiers to the newly founded Fort du Baud. The burgeoning fur trade, which reached its apex around 1685, provided a serious economic motivation for native societies to interact with the French. The settlement became a focal point for French activity in the upper Great Lakes, as missionaries and traders stopped en route to the distant reaches of Lake Superior. This included several persons of particular significance to the region, including the Jesuit

missionary Marquette (who founded the mission site at the straits), and Antoine de la Mothe de Cadillac, who was commandant of Fort du Baud for a time.

By the turn of the eighteenth century, the French influence in the Lake Superior basin was felt profoundly by native groups. Gone were the former individual group names for the people of the region; the French now rechristened the former Nouquets, Saulteurs, and various other peoples of the upper Great Lakes as Ojibwa, an appellation that would remain through to the modern era for the native culture of the region. Also known as the Chippewa, these peoples were the descendants of the groups first documented by Nicolet on the southern shores of Lake Superior, and the volume of ethnohistoric information concerning the lifeways, mores, and cultural mores of these peoples grew tremendously over the next two hundred years. Perhaps because of the lack of arable lands on the Upper Peninsula, coupled with the harsh climate, the Ojibwa were not pushed west by European expansion, as happened directly to the south in the Midwest.

The eighteenth century was a time of climactic change for the denizens of the upper Great Lakes, as the various societies were drawn inexorably into the armed conflict between the competing imperial aspirations of France, England, and, eventually, the United States. This association, which grew out of a shared symbiotic economy that developed as a result of the fur trade, would prove exceedingly difficult for the native peoples to engage in, and would eventually lead to catastrophe.

As France viewed the upper Great Lakes as their colonial dominion, the government of New France, centered in Quebec, considered the Ojibwa, Ottawa, and Menominee (to name but a few) of the region subject to the crown's authority. Hundreds of miles from formal civil authority, however, the edicts of the French were viewed entirely differently. Heldman et al. (1999) includes the region as part of the *Pays d'en Haut*, or middle ground, where native societies and European citizens (primarily missionaries and traders) developed a distinctly different culture than that east of the Appalachians. By his account, the perceived dominance of European culture, both spiritually and temporally (and materially), was not a substantive part of the eighteenth century landscape of the upper Great Lakes. Instead, the native cultures adopted the French into a worldview that integrated with pre-existing social mores, and in turn, the French of the frontier accepted this situation, to the extent that traditional native belief systems were honored. Over the course of the first fifty years of the eighteenth century, a unique environment was fostered across the region, where French presence did not necessitate European exploitation, and the vast colonization practices seen on the Atlantic seaboard were replaced by a shared community (Heldman et al., 1999).

When the end came for the indigenous era in Michigan, however, it proceeded quickly. European imperial designs on the North American continent touched off a series of wars, which culminated in the worldwide conflagration known alternately as the French and Indian War, and the Seven Year's War. One of the main cockpits for the conflict was the lower Great Lakes and Ohio River valley, a region contested by both the French and English crowns (and, to some extent, the colonial governments subservient to each). While the theater of war did not extend into the Upper Peninsula, the native populations were pulled into the conflict by their ties to New France.

During the previous fifty years, New France had begun a process of fortifying strategic points in the Great Lakes, with an eye towards protecting what they considered their domain. The encroachment of other European interests into the region, including the Hudson Bay Company to the north and the active English-speaking influx of traders to the south, necessitated a much stronger presence in the Lakes for policy-makers in the corridors of Versailles. A chain of frontier forts was constructed, linking the St. Lawrence River with the Mississippi. Old Fort du Baud was abandoned, replaced by a much sturdier military post known as Fort Michilimackinac in 1715. Fort Ponchartrain was erected at the entrance to the straits between Lake Erie and Lake St. Clair (the eventual site of the modern city of Detroit). These manifestations of French influence into the region became focal points for native activity and trade, and solidified the relationship between the Quebec government and the conglomerate villages of the Upper Peninsula region.

Fort Michilimackinac (known at its construction as Fort DeLignery) is the primary archaeological site of the period in the region. Located on the southern, Lower Peninsula side of the Mackinac Straits, the fort was constructed in 1715, within view of the abandoned settlement of St. Ignace (which was vacated at the turn of the eighteenth century). The small wooden outpost of 1715 was soon restructured, as both French and indigenous peoples congregated near the source of material goods and information. The Fort would grow in size over the next thirty years, as the French government attempted to secure a stronger foothold in the northern lakes. As the year 1744 began, however, imperial conflicts between France and England ignited into open war, a situation that would last through to 1763 with the capitulation of New France and the abandonment of French dominion over the Great Lakes.

The Development of Modern Michigan (1815 A.D. – Present Day)

Originally annexed as part of the Northwest Territory in the late eighteenth century, Michigan was christened as a full State of the Union on January 26, 1837. The

exploitation of the resources of the Upper Peninsula lagged far behind the situation on the Lower Peninsula, which left the majority of the Lake Superior basin vacant of any extensive American settlement until the second half of the century. In 1843, the Michigan legislature commissioned a formal survey of the entirety of the Upper Peninsula, in an effort to divide the landform into manageable counties. This survey work resulted in the formation of six counties, including Marquette. On April 4, 1848, the county of Marquette was formally organized into a separate legal entity, adopting the name of the 17th century Jesuit priest who established a mission at the Mackinac Straits. Encompassing a total of 1,821 square miles, Marquette County would become the largest county in the entire state.

Within a decade of the establishment of Marquette County, the industrial exploitation of the natural resources began in earnest. The vast tracts of timber, coupled with the presence of iron ore in the Marquette Range (the uplands south of the project area), attracted settlers and business interests into the region by way of the town of Marquette. Logging camps began to appear across the wilderness of the county, carving space out of the forests and making Michigan, over the last forty years of the 19th century, the nation's leading lumber-producing state (Whitney, 1994). Relying largely on riverine environments (for ease of transport of the timber), the smaller-scale logging camps begat towns, including Ishpeming (located approximately five miles east of the project area). The archaeological footprint of these logging camps can be seen across the entirety of the Upper Peninsula, and were typically composed of temporary wooden cabins around either a road, railroad grade, or river. The construction of the railroad network within the county led to an increase in the size and utility of the logging camps, as the ease of transport provided by the railroad had a similar affect on the necessity for additional woodsmen. The depletion of a timber source (which occurred often during the period) led to the abandonment of a camp in favor of a more profitable portion of the county. Conlin (1979) suggests that, apart from the structural remnants of these logging camps, the most abundant artifact type that could be expected to be encountered from these sites relate to food, due primarily to the transient nature of a given logging camp coupled with the prodigious amounts of energy necessary to process timber.

Around the turn of the 20th century, the modern character of the Upper Peninsula became largely defined. Davis et al. (1999) posit that the peak initial population across the Upper Peninsula occurred between 1890 and 1920, well after the intensive settlement of the rest of Michigan, with relatively little activity across the region prior to the American Civil War. He further suggests that historic land-use patterns in the Upper Peninsula can be divided into three stages of development: initial acquisition of large land-tracts by

commercial logging and mining interests, followed by an influx of homesteaders into biomes suitable for agrarian pursuits, which eventually gave way to a mixture of commercial, agricultural, and recreational utility (Davis et al., 1999:347). While the utilization of the land for agrarian interests was nowhere near as prevalent as that seen across lower Michigan, Davis has generalized that there were thousands of farmsteads across the Upper Peninsula by the turn of the 20th century.

APPENDIX B

SURVEY COVERAGE FORMS

URS

Sample Loci (SL) Form

Project Name and Number KMC Humboldt
Recorder CB
Date 09/18/2006

Segment AA
Transect Around lakeside S
Location

SL #	SL Type*	Distance from Previous SL	Vegetation/ Topography	Strat	Depth	Soil Profile (Color and Texture)	Artifacts** (Type, Count)	Comments
AA1	E	see GPS data	Pine forest, level, adjacent to lake	I	0-13	10YR 3/1 humic sand layer	∅	
				II	13-29	10YR 7/2 sand	∅	
				III	29-39	5YR 5/8 sand	∅	
AA2	E	15 m	"	I	0-15	10YR 3/1 silty sandy clay	∅	
				II	15-32	10YR 7/2 mottled with 10YR 5/4 silty sandy clay	∅	
				III	32-42	5YR 5/8 sand	∅	
AA3	E	15m	"	I	0-16	10YR 4/4 silty sand	∅	
				II	16-25	10YR 7/2 mottled with 10YR 5/4 silty sandy clay	∅	
				III	25-35	5YR 5/8 sand	∅	

***Use one code only.** **E**= Excavated Shovel Test, **P**= Pedestrian, **D**= Disturbed, **W**= Wet, **S**= Slope
****P**= Prehistoric, **H**=Historic, **M**= Modern

URS

Sample Loci (SL) Form

Project Name and Number KMC Humboldt
Recorder CB
Date 09/18/2006

Segment BB
Transect Around Lakeside S
Location

SL #	SL Type*	Distance from Previous SL	Vegetation/ Topography	Strat	Depth	Soil Profile (Color and Texture)	Artifacts** (Type, Count)	Comments
BB1	E	15m	Moderate slope mixed forest	I	0-19	10YR 4/4 silty sand	∅	
				II	19-29	10YR 7/2 mottled with 10YR 4/4 silty sand	∅	
				III	29-39	5YR 5/8 sand	∅	
BB2	E	15m		I	0-45	10YR 4/4 silty sand	∅	appears to be an artificial berm
				II	45-55	10YR 7/2 + 5YR 5/8 sand	∅	
BB3	E	15m		I	0-9	10YR 3/1 humic layer	∅	
				II	9-22	10YR 7/2 sand	∅	
				III	22-32	5YR 5/8 sand	∅	charcoal

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URS

Sample Loci (SL) Form

Project Name and Number KMC Humboldt
Recorder CB
Date 09/18/2006

Segment CC
Transect On small hill overlooking lake
Location

SL #	SL Type*	Distance from Previous SL	Vegetation/ Topography	Strat	Depth	Soil Profile (Color and Texture)	Artifacts** (Type, Count)	Comments
CC1	E	15m	hillslope, deciduous, mixed forest	I	0-5cm	10YR 3/1 humic layer	Ø	red burned over just below humus
				II	5-31cm	10YR 5/4 sand	P, 1	milk quartz flake; 30% gravel wash
				III	31-60cm	10YR 5/4 sand	Ø	no gravel
CC2	E	15m	level hilltop	I	0-4	10YR 3/1 humic layer	Ø	
			deciduous, mixed forest	II	4-24	10YR 5/4 sand	Ø	
CC3	E	15m	hillslope mixed forest	I	0-3	10YR 3/1 humic layer	Ø	on bedrock
CC4	E	15m	hillslope, mixed forest	I	0-14	10YR 4/4 silt	Ø	
				II	14-35	10YR 5/6 silt	Ø	
CC5	S	15m	hillslope (>15%) mixed forest	–	–	—	–	amidst beaver felled trees

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****P**= Prehistoric, **H**=Historic, **M**= Modern

URS

Sample Loci (SL) Form

Project Name and Number KMC Humboldt
Recorder CB
Date 09/18

Segment DD
Transect hill next to lake
Location

SL #	SL Type*	Distance from Previous SL	Vegetation/ Topography	Strat	Depth	Soil Profile (Color and Texture)	Artifacts** (Type, Count)	Comments
DD1	E	15m	mixed forest next to lake	I	0-8	10YR 5/4 sandy silt	∅	
				II	8-28	7.5YR 5/8 sand mottled with 10YR 5/3 sand	∅	
DD2	E	15m	mixed forest, hillslope	I	0-3	humic layer	∅	bedrock @ 3cmbs
DD3	S	15m	artificial berm, mixed forest	—	—	—	∅	artificial cut and berm, logging?
DD4	S	15m	bedrock cap to hilltop	—	—	—	∅	bedrock on surface
DD5	S	15m	artificially excavated pit	I	0-10	10YR 5/3 sand mixed with gravel	∅	
DD6	S	15m	bedrock	—	—	—	∅	

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****P**= Prehistoric, **H**=Historic, **M**= Modern

URS

Sample Loci (SL) Form

Project Name and Number KMC Humboldt
Recorder CB
Date 09/18/2006

Segment EE, FF
Transect Along main road; behind foundation
Location

SL #	SL Type*	Distance from Previous SL	Vegetation/ Topography	Strat	Depth	Soil Profile (Color and Texture)	Artifacts** (Type, Count)	Comments
EE1	E	see GPS data	level, grass-covered	I	0-10 cm	10YR 3/1 silt with gravel	Ø	badly disturbed area adj. to main road
FF1	E	see GPS data	level, mixed forest	I	—	rock debris at surface	Ø	disturbed, filled with bedrock
FF2	E	see GPS data	level, small hill mixed forest	I	0-10	10YR 4/4 silt	Ø	near disturbed area behind foundation
				II	10-20	10YR 5/6 silt	Ø	
FF3	E	see GPS data		I	0 - 8	Humic	Ø	
		1m S of berm/pit feature		II	8 - 15	10YR 4/4 silt	Ø	
				III	15 - 30	10YR 5/6 silt	Ø	
FF4	E	See GPS data		I	0-6	10YR 4/4 silt	Ø	- charcoal pc - possible ash
		in base of berm interior		II	6-30	10YR 5/6 silt	Ø	

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****P**= Prehistoric, **H**=Historic, **M**= Modern

URS

Sample Loci (SL) Form

Project Name and Number KMC Humboldt
Recorder KD
Date

Segment EE/FF
Transect along main Rd. behind foundation
Location

SL #	SL Type*	Distance from Previous SL	Vegetation/ Topography	Strat	Depth	Soil Profile (Color and Texture)	Artifacts** (Type, Count)	Comments
FF5	E	see GPS data	wooded, undulating ground surface	I	0-8	10YR4/4 silt, gravel	Ø	
		-1m E of door in berm		II	8-42	10YR5/6 silt -rocks under 42cm	Ø	

***Use one code only.** **E**= Excavated Shovel Test, **P**= Pedestrian, **D**= Disturbed, **W**= Wet, **S**= Slope
****P**= Prehistoric, **H**=Historic, **M**= Modern

URS

Sample Loci (SL) Form

Project Name and Number KMC Humboldt
Recorder CP
Date 09/19/2006

Segment 66
Transect Hill top overlooking mine buildings
Location

SL #	SL Type*	Distance from Previous SL	Vegetation/ Topography	Strat	Depth	Soil Profile (Color and Texture)	Artifacts** (Type, Count)	Comments
66	1	see GPS data	deciduous forest, level	I	0-16	10YR 3/3 silt	Ø	
				II	16-28	10YR 6/6 silt	Ø	
66	2	see GPS data	deciduous forest, level	I	0-15	10YR 3/3 silt	Ø	
				II	15-32	10YR 6/6 silt	Ø	

***Use one code only.** **E**= Excavated Shovel Test, **P**= Pedestrian, **D**= Disturbed, **W**= Wet, **S**= Slope
****P**= Prehistoric, **H**=Historic, **M**= Modern

URS

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Sample Loci (SL) Form

Project Name and Number KMC Hunnicutt
Recorder KD
Date 9/19/06

Segment HH
Transect
Location

SL #	SL Type*	Distance from Previous SL	Vegetation/ Topography	Strat	Depth	Soil Profile (Color and Texture)	Artifacts** (Type, Count)	Comments
HH1	X	on high point on side bench			0	Surface bedrock	Ø	
HH2	E			I	0-8	10YR 3/1 silt	Ø	
[illegible]	[illegible]			II	8-12	10YR 7/2 SiH	Ø	
[illegible]				III	12-25	10YR 6/6 silt		
HH3	E			I	0-10	10YR 3/1 silt	Ø	
	E			II	10-30	10YR 6/6 SiH	Ø	

***Use one code only.** **E**= Excavated Shovel Test, **P**= Pedestrian, **D**= Disturbed, **W**= Wet, **S**= Slope
****P**= Prehistoric, **H**=Historic, **M**= Modern

URS

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Sample Loci (SL) Form

Project Name and Number KMC Humboldt
Recorder KD
Date 9/19/06

Segment Humboldt M.11
Transect JJ
Location ____

SL #	SL Type*	Distance from Previous SL	Vegetation/ Topography	Strat	Depth	Soil Profile (Color and Texture)	Artifacts** (Type, Count)	Comments
JJ1	E	on Hillside	bench -wooded	I	0-6	10YR 3/1 silt	Ø	
		- See GPS Data		II	6-18	10YR 3/2 silt	Ø	
		"		III	18-37	10YR 5/6 silt	Ø	
JJ2	E			I	0-10	10YR 3/1 silt	Ø	
				II	10-30	10YR 4/6 silt	Ø	
JJ3	E			I	0-10	10YR 3/1 silt	Ø	
				II	10-22	10YR 7/2 silt	Ø	
				III	22-35	10YR 4/6 silt	Ø	
JJ4	E			I	0-8	10YR 3/1 silt	Ø	
				II	8-28	10YR 5/6 silt	Ø	

***Use one code only.** **E**= Excavated Shovel Test, **P**= Pedestrian, **D**= Disturbed, **W**= Wet, **S**= Slope
****P**= Prehistoric, **H**=Historic, **M**= Modern

URS

Sample Loci (SL) Form

Project Name and Number KMC Humboldt
Recorder KD
Date 9/19/06

Segment Humboldt
Transect
Location

SL #	SL Type*	Distance from Previous SL	Vegetation/ Topography	Strat	Depth	Soil Profile (Color and Texture)	Artifacts** (Type, Count)	Comments
JJ5	E	See GPS Data	- a saddle - wooded	I	0-20	10YR3/1 S:H	0	
				II	20-30	7.5YR 5/6 S:-	0	
JJ6	E	"	"	I	0-20	" 3/1 S:H	0	
				II	20-[illegible]	10YR5/6	0	

*Use one code only. **E**= Excavated Shovel Test, **P**= Pedestrian, **D**= Disturbed, **W**= Wet, **S**= Slope
P= Prehistoric, **H=Historic, **M**= Modern

APPENDIX C

SITE FORMS

URS MICHIGAN SITE FORM

SITE NAME N/A SITE NUMBER 20Mq 248

CULTURAL PERIOD(S) Unspecified Prehistoric

TYPE OF SITE Isolated find

PUBLISHEDREFERENCES

COUNTY Marquette TWP. Humboldt NEARESTTOWN West Ishpeming (8 miles east)

7.5 QUAD NAME Republic, MI EDITION 1977

U.T.M. COORDINATES:
ZONE 16 NORTHING 5148037 EASTING 430986

ELEVATION 1585 ft ams l

TOPOGRAPHIC
SETTING Small rise near pond

SLOPE DIRECTION AND
DEGREE Generally level CULTIVATION No

SOIL TYPE Disturbed, coarse to fine glaciofluvial sediments

BEDROCK Granitic Gneiss

IMMEDIATE VEGETATION Forest

NEAREST
WATER Adjacent to pond
(NATURE AND DISTANCE)

CRITERIA FOR NATIONAL REGISTER
INCLUSION Not eligible

SUBMITTED
BY Christopher Bergman ADDRESS 36 East Seventh Street, Suite 2300

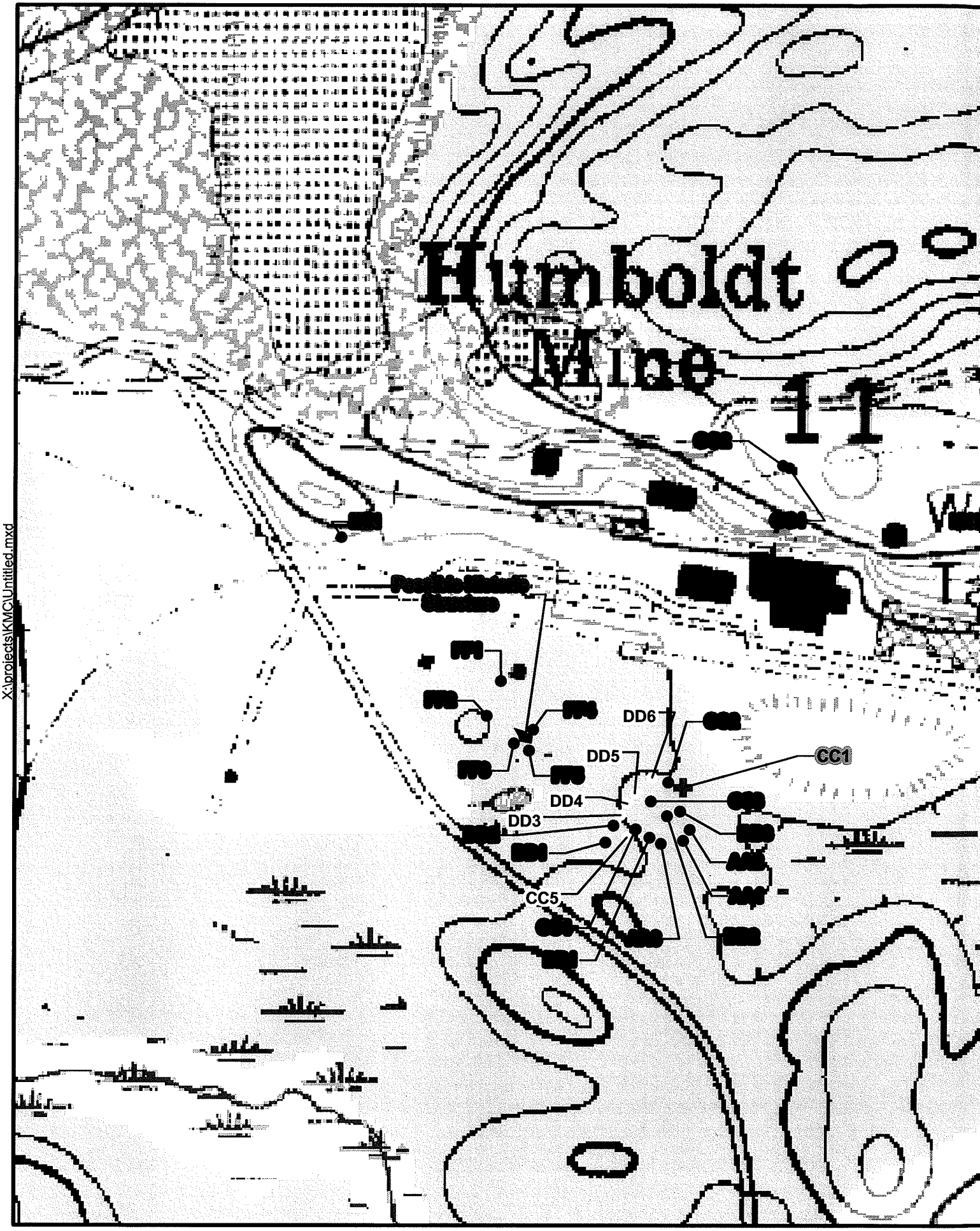
CITY Cincinnati STATE OH 45202 DATE 01.10.2007

SKETCH MAP OF SITE (WITH SOME POINT OF REFERENCE: HOUSE, ROAD, ETC., WHICH CAN BE RELATED TO THE 7.5 MIN. U.S.G.S. MAP).

See attached

LIST SPECIFIC CULTURAL COMPONENTS AND THEIR PRIMARY IDENTIFYING ARTIFACTS.

1 milk quartz flake



X:\projects\KMC\Untitled.mxd

URS MICHIGAN SITE FORM

SITE NAME N/A SITE NUMBER 20Mq 249

CULTURAL PERIOD(S) Historic

TYPE OF SITE Historic structural remnants, embankment

PUBLISHEDREFERENCES

COUNTY Marquette TWP. Humboldt NEARESTTOWN West Ishpeming (8 miles east)

7.5 QUAD NAME Republic, MI EDITION 1977

U.T.M. COORDINATES:
ZONE 16 NORTHING 5148080 EASTING 430840

ELEVATION 1570 ft amsl

TOPOGRAPHIC SETTING Level upland

SLOPE DIRECTION AND DEGREE Level CULTIVATION None

SOIL TYPE Disturbed, coarse to fine glaciofluvial sediments

BEDROCK Granitic Gneiss

IMMEDIATE VEGETATION Forest

NEAREST WATER (NATURE AND DISTANCE) Adjacent to pond

CRITERIA FOR NATIONAL REGISTER INCLUSION Not eligible

SUBMITTED BY Christopher Bergman ADDRESS 36 East Seventh Street, Suite 2300

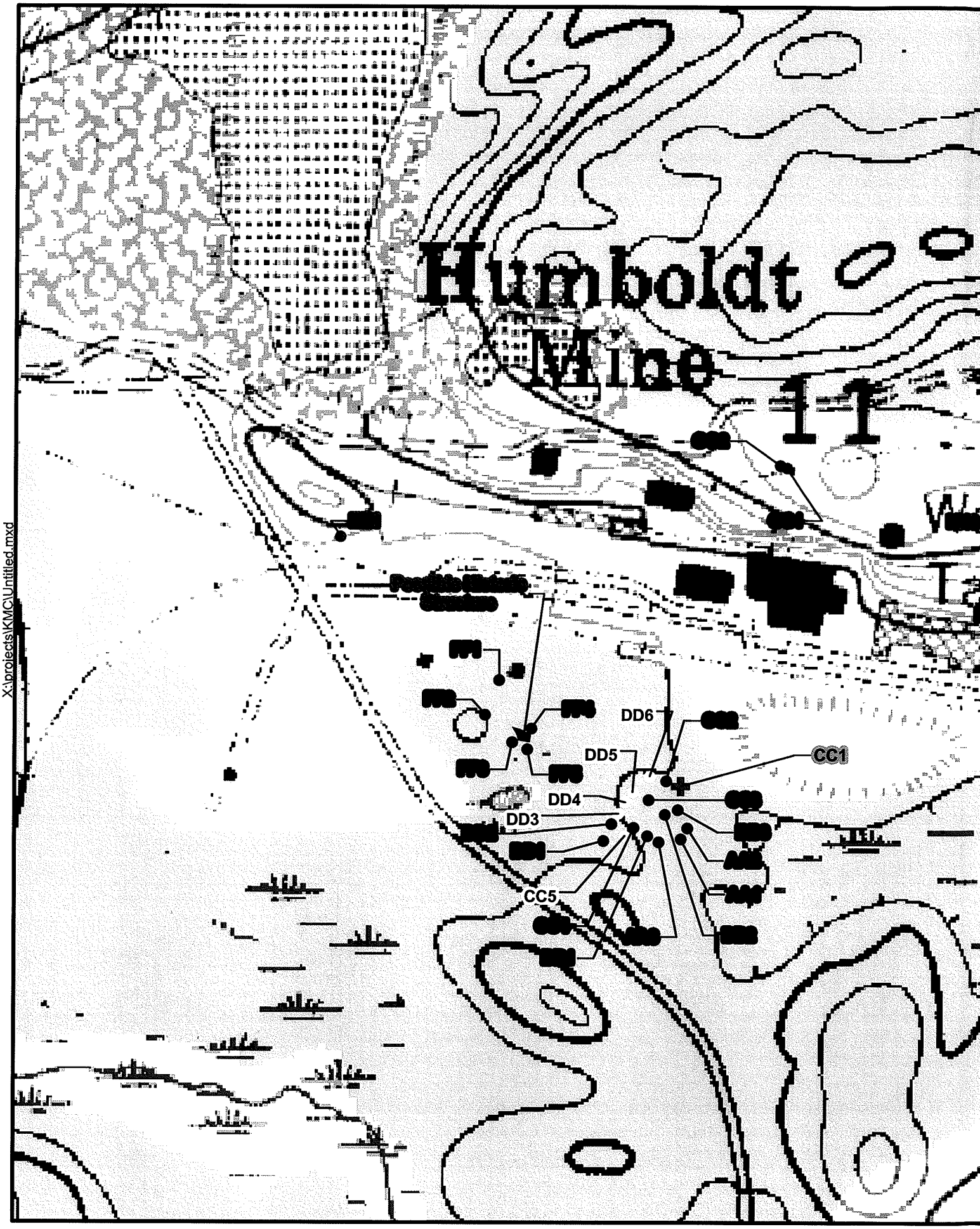
CITY Cincinnati STATE OH 45202 DATE _____

SKETCH MAP OF SITE (WITH SOME POINT OF REFERENCE: HOUSE, ROAD, ETC., WHICH CAN BE RELATED TO THE 7.5 MIN. U.S.G.S. MAP).

See attached.

LIST SPECIFIC CULTURAL COMPONENTS AND THEIR PRIMARY IDENTIFYING ARTIFACTS.

No artifacts recovered, but earthen embankment with wooden doorway and timber frame noted



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APPENDIX D

ACCIDENTAL FINDINGS PLAN

URS

ACCIDENTAL FINDINGS PLAN

In order to assist Kennecott Minerals Company (KEMC) in meeting the requirements of Section 106 as defined in the Advisory Council on Historic Preservation (Council) regulations "Protection of Historic Properties" (36 CFR Part 800), URS Corporation (URS) and KEMC have developed the following plan to be implemented should new or additional cultural resources be found after construction has begun on the proposed project. This plan has been developed through reference to the document Section 106, Step-by-Step issued by the Council (October 1986).

Termed "accidental findings," discovery of new or additional cultural resources during implementation of an undertaking typically occurs in the case of projects that involve excavation or ground-disturbing activities. The plan detailed here will be implemented by KEMC if previously undiscovered archaeological resources are identified during soil sampling (excavation, boring, and coring) or during construction. Development of this plan reflects provisions in 36 CFR 800.11(a) which indicate that when agency identification efforts in accordance with Section 800.4 indicate that cultural resources are likely to be discovered during an undertaking, then a plan for treatment of such properties should be developed.

This accidental findings plan assumes that another Agency Official has not prepared a plan for this project in accordance with Section 800.11(a); if such a plan has been developed for this project, then the agency plan is considered paramount.

Under this plan and in accordance with Section 800.11(b)(2), when an Agency Official (e.g., the Michigan State Historic Preservation Office) has completed the Section 106 process without preparing a plan in accordance with Section 800.11(a) and finds after beginning the proposed undertaking that the undertaking will affect a previously unidentified property (historic or prehistoric archaeological or architectural site) that may be eligible for inclusion in the National Register of Historic Places (NRHP), or that the undertaking may affect a known historic (or prehistoric) property in an unanticipated manner, then one of the following courses of action must be chosen, based on the assumption that the property in question may be eligible for listing in the NRHP [800.11(d)(1)]:

1) The agency can comply with Section 800.6, "Affording the Council an opportunity to comment" by either consulting to develop a memorandum of agreement (MOA) and submitting the developed MOA to Council for review, or by requesting Council comment without an MOA. This option follows regulations as outlined in 36 CFR 800.11(b)(2)(i). If this option is chosen,

Council will provide comments in an accelerated time frame compared to the usual 30 day allotment [Section 800.11(c)(1)].

2) Alternatively, the agency can develop and implement actions to handle the newly discovered cultural resources which take into account the effect of the undertaking on these resources as well as SHPO and Council comment. This option is documented in Section 800.11(b)(2)(ii). When this option is elected, the Agency Official must notify the SHPO and Council at the "earliest possible time" [800.11(c)(2)], describe the actions proposed to take effects into account, and request the comments of the Council.

With either option, Section 106 and the noted regulations of 800.11 do not require the undertaking to be halted. Depending on the nature of the newly discovered property and the effects of the undertaking on it, the Agency Official should "make reasonable efforts to avoid or minimize harm to the property" [800.11(b)(3)] until the requirements of Section 106 are met. A potential reasonable course of action would be to proceed with construction activities in areas removed from the vicinity of an accidental find while delaying work in the immediate area of such a find.

The above contingencies of the KEMC plan for accidental findings will be implemented through the following steps should an accidental find be made by a KEMC inspector, a contractor, or subconsultant during the proposed undertaking:

3) Construction activities within the immediate area of an accidental find will be halted ("immediate area" is a context-specific measure, however roughly 30 to 50 feet is probably adequate, although special attention should be given the possible extension of a new find beyond this buffer zone).

4) KEMC will notify their cultural resources consultant on the project who will, in conjunction with KEMC, notify by telephone the SHPO and (if necessary) the applicable County Coroner and Sheriff (the latter parties will be notified only in the case of a finding of human remains). These notifications will take place within 24 hours of an accidental find.

5) Specific SHPO instructions concerning an accidental find resulting from the notification as described above will be followed on a case by case basis, although at a minimum sufficient archaeological work will be performed on the accidental find location to stabilize deposits, protect deposits from scavengers or looters, and to collect readily available samples (e.g., for radiocarbon dating) which may help pinpoint the age of deposits or the presence (in the case of burials) of data which may serve to identify lineal or cultural descendants.

6) KEMC and their cultural resources consultant will consult with the SHPO to follow through on the course of action selected by the Agency Official to comply with Section 106 as outlined above. This may require development of an MOA or implementation of actions involving the find that satisfy Section 106, and may involve consultation with Native American groups. In any case, construction activities will remain halted until SHPO indicates in writing to KEMC that the undertaking may proceed in the area of a specific accidental find.

In the case of an accidental find of human remains, KEMC proposes to follow all relevant recommendations regarding treatment of human remains. KEMC recognizes the importance of providing careful and respectful treatment for human remains recovered as an accidental find or as part of an archaeological investigation. As the proposed undertaking is not on federal or Native American lands, consultation prior to implementation of the proposed project is not required. In the event of an accidental find of human remains, KEMC will refer to the SHPO as to the appropriate Native American groups with which to consult. Lastly, in coordination with the SHPO and other interested parties, a decision will be made for the treatment of the remains (e.g., reburial, preservation in place, scientific study, sacred rituals, or a combination).

APPENDIX E

RESUMES OF KEY PERSONNEL

URS

Christopher A. Bergman, Ph.D., RPA

Principal Archaeologist

OVERVIEW

Dr. Bergman serves as Principal Investigator on archaeological projects, and is a specialist in lithic analysis. His duties include designing and implementing field surveys, coordinating with state and federal agencies, preparing reports, and overseeing laboratory analysis. He is responsible for assessing the significance of cultural resources found during cultural resource studies and for making recommendations on National Register eligibility status. In addition to the many cultural resource projects he has completed, he has directed Data Recovery excavations at major prehistoric sites in both the Midwest and Northeast.

In 1995, he was the recipient of the first Annual Historic Preservation Archaeological Award for Outstanding Achievement upon completion of Transcontinental Gas Pipe Line Corporation's Sandts Eddy Archaeological Project. The award was presented by the Pennsylvania Historical and Museum Commission in Wilkes Barre, Pennsylvania. In 1997, the Sandts Eddy project was one of four projects nationwide selected for inclusion in the Secretary of Interior's Annual Report to the U.S. Congress as an outstanding contribution to research in the Federal Archaeology Program. In 1999, Dr. Bergman received a second citation in the Secretary of the Interior's Annual Report to U.S. Congress for his work on the 18th century Susan Furnace site in Cherokee County, South Carolina.

SELECTED PROJECT EXPERIENCE

Principal Investigator - Preparation of the Historic Preservation Plan for Tyndall Air Force Base, Bay County, Florida on behalf of the National Park Service.

Project Manager and Principal Investigator – Historic Context Statement for Prehistory at Ft. Campbell, Kentucky on behalf of the USACE, Louisville District.

Principal Investigator - Preparation of the Historic Preservation Plan for the Atchison Defense Facility on behalf of the USACE, Kansas City District.

Director and Principal Investigator - Phase III Mitigation Excavations at two prehistoric sites: Sandts Eddy (36Nm12) and Padula (36Nm15), in Northampton County, Pennsylvania on behalf of Transcontinental Gas Pipe Line Corporation.

Principal Investigator - Phase III Mitigation Excavations at Site 15Be391 for the Greater Cincinnati-Northern Kentucky International Airport, Boone County, Kentucky on behalf of Landrum and Brown.

AREAS OF EXPERTISE

- Project Management
- Principal Investigator on Archaeological Projects
- Lithic Analysis
- Research Excavation
- Cultural Resource Studies
- Phase I and II Investigations
- Phase III Mitigation Excavations
- Historic Preservation Plans

Years of Experience

- With URS: 1 Year
- With Other Firms: 20 Years

Education

- Ph.D./1985/Archaeology/ Institute of Archaeology, University of London
- BA/1979/Archaeology and Geology/American University of Beirut

Registration/Certification

Register of Professional Archaeologists (RPA)

Principal Investigator - Phase III Mitigation Report Preparation and Lithic Analysis for the Atterbury Site (12B815), Bartholomew County, Indiana on behalf of Texas Gas Transmission Corporation.

Principal Investigator - Phase III Mitigation Excavations at Sites 40Ln163 and 40Ln167, Lincoln County, Tennessee on behalf of the Tennessee Department of Transportation.

Principal Investigator/Lithic Analyst – Refitting Analysis of Lithic Materials from the Phase III investigation of 36So106 for PennDOT's Meyersdale U.S. 219 Project in Somerset County, Pennsylvania on behalf of Greenhorne & O'Mara.

Project Manager – Phase I, II, and III Cultural Resource investigations for the Cincinnati Central Riverfront Park on behalf of the Cincinnati Park Board.

Project Manager and Principal Investigator – Phase I, II, and III Cultural Resource investigations for the 160 mile Market-Link project in multiple counties in Pennsylvania and New Jersey on behalf of Williams Gas Pipelines - Transco.

Principal Investigator – Phase II Testing of the Susan Furnace site (38Ck67) in Cherokee County, South Carolina on behalf of Transcontinental Gas Pipe Line Corporation.

Principal Investigator – 2004 Phase II Testing at 19th century Historic Sites 15Tr099, 15Tr247, 15Tr239/240, Ft. Campbell, Kentucky on behalf of the USACE, Louisville District.

Principal Investigator – Phase II Testing at Eight Historic Locations on Wright Patterson Air Force Base, Ohio on behalf of Shaw Environmental and Infrastructure.

Principal Investigator – 2002 Phase II Testing of 40Sw287, Ft. Campbell, Kentucky on behalf of the USACE, Louisville District.

Principal Investigator - Phase I Survey of 147 miles of proposed petroleum products pipeline and related facilities in West Virginia and Ohio, including deep testing at numerous stream crossings, on behalf of Ohio River Pipe Line.

Principal Investigator - Phase I Survey of 70 miles of proposed natural gas pipeline in Arkansas and Mississippi on behalf of Texas Gas Transmission Corporation.

Principal Investigator – Phase I Survey for Earnhart Hill Regional Water and Sewer District, 50 mile Phase IV Extensions Project near Circleville, Ohio.

Principal Investigator – Inventory and Assessment of 130 Historic Locations on Wright Patterson Air Force Base, Ohio on behalf of Shaw Environmental and Infrastructure.

Principal Investigator – Phase I and II investigations for 595 acres and 14 archaeological sites at Ft. Campbell, Kentucky on behalf of the USACE, Louisville District.

Principal Investigator – Phase I and II investigations for 1359 acres and 21 archaeological sites at Ft. Campbell, Kentucky on behalf of the USACE, Louisville District.

Principal Investigator – Public hearing testimony regarding Silver Creek Sand & Gravel, Clarksville, Indiana for the Indiana Department of Natural Resources, Division of Historic Preservation and Archaeology.

Principal Investigator – Public hearing testimony regarding the Cyrus Charles Indian Cemetery Site, Montauk, Long Island, New York.

RESEARCH EXCAVATION EXPERIENCE

Orontes River, Syria: Lower and Middle Paleolithic.

Beirut, Lebanon, Middle Paleolithic.

Le Flageolet, France: Upper Paleolithic.

Pont d'Ambon, France: Upper Paleolithic.

Hengistbury Head, England: Mesolithic.

Hengistbury Head, England: Upper Paleolithic.

Stoke Newington, England: Lower Paleolithic.

Pincevent, France: Upper Paleolithic.

Boxgrove, England: Lower Paleolithic.

Rio Major, Portugal: Upper Paleolithic.

Big Bone Lick State Park, Kentucky: Late Prehistoric

PROFESSIONAL AND PEER-REVIEWED PUBLICATIONS

BOOKS

Bergman, C.A. and L. Copeland (eds.) 1986. I. Azoury Ksar Akil, Lebanon: A Technological and Typological Analysis of the Transitional and Early Upper Palaeolithic Levels of Ksar Akil and Abu Halka. Volume I. BAR International Series 289 (i and ii).

Bergman, C.A. 1987. Ksar Akil, Lebanon: A Technological and Typological Analysis of the Later Palaeolithic Levels. Volume II. BAR International Series 329.

Bergman, C.A. and J.F. Doershuk (eds.) 1994. Recent Research into the Prehistory of the Delaware Valley. Journal of Middle Atlantic Archaeology 10.

MONOGRAPHS

J.F. Doershuk, C.A. Bergman and D. Pollack (eds.) 1995. Current Archaeological Research in Kentucky: Volume 3. Kentucky Heritage Council, Frankfort.

URS

JOURNAL PAPERS

Azoury, I and C.A. Bergman 1980. The Halafian Lithic Assemblage of Shams ed Din Tannira. Berytus XXVIII: 127-143.

Bergman, C.A. 1981. Point Types in the Upper Palaeolithic Sequence at Ksar Akil, Lebanon in J. Cauvin and P. Sanlaville (eds.) Prehistoire du Levant: 319-330.

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Ohnuma, K. and C.A. Bergman 1982. Experimental Studies in the Determination of Flaking Mode. Bulletin of the Institute of Archaeology, London 19: 161-170.

Bergman, C.A. and M.H. Newcomer 1983. Flint arrowhead breakage: examples from Ksar Akil, Lebanon. Journal of Field Archaeology 10: 238-243.

Bergman, C.A. and K. Ohnuma 1983. Technological notes on some blades from Hummal la, Syria. Quartar 33/34: 171-180.

Bergman C.A., R.N.E. Barton; S.N. Collcutt and G. Morris 1983. La Fracture Volontaire dans une Industrie du Paleolithique Superieur Tardif du Sud de l ' Angleterre. L'Anthropologie 87: 323-337.

Barton, N. and C.A. Bergman 1985. The Stone Age in C. Pepin (ed.) Hengistbury Head. Roman Press, Bournemouth: 62-65.

Bergman, C.A. and L. Copeland 1986. Editor's Preface. in I. Azoury Ksar Akil, Lebanon: A Technological and Typological Analysis of the Transitional and Early Upper Palaeolithic Levels of Ksar Akil and Abu Halka. Volume I. BAR International Series 289 (i): i-x.

Miller, R., E. McEwen and C. Bergman 1986. Experimental approaches to ancient Near Eastern archery. World Archaeology 18/2: 178-195.

Bergman, C.A. and D.R. Griffiths 1986. The Heat Treatment of Chert in Antiquity in S. Collcutt (ed.) Recent Studies in the Palaeolithic of Britain and it's Nearest Neighbors. J.R. Collis, Sheffield: 92-94.

Bergman, C.A. and R.N.E. Barton 1986. The Upper Palaeolithic Site of Hengistbury Head, Dorset, England in S. Collcutt (ed.) Recent Studies in the Palaeolithic of Britain and it's Nearest Neighbors. J.R. Collis, Sheffield: 69-72.

Bergman, C.A. 1986. Refitting of the Flint Assemblages in M.B. Roberts et al. Excavation of the Lower Palaeolithic Site at Amey's Eartham Pit, Boxgrove, West Sussex. Proceedings of the Prehistoric Society 52: 235-236.

Griffiths, D.R., C.A. Bergman; C.J. Clayton; K. Ohnuma; G.V. Robins and N.J. Seeley 1987. Experimental investigation of the Heat Treatment of Flint in G. de G. Sieveking and M.H. Newcomer (eds.) The Human Uses of Chert. Cambridge University Press: 43-52.

Bergman, C.A. and N. Goring-Morris 1987. Conference: The Levantine Aurignacian with special reference to Ksar Akil, Lebanon. Paleorient 13/1: 142-145.

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Bergman, C.A. 1987. Hafting and use of bone and antler points from Ksar Akil, Lebanon in D. Stordeur (ed.) La Main et l' Outil. Travaux de la Maison de l' Orient Mediterraneen, Lyon 15: 177-126.

Bergman, C.A. and K. Ohnuma 1987. The Upper Palaeolithic Sequence of Ksar Akil, Lebanon. Berytus XXV: 13-40.

Moloney, N., C.A. Bergman; F. Wenban-Smith and M.H. Newcomer 1988. Experimental replication of bifacial implements in Bunter Quartzite pebbles. in R.J. MacRae and N. Moloney (eds.) Non-Flint Stone Tools and the Palaeolithic Occupation of Britain. BAR British Series 189: 25-47.

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Barton, R.N.E. and C.A. Bergman 1988. The Upper Palaeolithic Tool Assemblage from Hengistbury Head. in M. Otte (ed.) De la Loire a l'Oder: Les civilisations du Paleolithique final dans la nord-ouest europeen. BAR International Series 444 (ii): 447-464.

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PROFESSIONAL SOCIETIES/AFFILIATES

Society for American Archaeologists

Member of the New York Archaeological Council

Member of the Ohio Archaeological Council

Member of the Pennsylvania Archaeological Council

MISCELLANEOUS

2002-2004:	Panel Member, Historic Preservation GrantsCommittee for the Pennsylvania Historical and Museum Commission.
1999-2000:	President of the Middle Atlantic Archaeological Conference.
1999:	Cited for Outstanding Achievement in the conduct of the Susan Furnace Project, Secretary of Interior's Annual Report to the United States Congress.
1997-1998:	President-elect of the Middle Atlantic Archaeological Conference.
1997:	Designed and participated in segments of the National Geographic Explorer special entitled "Mystery of the Neanderthals."
1997:	Cited for Outstanding Achievement in the conduct of the Sandts Eddy Project, Secretary of Interior's Annual Report to the United States Congress.

1995:	Recipient of the 1st Annual Historic Preservation Archaeological Award for Outstanding Achievement upon completion of the Sandts Eddy Archaeological Project. Award presented by the Pennsylvania Historical and Museum Commission.
1994:	Collaborated on a children's book entitled Frozen Man (published by Henry Holt) about the "Iceman" discovery.
1994-Present:	Reviewer for the Journal of Middle Atlantic Archaeology.
1994-Present:	Midwestern Regional Advisory Editor for North American Archaeologist.
1994:	Developed and presented a segment on the history and technology of bows and arrows for Newton's Apple, PBS Television, Minneapolis.

Christopher A. Bergman, Ph.D., RPA

Principal Archaeologist

Areas of Expertise

Project Management
Principal Investigator on Archaeological Projects
Lithic Analysis
Research Excavation
Cultural Resource Studies
Phase I and II Investigations
Phase III Mitigation Excavations
Historic Preservation Plans

Years of Experience

With URS: 1 Year
With Other Firms: 20 Years

Education

Ph.D./1985/Archaeology/ Institute of Archaeology, University of London
BA/1979/Archaeology and Geology/American University of Beirut

Registration / Certification

Register of Professional Archaeologists (RPA)

Overview

Dr. Bergman serves as Principal Investigator on archaeological projects, and is a specialist in lithic analysis. His duties include designing and implementing field surveys, coordinating with state and federal agencies, preparing reports, and overseeing laboratory analysis. He is responsible for assessing the significance of cultural resources found during cultural resource studies and for making recommendations on National Register eligibility status. In addition to the many cultural resource projects he has completed, he has directed Data Recovery excavations at major prehistoric sites in both the Midwest and Northeast.

In 1995, he was the recipient of the first Annual Historic Preservation Archaeological Award for Outstanding Achievement upon completion of Transcontinental Gas Pipe Line Corporation's Sandts Eddy Archaeological Project. The award was presented by the Pennsylvania Historical and Museum Commission in Wilkes Barre, Pennsylvania. In 1997, the Sandts Eddy project was one of four projects nationwide selected for inclusion in the Secretary of Interior's Annual Report to the U.S. Congress as an outstanding contribution to research in the Federal Archaeology Program. In 1999, Dr. Bergman received a second citation in the Secretary of the Interior's Annual Report to U.S. Congress for his work on the 18th century Susan Furnace site in Cherokee County, South Carolina.

Selected Project Experience

Principal Investigator - Preparation of the Historic Preservation Plan for Tyndall Air Force Base, Bay County, Florida on behalf of the National Park Service.

Project Manager and Principal Investigator – Historic Context Statement for Prehistory at Ft. Campbell, Kentucky on behalf of the USACE, Louisville District.

Principal Investigator - Preparation of the Historic Preservation Plan for the Atchison Defense Facility on behalf of the USACE, Kansas City District.

Director and Principal Investigator - Phase III Mitigation Excavations at two prehistoric sites: Sandts Eddy (36Nm12) and Padula (36Nm15), in Northampton County, Pennsylvania on behalf of Transcontinental Gas Pipe Line Corporation.

Principal Investigator - Phase III Mitigation Excavations at Site 15Be391 for the Greater Cincinnati-Northern Kentucky International Airport, Boone County, Kentucky on behalf of Landrum and Brown.

Principal Investigator - Phase III Mitigation Report Preparation and Lithic Analysis for the Atterbury Site (12B815), Bartholomew County, Indiana on behalf of Texas Gas Transmission Corporation.

Principal Investigator - Phase III Mitigation Excavations at Sites 40Ln163 and 40Ln167, Lincoln County, Tennessee on behalf of the Tennessee Department of Transportation.

Principal Investigator/Lithic Analyst – Refitting Analysis of Lithic Materials from the Phase III investigation of 36So106 for PennDOT's Meyersdale U.S. 219 Project in Somerset County, Pennsylvania on behalf of Greenhorne & O'Mara.

Project Manager – Phase I, II, and III Cultural Resource investigations for the Cincinnati Central Riverfront Park on behalf of the Cincinnati Park Board.

Project Manager and Principal Investigator – Phase I, II, and III Cultural Resource investigations for the 160 mile Market-Link project in multiple counties in Pennsylvania and New Jersey on behalf of Williams Gas Pipelines - Transco.

Principal Investigator – Phase II Testing of the Susan Furnace site (38Ck67) in Cherokee County, South Carolina on behalf of Transcontinental Gas Pipe Line Corporation.

Principal Investigator – 2004 Phase II Testing at 19th century Historic Sites 15Tr099, 15Tr247, 15Tr239/240, Ft. Campbell, Kentucky on behalf of the USACE, Louisville District.

Principal Investigator – Phase II Testing at Eight Historic Locations on Wright Patterson Air Force Base, Ohio on behalf of Shaw Environmental and Infrastructure.

Principal Investigator – 2002 Phase II Testing of 40Sw287, Ft. Campbell, Kentucky on behalf of the USACE, Louisville District.

Principal Investigator - Phase I Survey of 147 miles of proposed petroleum products pipeline and related facilities in West Virginia and Ohio, including deep testing at numerous stream crossings, on behalf of Ohio River Pipe Line.

Principal Investigator - Phase I Survey of 70 miles of proposed natural gas pipeline in Arkansas and Mississippi on behalf of Texas Gas Transmission Corporation.

Principal Investigator – Phase I Survey for Earnhart Hill Regional Water and Sewer District, 50 mile Phase IV Extensions Project near Circleville, Ohio.

Principal Investigator – Inventory and Assessment of 130 Historic Locations on Wright Patterson Air Force Base, Ohio on behalf of Shaw Environmental and Infrastructure.

Principal Investigator – Phase I and II investigations for 595 acres and 14 archaeological sites at Ft. Campbell, Kentucky on behalf of the USACE, Louisville District.

Principal Investigator – Phase I and II investigations for 1359 acres and 21 archaeological sites at Ft. Campbell, Kentucky on behalf of the USACE, Louisville District.

Principal Investigator – Public hearing testimony regarding Silver Creek Sand & Gravel, Clarksville, Indiana for the Indiana Department of Natural Resources, Division of Historic Preservation and Archaeology.

Principal Investigator – Public hearing testimony regarding the Cyrus Charles Indian Cemetery Site, Montauk, Long Island, New York.

Research Excavation Experience

Orontes River, Syria: Lower and Middle Paleolithic.

Beirut, Lebanon, Middle Paleolithic.

Le Flageolet, France: Upper Paleolithic.

Pont d'Ambon, France: Upper Paleolithic.

Hengistbury Head, England: Mesolithic.

Hengistbury Head, England: Upper Paleolithic.

Stoke Newington, England: Lower Paleolithic.

Pincevent, France: Upper Paleolithic.

Boxgrove, England: Lower Paleolithic.

Rio Major, Portugal: Upper Paleolithic.

Big Bone Lick State Park, Kentucky: Late Prehistoric

Professional and Peer-Reviewed Publications

Books

Bergman, C.A. and L. Copeland (eds.) 1986. I. Azoury Ksar Akil, Lebanon: A Technological and Typological Analysis of the Transitional and Early Upper Palaeolithic Levels of Ksar Akil and Abu Halka. Volume I. BAR International Series 289 (i and ii).

Bergman, C.A. 1987. Ksar Akil, Lebanon: A Technological and Typological Analysis of the Later Palaeolithic Levels. Volume II. BAR International Series 329.

Bergman, C.A. and J.F. Doershuk (eds.) 1994. Recent Research into the Prehistory of the Delaware Valley. Journal of Middle Atlantic Archaeology 10.

Monographs

J.F. Doershuk, C.A. Bergman and D. Pollack (eds.) 1995. Current Archaeological Research in Kentucky: Volume 3. Kentucky Heritage Council, Frankfort.

Journal Papers

Azoury, I and C.A. Bergman 1980. The Halafian Lithic Assemblage of Shams ed Din Tannira. Berytus XXVIII: 127-143.

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Barton, R.N.E. and C.A. Bergman 1982. Hunters at Hengistbury: some evidence from experimental archaeology. World Archaeology 14:237-248.

Ohnuma, K. and C.A. Bergman 1982. Experimental Studies in the Determination of Flaking Mode. Bulletin of the Institute of Archaeology, London 19: 161-170.

Bergman, C.A. and M.H. Newcomer 1983. Flint arrowhead breakage: examples from Ksar Akil, Lebanon. Journal of Field Archaeology 10: 238-243.

Bergman, C.A. and K. Ohnuma 1983. Technological notes on some blades from Hummal la, Syria. Quartar 33/34: 171-180.

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Bergman, C.A. and R.N.E. Barton 1986. The Upper Palaeolithic Site of Hengistbury Head, Dorset, England in S. Collcutt (ed.) Recent Studies in the Palaeolithic of Britain and it's Nearest Neighbors. J.R. Collis, Sheffield: 69-72.

Bergman, C.A. 1986. Refitting of the Flint Assemblages in M.B. Roberts et al. Excavation of the Lower Palaeolithic Site at Amey's Eartham Pit, Boxgrove, West Sussex. Proceedings of the Prehistoric Society 52: 235-236.

Griffiths, D.R., C.A. Bergman; C.J. Clayton; K. Ohnuma; G.V. Robins and N.J. Seeley 1987. Experimental investigation of the Heat Treatment of Flint in G. de G. Sieveking and M.H. Newcomer (eds.) The Human Uses of Chert. Cambridge University Press: 43-52.

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Unger-Hamilton, R., R. Grace; R. Miller and C. Bergman 1987. Drill Bits from Abu Salabikh, Iraq in D. Stordeur (ed.) La Main et l' Outil. Travaux de la Maison de l' Orient Mediterraneen, Lyon 15: 269-285.

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Barton, R.N.E. and C.A. Bergman 1988. The Upper Palaeolithic Tool Assemblage from Hengistbury Head. in M. Otte (ed.) De la Loire a l'Oder: Les civilisations du Paleolithique final dans la nord-ouest europeen. BAR International Series 444 (ii): 447-464.

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Collcutt, S., R.N.E. Barton and C.A. Bergman 1990. Refitting in Context: A taphonomic case study from a late Upper Palaeolithic Site in sands on Hengistbury Head, Dorset, Great Britain. in E. Cziesla, S. Eickhoff, N. Arts, and D. Winter (eds.) The Big Puzzle. Holos, Bonn: 219-235.

McEwen, E., R.L. Miller and C.A. Bergman 1991. Early Bow Design and Construction. Scientific American June (Lead Article): 76-82.

Rue, D.J. and C.A. Bergman 1991. Contemporaneity of Late Archaic Piedmont Projectile Forms: The Woodward Site (36-Ch-374), Chester County, Pennsylvania. Journal of Middle Atlantic Archaeology volume 7: 127-154.

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Bergman, C.A. and J.F. Doershuk 2000. The Sandts Eddy Project: exceptional perhaps, but it needn't be relegated to an exception. in J. Baker (ed.) The Pennsylvania Cultural Resource Management Symposium. Journal of the Middle Atlantic Archaeological Conference 16: 27-34.

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Miscellaneous Publications

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Miller, R., C. A. Bergman and I. Azoury 1982. Additional note on aspects of archery equipment at Shams ed-Din Tannira. Berytus XXX: 53-54.

Barton, R.N.E. and C.A. Bergman 1983. The Hunters of Hengistbury. The Illustrated London News. February 1983: 42.

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Miller, R.L. Flintknapping and Arrowhead Manufacture at Tell Hadidi, Syria. The Milwaukee Public Museum Contributions in Anthropology and History Number 4, 1985. Palestine Exploration Quarterly Number 6 1984/1985: 71-72.

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Singer, R.; B.G. Gladfelter and J.J. Wymer The Lower Paleolithic Site at Hoxne, England. University of Chicago Press, Chicago 1993. American Antiquity 60 July 1995: 560-562.

Custer, Jay F. Prehistoric Cultures of Eastern Pennsylvania. Pennsylvania Historical and Museum Commission. North American Archaeologist Volume 19/1: 89-92.

Rosen, S.A. Lithics After the Stone Age. AltaMira Press, Walnut Creek, California. Palestine Exploration Quarterly 1998.

Levine, Mary Ann; Kenneth E. Sassaman and Michael Nassaney. The Archaeological Northeast. Bergin and Garvey, Greenwich. Journal of Middle Atlantic Archaeology 17 2001: 186-187.

Professional Societies/Affiliates

Society for American Archaeologists

Member of the New York Archaeological Council

Member of the Ohio Archaeological Council

Member of the Pennsylvania Archaeological Council

Miscellaneous

2002-2004: Panel Member, Historic Preservation GrantsCommittee for the Pennsylvania Historical and Museum Commission.

1999-2000: President of the Middle Atlantic Archaeological Conference.

1999: Cited for Outstanding Achievement in the conduct of the Susan Furnace Project, Secretary of Interior's Annual Report to the United States Congress.

1997-1998: President-elect of the Middle Atlantic Archaeological Conference.

1997: Designed and participated in segments of the National Geographic Explorer special entitled "Mystery of the Neanderthals."

1997: Cited for Outstanding Achievement in the conduct of the Sandts Eddy Project, Secretary of Interior's Annual Report to the United States Congress.

1995:	Recipient of the 1st Annual Historic Preservation Archaeological Award for Outstanding Achievement upon completion of the Sandts Eddy Archaeological Project. Award presented by the Pennsylvania Historical and Museum Commission.
1994:	Collaborated on a children's book entitled Frozen Man (published by Henry Holt) about the "Iceman" discovery.
1994-Present:	Reviewer for the Journal of Middle Atlantic Archaeology.
1994-Present:	Midwestern Regional Advisory Editor for North American Archaeologist.
1994:	Developed and presented a segment on the history and technology of bows and arrows for Newton's Apple, PBS Television, Minneapolis.

Appendix F

Air Quality and Meteorology Studies

F-1

Memorandum on Air Quality Data and Meteorological Data

Memorandum

October 22, 2007

TO: 06W003-6001

CC: Steve Donohue
Jerry Eykholt

FR: Curtis Dungey

RE: Humboldt Mill Meteorological and Climatic Data

Introduction and Purpose

The purpose of this memorandum is to document background air quality, meteorological and climatic data that are appropriate for air permitting, mine permitting (Part 632 permit) and engineering and design work at the Humboldt Mill site. For purposes of air permitting, sanctioned meteorological data sets (wind speed, wind direction, etc.) and background air quality are required for air dispersion modeling of planned activities at the site. Background air quality includes the results of representative ambient air monitoring in the area. For mine permitting and engineering design work, other required climatic data are necessary for hydrologic modeling. These data include temperature, precipitation (rainfall and snow), snow pack levels and possibly stream gauging data for estimating maximum flow rates into local water bodies. Below is a description of identified data for each of these areas that have been used for the Humboldt Mill Project.

Air Quality and Dispersion Modeling

To adequately describe background air quality near the site, results of ambient air quality monitoring performed at representative monitoring stations within the area are must be used. There are numerous state monitoring locations and other data that are relied upon to properly characterize current conditions. The Michigan Air Quality Monitoring Program consists of the operation of federally mandated National Air Monitoring Stations (NAMS) and State and Local Air Monitoring Sites (SLAMS) as well as the Special Purpose Monitoring Stations (SPMS) network in Michigan. The requirements for this network are described in Title 40 CFR, Part 58. Air quality measurements from this network are used to demonstrate the attainment status with regard to National Ambient Air Quality Standards (NAAQS).

The Michigan Department of Environmental Quality (MDEQ) reviews data from each of these stations annually and tabulates background ambient concentrations for each Air Quality Control Region (AQCR) in the state. Data include all criteria pollutants regulated by USEPA. These are particulate matter, sulfur dioxide, nitrogen oxides, carbon monoxide and lead. MDEQ

previously provided sanctioned background data for use in air dispersion modeling at the Eagle site. These data were identified to be representative of background data for the Upper Peninsula area. Attachment 1 includes a copy of the MDEQ background data.

Ambient metals data are also available from remote monitoring stations in Michigan that are used to characterize ambient concentrations of metals in the vicinity of the Humboldt Mill site. The Houghton Lake monitoring site is used by MDEQ to characterize metals background for AQCR 126, which includes the Upper Peninsula. The most recent full year of data available is from 2005. A summary of these data is included in Attachment 1.

For purposes of air dispersion modeling, sanctioned meteorological data must be used during performance of modeling iterations in the air permitting process. The MDEQ *Meteorological Data Support Document* dated July 2, 2007 shows the location of meteorological stations throughout the state and provides links to sanctioned data. For purposes of air dispersion modeling, the state has processed these data into formats that can be used in AERMOD, which is the USEPA and MDEQ preferred regulatory model. Sawyer International Airport (SAW) near Gwinn, Michigan is representative of conditions for the Humboldt Mill site. Data are from the years 2002 through 2006. A copy of the meteorological station map from this document and an example of a wind rose at SAW for 2006 are included as Attachment 2.

Other Meteorological Data for Hydrologic Modeling

A weather station close to the Humboldt Mill site is located at Van Riper State Park near Champion, Michigan. The park is located approximately 6 miles from the mill site. Given this close proximity, climatic data from this location provides a long term record of meteorological conditions at the mill. According to information from the Midwestern Regional Climatic Center (MRCC), this station has been in operation since about 1949. A general description of the climate in the Champion area and a map showing the location of the station is included as Attachment 3.

The weather station has compiled data related to precipitation and temperature, including average, maximum and minimum rainfall, snowfall and temperature. While summaries of these data are available by month and year, there is also information showing rainfall, snowfall and temperature extremes. From this information, more detailed breakdowns (daily records) of these data are available. For example, these tables show the one-day maximum for each of these parameters. In addition, an accompanying table shows monthly snowfall data by month from 1950 through 2005 for the Van Riper State Park – Champion site. This latter table was compiled from snowfall data gathered for several regional weather stations. Attachment 4 includes this information showing summary data for rainfall, snowfall and temperature extremes for this station.

Additional tables available from the National Climatic Data Center (NCDC) show the daily average, maximum and minimum for temperature, precipitation and heating and cooling degree days by month for the Van Riper State Park weather station from 1971 to 2000. A second table from the NCDC shows averages for these data by month and also provides information on yearly and daily extremes, including daily maximum, minimum for each month. This table also provides information on the highest daily and monthly snowfall, and highest daily and monthly mean snow depth. These tables are presented in Attachment 5.

While not specific for the Van Riper State Park station, the Natural Resources Conservation Service (NRCS) has data available for maximum 24-hour rainfall by county in Michigan. This data set breaks down the maximum inches of rainfall into maximum 2-year, 5-year, 10-year, 25-year, 50-year and 100-year increments. In addition to the maximum 24-hour storm event table, the NRCS also provides a county-by-county table for Michigan for monthly and precipitation and evaporation data. The tables for these data are provided in Attachment 6.

In addition to the above data sets, the United State Geological Service (USGS) also has information on average and peak stream flow from several gauging stations in Michigan. One of these gauging stations is located on the Peshekee River near Champion, Michigan. These same data were used as part of the Eagle Project to estimate 50-year runoff event quantities and required on-site water storage capacities prior to treatment at the Wastewater Treatment Plant. In addition to this station, there is also a gauging station near Humboldt on the Middle Branch of the Escanaba River. Examples of this type of information are included as Attachment 7.

In summary, over fifty years of certain meteorological data are available from the Van Riper State Park – Champion station for rainfall, snowfall, snow pack and temperature. This information forms a robust data base to assess seasonal and long-term variations with respect to these parameters for the immediate vicinity. These data can also be used for design work associated with construction of storm water drainage collection basins for the site.

Attachment 1

Air Quality

http://www.michigan.gov/deq/0,1607,7-135-3310_4195---,00.html

2007 Michigan Air Network
Sault Ste Marie - Easterday
Bay Mills
Sault Ste Marie - Marquette
Seney
Peshawbestown
Frankfort
Houghton Lake
Manistee
Scottville
Harbor Beach
Bay City
Muskegon Green Creek
Muskegon Apple Ave
Otisville
Evans
Port Huron
Grand Rapids-Monroe
Flint
Grand Rapids-Wealthy
Jenison
Rose Lake
New Haven
Holland
Lansing
Sterling Hts.
Pontiac
Rochester
Oak Park
Warren
Kalamazoo
Ypsilanti
Coloma
Tecumseh
Cassopolis
Luna Pier
DEQ monitor
Tribal monitor
Wayne County Monitors
Livonia
E. Seven Mile
Linwood
Joy Road
Newberry
Dearborn
W. Lafayette
W. Jefferson
Southwest
River Rouge
Allen Park
Wyandotte

Air Criteria Pollutant
Background Concentrations for
Air Quality Control Region 126

City Annual	Address	Type	Year	Distance	3-HR	24-HR	Annual
SO2 Escanaba	County Road 414	Rural	2002	111.2 km	53.2	16.0	2.7
SO2 Escanaba	County Road 414	Rural	2003	111.2 km	45.2	13.3	2.7
SO2 Escanaba	County Road 414	Rural	2004	111.2 km	34.6	10.6	2.7
					53.2	16.0	2.7

City	Address	Type	Year	Distance	Annual
NO2	Illinois Beach State Park	Rural	2002	308.8 km	13.4
NO2	Harrington Beach State Park	Hw Rural	2003	234.7 km	11.5
NO2	Two Rivers Manitowoc/Woodland Dunes	Goodw Rural	2004	190.8 km	5.7
					13.4

City	Address	Type	Year	Distance	24-HR	Annual
PM10 Crandon	Fire Tower Rd, Potawatomi Site	Site	2002	130.6 km	---	16.0
PM10 Crandon	Fire Tower Rd, Potawatomi Site	Site	2003	130.6 km	---	11.0
PM10 Crandon	Fire Tower Rd, Potawatomi Site	Site	2004	130.6 km	---	5.0
					28.0	16.0

4th High

City	Address	Type	Year	Distance	1-HR	8-HR
CO Milwaukee	7528 W. Appleton Ave.	Suburban	2002	263.9 km	4872	2784
CO Milwaukee	7528 W. Appleton Ave.	Suburban	2003	263.9 km	5800	2436
CO Milwaukee	7528 W. Appleton Ave.	Suburban	2004	263.9 km	4176	2088
					5800	2784

City	Address	Type	Year	Distance	Quarter
Pb Manitowoc	1025 South 9th Street	Urban	2002	293.8 km	0.01
Pb Manitowoc	East High, 2302 Hoard St	Urban	2003	306.8 km	0.01
Pb Manitowoc	Mayville, Near N 6705 Madison Rd	Rural	2004	248.6 km	0.00
					0.01

2005 Annual Air Quality Report for Michigan
Background Concentrations for Metals in Remote Area
Houghton Lake

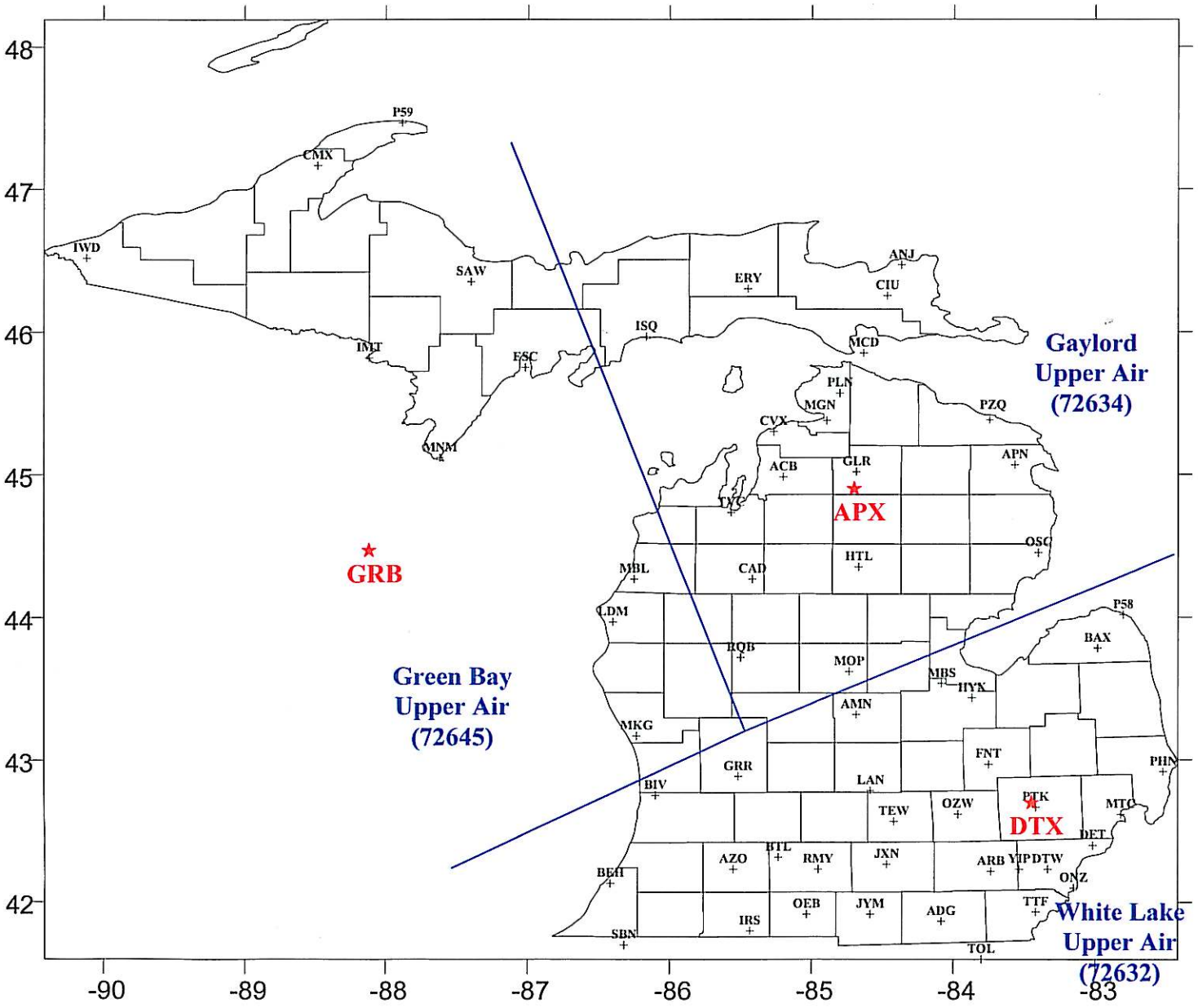
HOUGHTON LAKE			AIRS ID: 261130001				Units: µg/m³	
Chemical Name	# Obs	Obs > MDL	MDL	Max1	Max2	Max3	Min Mean	Max Mean
Arsenic (TSP)	60	60	0.0000661	0.00223	0.00168	0.00164	0.000662	0.000662
Barium (TSP)	60	60	0.000521	0.13	0.128	0.12	0.0984	0.0984
Beryllium (TSP)	60	50	0.0000683	0.000117	0.000034	0.0000279	0.0000101	0.000013
Cadmium (TSP)	60	60	0.0000661	0.00064	0.00045	0.000307	0.000137	0.000137
Chromium (TSP)	60	60	0.000235	0.0319	0.0307	0.0101	0.00386	0.00386
Cobalt (TSP)	60	60	0.0000635	0.0005	0.00045	0.00039	0.000099	0.000099
Copper (TSP)	60	60	0.000746	2.02	1.72	1.68	0.562	0.562
Iron (TSP)	60	60	0.000453	0.483	0.321	0.32	0.131	0.131
Lead (TSP)	60	60	0.000103	0.0229	0.0082	0.00806	0.00375	0.00375
Manganese (TSP)	60	60	0.000191	0.066	0.019	0.018	0.00688	0.00688
Molybdenum (TSP)	60	60	0.0000881	0.00121	0.0009	0.000675	0.000316	0.000316
Nickel (TSP)	60	60	0.000193	0.0353	0.0289	0.00269	0.00194	0.00194
Vanadium (TSP)	59	56	0.0000892	0.00348	0.0024	0.00172	0.000536	0.000541
Zinc (TSP)	60	60	0.000253	0.069	0.0572	0.057	0.0283	0.0283

Attachment 2

Excerpts from the MDEQ
Meteorological Data Support Document

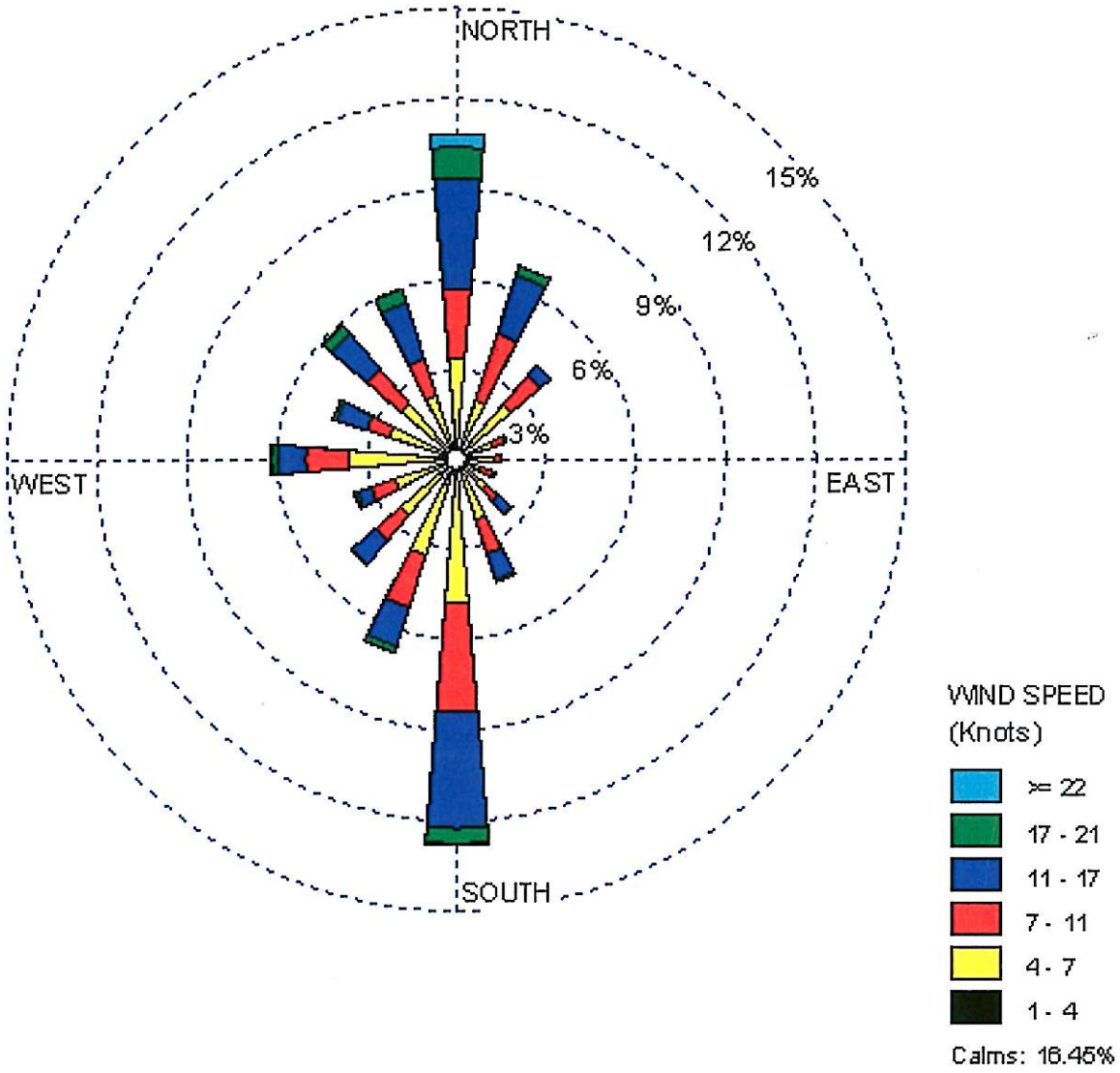
http://www.deq.state.mi.us/documents/deq-aqd-mm-met_support.pdf

Map of Available Meteorological Stations



The above map depicts stations for which surface meteorological data and wind roses are available for download from the DEQ website. All stations are denoted by their three letter abbreviated call sign. Stations in RED are those for which upper meteorological data is available. For more detailed information about each station, please visit the National Climatic Data Center (NCDC) and search based on *call sign*. In addition, a list of basic station parameters is provided in the *Station Information* section of this PDF document.

K.I. SAYWER AFB – 2006



Attachment 3

Midwest Regional Climate Center

General Description of Climate in the Van Riper State Park - Champion Area

http://climate.geo.msu.edu/stations/1439

CLIMATE OF CHAMPION

Champion, located in west central Marquette County of the West Upper Climatic Division, is 28 miles west southwest of Marquette and 25 miles southwest of Lake Superior. Lake Michigamme borders on the west edge of Van Riper State Park, located about 1.5 miles west of Champion. The surrounding area is rolling to hilly with a 90% second-growth forest cover. Soils are predominantly sand or sandy loam. For additional county soil information, please contact the Michigan Department of Agriculture (MDA)/Environmental Division/Soil Conservation Program, the USDA/Soil Conservation Service, the local Soil Conservation District, or the county Cooperative Extension Service (CES). For detailed county agricultural statistics please refer to the publication: "1988 County Food and Agricultural Development Statistics" produced by the MDA in cooperation with the USDA/Michigan Agricultural Statistics Service (MASS), or contact the MDA/Press and Public Affairs Division, the MASS, or the county CES.

Champion's interior location results in a greatly reduced climatic effect by the Great Lakes, due to the sheltering effects of the Keweenaw Ridge to the west and the Huron Mountains to the north. The only true lake effect of this region is the increased cloudiness during the fall and winter months which helps moderate temperature. While predominantly continental, Champion's climate is subjected to a limited lake effect. Diminished wind speeds or winds which do not traverse large unfrozen lakes often produce clearing skies and the colder temperatures expected at continental locations.

Because the day-to-day weather is controlled by the movement of pressure systems across the nation, this area seldom experiences prolonged periods of hot, humid weather in the summer or extreme cold during the winter. Long-term wind, humidity, and sunshine records are not available for this location, but these data should be similar to the following values which were observed at the National Weather Service Office in Marquette. The prevailing wind is westerly, averaging 9 mph. The strongest one-minute wind speed, 59 mph, was recorded in June 1958. The average 1 P.M. relative humidity varies from 61% for April to 70% for November and December. The average percent possible sunshine varies from 25% for December to 64% for July, and averages 44% annually.

Summers are dominated by moderately warm temperatures with a 1951-80 average of 3 days exceeding the 90 F mark. During the same period no day was 100 F or higher. The lake influence was reflected in the minimum temperatures; an average of 215 days was 32 F or lower, an average of 56 days was 0 F or lower, and no year stayed above 0 F. The highest average monthly maximum temperature of 84.3 F was recorded July 1955, and the lowest average monthly minimum temperature of -9.3 F was recorded January 1977. The following temperature extremes, based on the time period of this station's published record, are: maximum, 98 F, recorded July 28, 1988; minimum, -44 F, recorded February 17, 1979; warmest monthly mean, 70.3 F, recorded July 1955; and coldest monthly mean, 2.0 F, recorded January 1977.

Heating and cooling degree-day data are used as an index of the heating and cooling requirements for buildings which are proportional to the number of degree-days. Heating degree-days for a single day are obtained by subtracting the mean temperature from 65 F when the mean temperature is below 65 F. Cooling degree-days for a single day are obtained by subtracting 65 F from the mean temperature when the mean temperature is above 65 F. Each are then summed to yield monthly totals. The average heating degree-days for January was 1672 while October was 638. The average cooling degree-days for July was 77 while May was 10.

Based on the 1951-80 period, the average date of the last freezing temperature in the spring was June 15, while the average date of the first freezing temperature in the fall was August 25. The freeze-free period, or growing season, averaged 70 days annually.

Precipitation was well distributed throughout the year with the crop season, April-September, receiving an average of 21.35 inches or 63% of the average annual total for the 1951-80 period. During this same period the average wettest month was September with 4.27 inches, while the average driest month was February with 1.36 inches. The following precipitation extremes, based on the time period of this station's published record, are: greatest published 24-hour total, 4.41 inches, recorded September 1-2, 1957; greatest monthly total, 9.91 inches, recorded September 1957; and least monthly total, .17 inches, recorded May 1986.

Summer precipitation comes mainly in the form of afternoon showers and thundershowers. Annually, thunderstorms will occur on an average of 27 days. Michigan is located on the northeast fringe of the Midwest tornado belt. The lower frequency of tornadoes occurring in Michigan may be, in part, the result of the colder water of Lake Michigan during the spring and early summer months, a prime period of tornado activity. During 1950-87, Michigan has averaged 15 tornadoes each year. During this same period, 4 tornadoes occurred within the county.

The 1951-52 through 1979-80 average seasonal snowfall was 139.1 inches. During this period, 157 days per season averaged 1 inch or more of snow on the ground, but varied greatly from season to season. The following snowfall extremes, based on the time period of this station's published record, are: greatest observation-day total, 25.0 inches, recorded February 12, 1965; greatest monthly total, 68.0 inches, recorded December 1968; greatest seasonal total, 211.0 inches, recorded during 1970-71; least seasonal total, 81.5 inches, recorded during 1948-49 and 1 earlier season; and greatest snowdepth, 47 inches, recorded February 12, 1965.

Evaporation data from the Class "A" pan were not available for this station, but these data should be similar to those observed at Seney. During 1951-80, the pan evaporation for May through October exceeded the average precipitation by 17%. Therefore, soil moisture replenishment during the fall and winter months plays an important role in the success of agriculture for this area. While drought occurs periodically, the Palmer Drought Index indicated drought conditions reached extreme severity only 4% of the time.

Station History of Champion

Observations began at Michigamme on January 1, 1939 as a precipitation-only station, .1 mi. W of the Michigamme post office (PO). From June 1, 1949 through September 30, 1949 the station was closed. On October 1, 1949 the station was re-established at a location .1 mi. SW of the Michigamme PO and then closed on October 31, 1949. On December 1, 1949 the station was re-established at Van Riper State Park as a precipitation-only station, 1.5 mi. WNW of the Champion PO. On October 5, 1951 the station was converted into a full climate station. The station has been at this location to the present.

For more information please contact:

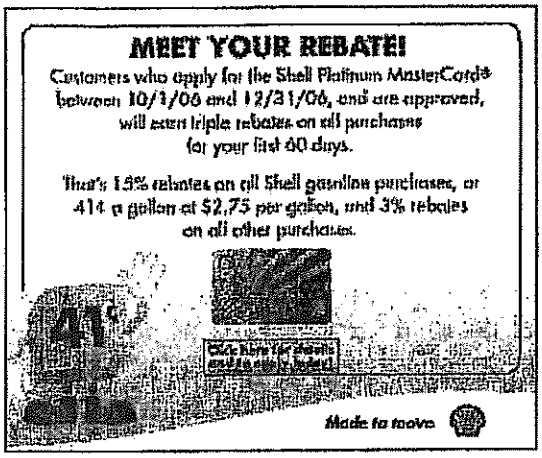
Michigan Department of Agriculture, Climatology Program
417 Natural Science Building
Michigan State University
East Lansing, MI 48824

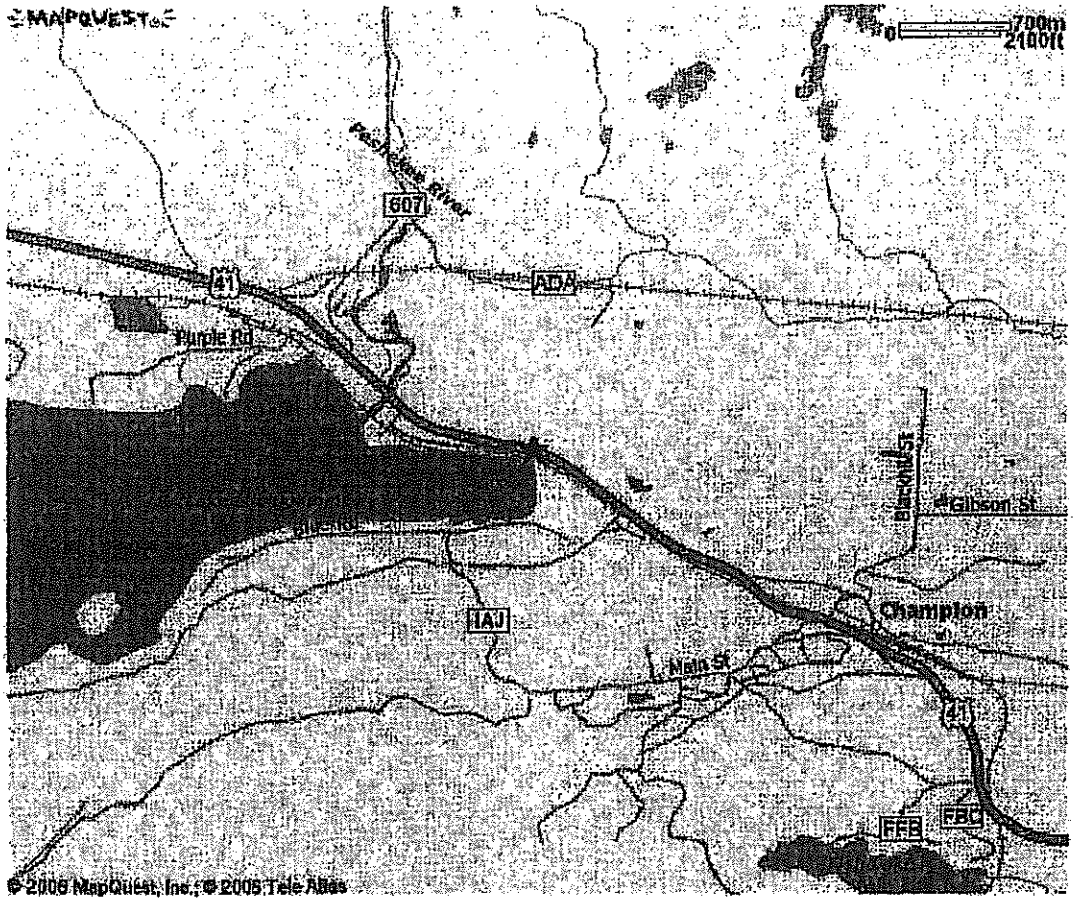
Voice (517)373-8338 BBS (517)336-1075
(517)355-0231 FAX (517)336-1076

MAPQUEST

Van Riper State Park: 906-339-4461
851 Blue Rd
Champion MI
49814 US

Notes:





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Attachment 4

Midwest Regional Climate Center
Summaries of Temperature, Rainfall and Snowfall Data for the Van Riper State Park – Champion Site

http://mcc.sws.uiuc.edu/

1. Historical Climate Data

2. Precipitation Summary

Station: 201439 CHAMPION VAN RIPER PRK, MI

1971-2000 NCDC Normals

Select a different Station | Select a different County

Element	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
Precip (in)	1.82	1.32	2.32	2.42	3.10	3.35	3.80	3.74	3.88	3.29	2.44	1.82	33.30

3. Precipitation Extremes

Period of Record: 1949-2001

Month	High (in)	Year	Low (in)	Year	1-Day Max (in)	Date
JAN	4.74	1997	0.48	1957	1.52	01-27-1996
FEB	3.53	1971	0.24	1956	1.27	02-12-1984
MAR	4.43	1966	0.52	1993	2.13	03-22-1984
APR	7.42	1985	0.76	1971	2.49	04-19-1985
MAY	6.77	1999	0.17	1986	1.79	05-20-1975
JUN	8.54	1951	1.00	1988	2.96	06-08-1989
JUL	7.50	1992	0.90	1989	3.61	07-02-1992
AUG	8.92	1988	0.48	1976	3.33	08-31-1951
SEP	9.89	1957	0.75	1976	4.41	09-02-1957
OCT	6.41	1967	0.77	1950	2.49	10-15-1966
NOV	5.61	1965	0.71	1997	1.49	11-20-1992
DEC	3.38	1996	0.28	1994	2.05	12-11-1949
Annual	46.94	1985	20.17	1976	4.41	09-02-1957
Winter	8.84	1996	2.02	1994	2.05	12-11-1949
Spring	14.49	1985	3.77	1980	2.49	04-19-1985
Summer	19.92	1951	3.85	1976	3.61	07-02-1992
Fall	15.62	1957	3.45	1976	4.41	09-02-1957

4. Precipitation Threshold Climatology

Derived from 1971-2000 Averages

5. *Annual/seasonal totals may differ from the sum of the monthly totals due to rounding.

Month	# Days Total ≥ 0.01"	# Days Total ≥ 0.10"	# Days Total ≥ 0.50"	# Days Total ≥ 1.00"
JAN	14.8	5.4	0.5	0.1
FEB	11.0	3.9	0.4	0.1
MAR	11.2	5.7	1.2	0.2

APR	9.9	5.3	1.5	0.5
MAY	10.7	6.6	2.1	0.3
JUN	12.4	7.5	2.2	0.6
JUL	11.9	7.2	2.5	1.0
AUG	12.3	7.1	2.7	1.0
SEP	14.2	8.4	2.2	0.7
OCT	14.3	7.8	1.9	0.7
NOV	13.8	6.8	1.5	0.2
DEC	14.2	5.6	0.7	0.0
Annual	150.7	77.2	19.5	5.3
Winter	40.0	14.9	1.5	0.2
Spring	31.7	17.6	4.8	1.0
Summer	36.7	21.8	7.5	2.5
Fall	42.3	23.1	5.7	1.7

6. Historical Climate Data

7. Snowfall Summary

Station: 201439 CHAMPION VAN RIPER PRK, MI

1971-2000 Averages

Select a different Station | Select a different County

Element	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
Snow(in)	29.5	18.2	22.2	8.7	1.0	0.0	0.0	0.0	0.1	5.1	19.1	26.7	130.6

8. Snowfall Extremes

Period of Record: 1949-2001

Month	High (in)	Year	1-Day Max (in)	Date
JAN	63.4	1997	21.5	01-27-1996
FEB	40.0	1971	25.0	02-12-1965
MAR	49.8	1955	17.0	03-19-1986
APR	31.8	1950	19.3	04-05-1977
MAY	11.7	1990	8.7	05-10-1990
JUN	0.0	-	-	-
JUL	0.0	-	-	-
AUG	0.0	-	-	-
SEP	2.1	1989	2.1	09-23-1989
OCT	19.6	1979	11.9	10-21-1989
NOV	56.1	1991	21.3	11-24-1991
DEC	68.0	1968	18.7	12-04-1990
Season (Jul-Jun)	211.0	1970-1971	25.0	02-12-1965

9. Snowfall Threshold Climatology

Derived from 1971-2000 Averages

10. *Annual/seasonal totals may differ from the sum of the monthly totals due to rounding.

Month	# Days Total ≥ 0.1"	# Days Total ≥ 1.0"	# Days Total ≥ 2.0"	# Days Total ≥ 5.0"
JAN	15.4	8.6	4.9	1.5
FEB	10.5	5.9	3.0	0.7
MAR	8.5	5.4	3.7	1.4
APR	3.8	2.4	1.5	0.5
MAY	0.6	0.2	0.1	0.0
JUN	0.0	0.0	0.0	0.0
JUL	0.0	0.0	0.0	0.0

AUG	0.0	0.0	0.0	0.0
SEP	0.1	0.0	0.0	0.0
OCT	2.7	1.5	0.8	0.3
NOV	9.1	6.1	3.4	0.9
DEC	13.8	8.6	5.1	1.2
Annual	63.9	38.3	22.5	6.4

11. Historical Climate Data

12. Temperature Summary

Station: 201439 CHAMPION VAN RIPER PRK, MI

1971-2000 NCDC Normals

Select a different Station | Select a different County

Element	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
Max °F	22.4	28.2	38.2	51.9	67.1	74.6	78.8	76.6	67.1	55.1	38.3	26.3	52.1
Min °F	0.2	2.1	11.0	23.4	35.3	44.3	49.7	48.4	41.2	31.8	20.5	7.4	26.3
Mean °F	11.3	15.2	24.6	37.7	51.2	59.5	64.3	62.5	54.2	43.5	29.4	16.9	39.2
HDD base 65	1664	1396	1253	819	444	190	96	128	328	669	1068	1493	9548
CDD base 65	0	0	0	0	15	22	71	51	3	0	0	0	162

13. Temperature Extremes

Period of Record: 1951-2001

Month	High Mean°F	Year	Low Mean°F	Year	1-Day Max°F	Date	1-Day Min°F	Date
JAN	22.3	1990	1.9	1994	54	01-26-1973	-40	01-09-1977
FEB	27.1	1998	5.6	1979	61	02-24-1976	-44	02-17-1979
MAR	33.3	1973	14.4	1960	69	03-27-1989	-33	03-02-1989
APR	45.0	1987	30.1	1975	92	04-22-1980	-17	04-04-1954
MAY	59.7	1977	42.7	1997	93	05-28-1969	11	05-06-1954
JUN	65.1	1956	53.2	1982	97	06-30-1963	17	06-05-1998
JUL	70.3	1955	58.8	1992	98	07-28-1988	26	07-19-2000
AUG	67.9	1955	58.0	1977	96	08-19-1976	27	08-13-1992
SEP	58.4	1998	49.3	1974	94	09-07-1976	15	09-28-2000
OCT	53.1	1963	38.6	1952	86	10-01-1976	5	10-23-1969
NOV	35.4	1963	19.4	1995	73	11-03-1978	-13	11-29-1976
DEC	23.9	1997	7.3	1983	60	12-03-1998	-38	12-19-1983
Annual	43.5	2001	35.9	1972	98	07-28-1988	-44	02-17-1979
Winter	22.1	1998	7.5	1977	61	02-24-1976	-44	02-17-1979
Spring	44.5	1977	32.5	1996	93	05-28-1969	-33	03-02-1989
Summer	66.6	1955	58.3	1992	98	07-28-1988	17	06-05-1998

Fall	48.0	1963	38.2	1997	94	09-07-1976	-13	11-29-1976

14. Temperature Threshold Climatology
Derived from 1971-2000 Averages

15. *Annual/seasonal totals may differ from the sum of the monthly totals due to rounding.

Month	# Days Max ≥ 90°F	# Days Max ≤ 32°F	# Days Min ≤ 32°F	# Days Min ≤ 0°F
JAN	0.0	26.5	31.0	15.0
FEB	0.0	19.1	28.0	12.4
MAR	0.0	9.3	29.8	7.9
APR	0.0	1.5	24.6	1.2
MAY	0.1	0.0	13.4	0.0
JUN	0.5	0.0	3.4	0.0
JUL	1.3	0.0	0.5	0.0
AUG	0.4	0.0	1.2	0.0
SEP	0.2	0.0	6.3	0.0
OCT	0.0	0.3	18.0	0.0
NOV	0.0	9.9	27.2	1.3
DEC	0.0	22.9	30.9	9.2
Annual	2.5	90.0	215.2	47.3
Winter	0.0	68.4	89.9	36.5
Spring	0.1	10.8	67.9	9.1
Summer	2.2	0.0	5.2	0.0
Fall	0.2	10.0	51.2	1.3

Champion Van Riper Park
Snowfall/Snowpack Data

Station	Lat / Lon	NCDC Site	Period of Record	Percent complete	Annual Snowfall (in.)						
					Mean	Standard deviation	75th percentile	90th percentile	95th percentile	Maximum	Minimum
Champion Van Riper Park	46 31' N, 87 58' E	201439	1949-2005	88%	135	31	152	170	180	212	65.2

Station: (201439) CHAMPION_VAN_RIPER_PRK, MI [1]

From Year 1949 To 2005

Snowfall (in)

Yr	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann	
1949													8.2	
1950	36.4	15	14.8	31.8	2.8	0	0	0	0	0	35.5	47.4	183.7	
1951	24.2	18.9	21.5	19.8	0	0	0	0	0	10.5	24.7	19.3	138.9	
1952	29.1	16.6	20.9	16.9	0	0	0	0	0	7.2	15.4	24.3	130.4	
1953	27.6	37.9	12.3	23.5	0	0	0	0	0	0	20.7	24.9	146.9	
1954	19.5	20.5	44.4	1.7	10	0	0	0	0	7.3	17.4	23	143.8	
1955	18.4	13	49.8	3.4	0	0	0	0	0	1.3	40.3	38.9	165.1	
1956	23	8.4	26.7	14.3	0	0	0	0	0	0	40.9	33.5	146.8	
1957	10.3	22.5	8.1	14.5	0	0	0	0	0	0	33.5	16.9	105.8	
1958	30.4	12.7	15.2	1.6	0	0	0	0	0	0	15.5	29.5	104.9	
1959	10.6	13.9	38.6	0	0	0	0	0	0	6.8	40.6	28.3	138.8	
1960	29.8	36.6	17.5	12.9	9.3	0	0	0	0	4.9	31.4	23.8	166.2	
1961	21.2	25.4	30.9	1.8	1.6	0	0	0	0	1	22.9	33	137.8	
1962	25.9	31.1	9.9	4.3	2	0	0	0	0	11.9	15.2	30.6	130.9	
1963	14.7	14.8	26.4	0.6	1.2	0	0	0	0	0	18.4	23.4	99.5	
1964	21	25.6	20.2	11.1	0	0	0	0	0	8.1	17.8	31.5	135.3	
1965	20.4	39	33.1	9.6	0	0	0	0	0	1	45.9	25.1	174.1	
1966	18.5	12.7	37.7	21.4	2	0	0	0	0	2	31.2	35.6	161.1	
1967	49	20.3	8.3	1.9	4.1	0	0	0	0	6.3	13.3	14.7	117.9	
1968	17.7	31.6	11	6.5	0	0	0	0	0	3.9	16.9	68	155.6	
1969	40.8	16.6	14.9	4	0	0	0	0	0	5.8	9.9	44.9	136.9	
1970	28.9	12	10.9	4.7	1	0	0	0	0	0	25.8	34.5	117.8	
1971	59.4	40	42.3	5.1	3.9	0	0	0	0	0	30.6	30.8	212.1	
1972	30.9	20.3	45.3	21.5	0	0	0	0	0	2.6	10.7	31.1	162.4	
1973	19.6	19.9	1.1	8.5	6.8	0	0	0	0	0	17.6	30.3	103.8	
1974	10.4	15	8.2	4.4	0.7	0	0	0	0	5.5	14.4	12.9	71.5	
1975	27.5	37	38.6	0	0	0	0	0	0	0.5	24.9	20.7	149.2	
1976	40	29.9	45.5	0.3	5.2	0	0	0	0	5.1	25.9	16.4	168.3	
1977	20.4	14.7	11.7	26.3	0	0	0	0	0	0.4	9.7	43.4	126.6	
1978	37.1	14.4	11.8	5.7	0	0	0	0	0	1	18.8	36	124.8	
1979	27	19.7	34.7	15.1	1	0	0	0	0	19.6	22.1	12.6	151.8	
1980	32.7	14.8	7.8	8.3	0	0	0	0	0	6.5	16.8	25.8	112.7	
1981	20.7	21.4	25.8	4.3	0.5	0	0	0	0	15.9	9.2	43.9	141.7	
1982	42.6	5.8	12.7	19.9	0	0	0	0	0	9	16.3	15.8	122.1	
1983	29.1	22.3	21.6	12.3	0	0	0	0	0	2.2	18.7	33.5	139.7	
1984	19.3	10.7	30.2	1.1	0.5	0	0	0	0.5	1	3	28.1	94.4	
1985	35	27.9	40.9	17.7	0	0	0	0	0	0	22.3	52.5	196.3	

From Year 1949 To 2005

Snowfall (in)

Yr	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann	
1986	33.4	15	43.8	3.7	0	0	0	0	0	2.2	17.7	12.3	128.1	
1987	15.6	15.2	9.2	17.8	0	0	0	0	0	7.9	12.3	43.1	121.1	
1988	38.6	16.3	35.6	3.7	0	0	0	0	0	12.9	35.5	27.8	170.4	
1989	28.8	13.9	20.1	4.2	0	0	0	0	2.1	18.3	37	27.8	152.2	
1990	23.1	22.1	10.3	10.2	11.7	0	0	0	0	12.7		33.8		
1991	18.3	16.8	16.2	9.5	0.3	0	0		0	2.1	56.1	16.2	135.5	
1992	21.9	28.7	12.7	9.4	0	0	0	0	0	12.7	27.4	28.7	141.5	
1993	20.8	7.4	6.9	13	0	0	0	0	0	0				
1994		2.3	12.9	1	0	0		0	0	0	19.3	1.7		
1995	13.4	28.5	24.8	3	0	0	0	0	0	1	21.5	26	118.2	
1996	43.5	19.7	16.5	31.5	0	0	0	0	0	0.2	13.2	46	170.6	
1997	63.4	7.2	25	0	0	0	0	0	0	3.5	9	16	124.1	
1998	22.5	5.5	16	1.5	0	0	0	0	0	0	3.5	21.5	70.5	
1999	39.3	17.6	16.5	0	0	0	0	0	0	2	4.5	19	98.9	
2000	20	16	20.5	3	0	0	0	0	0	7	15.8	19.6	101.9	
2001	21.3	14.9	14.5	0	0	0	0	0	0	5	9	0.5	65.2	
2002	1	28		3	0	0	0	0	0	2	1	3		
2003		6.9	9	6	0	0	0	0		0	7	23		
2004	16	20	19	1	0	0	0	0	0	0		35.5		
2005	13.5	19	18.2	0	0									
Avg	26.3	19.2	21.8	8.5	1.1	0	0	0	0	4.3	20.8	27.1	134.9	

Annual Average Snowpack	135.0
Standard Deviation	30.78
Annual Minimum	65.2
Annual Maximum	212.1
75th Percentile	152.2
90th Percentile	170
95th Percentile	180

'-9.9' = missing

Notes:

1. All data from the Midwest Regional Climatic Center (MRCC).

Attachment 5

National Climatic Data Center
Temperature, Rainfall and Snowfall and
Snow Pack Summaries and Extremes for the
Van Riper State Park – Champion Site

http://cdo.ncdc.noaa.gov/

http://cdo.ncdc.noaa.gov/cgi-bin/climatenormals/climatenormals.pl

Climatography of the United States NO. 84, 1971-2000

Daily Normals of

Temperature, Precipitation, and Heating and Cooling Degree Days

(includes monthly tables for precipitation probability and quintiles)

Station Name, State:	CHAMPION VAN RIPER PRK, MI	Station Number:	201439

Latitude: 46°31' Longitude: -87°59' Elevation: 1599ft Climate Division: 01

December

DATE	MAX	MIN	AVG	HDD	CDD	PRCP
1	31	14	22	43	0	0.07
2	31	13	22	43	0	0.06
3	30	13	21	44	0	0.06
4	30	12	21	44	0	0.06
5	29	12	21	44	0	0.06
6	29	11	20	45	0	0.06
7	29	11	20	45	0	0.06
8	28	10	19	46	0	0.06
9	28	10	19	46	0	0.06
10	28	9	19	46	0	0.06
11	27	9	18	47	0	0.06
12	27	9	18	47	0	0.06
13	27	8	18	47	0	0.06
14	27	8	17	48	0	0.06
15	26	7	17	48	0	0.06
16	26	7	17	49	0	0.06
17	26	7	16	49	0	0.06
18	25	6	16	49	0	0.06
19	25	6	16	49	0	0.05
20	25	6	15	50	0	0.05
21	25	5	15	50	0	0.05
22	25	5	15	50	0	0.05
23	24	5	15	51	0	0.05
24	24	4	14	51	0	0.06
25	24	4	14	51	0	0.06
26	24	4	14	51	0	0.06
27	23	3	13	52	0	0.06
28	23	3	13	52	0	0.06
29	23	3	13	52	0	0.06
30	23	3	13	52	0	0.06
31	23	2	13	52	0	0.06
MNTH:	26.3	7.4	16.9	1493	0	1.82

January

DATE	MAX	MIN	AVG	HDD	CDD	PRCP
1	23	2	12	53	0	0.06
2	22	2	12	53	0	0.06
3	22	2	12	53	0	0.06
4	22	2	12	53	0	0.06
5	22	1	12	53	0	0.06
6	22	1	12	53	0	0.06
7	22	1	11	54	0	0.06
8	22	1	11	54	0	0.06
9	22	1	11	54	0	0.06
10	22	0	11	54	0	0.06
11	22	0	11	54	0	0.06
12	22	0	11	54	0	0.06
13	22	0	11	54	0	0.06
14	22	0	11	54	0	0.06
15	22	0	11	54	0	0.06
16	22	0	11	54	0	0.06
17	22	0	11	54	0	0.06
18	22	0	11	54	0	0.06
19	22	0	11	54	0	0.06
20	22	0	11	54	0	0.06
21	22	-1	11	54	0	0.06
22	22	-1	11	54	0	0.06
23	22	-1	11	54	0	0.06
24	23	-1	11	54	0	0.06
25	23	-1	11	54	0	0.06
26	23	-1	11	54	0	0.06
27	23	-1	11	54	0	0.06
28	23	0	11	53	0	0.05
29	24	0	12	53	0	0.05
30	24	0	12	53	0	0.05
31	24	0	12	53	0	0.05
MNTH:	22.4	0.2	11.3	1664	0	1.82
Winter	25.6	3.2	14.5	4553	0	4.96

February

DATE	MAX	MIN	AVG	HDD	CD
1	24	0	12	53	0
2	25	0	12	53	0
3	25	0	13	52	0
4	25	0	13	52	0
5	25	0	13	52	0
6	26	0	13	52	0
7	26	1	13	52	0
8	26	1	14	52	0
9	27	1	14	51	0
10	27	1	14	51	0
11	27	1	14	51	0
12	27	1	14	51	0
13	28	2	15	50	0
14	28	2	15	50	0
15	28	2	15	50	0
16	29	2	15	50	0
17	29	2	16	49	0
18	29	3	16	49	0
19	30	3	16	49	0
20	30	3	16	49	0
21	30	3	17	48	0
22	30	4	17	48	0
23	31	4	17	48	0
24	31	4	18	47	0
25	31	4	18	47	0
26	32	5	18	47	0
27	32	5	19	47	0
28	32	5	19	46	0
MNTH:	28.2	2.1	15.2	1396	0

Annual	52.1	26.3	39.2	9548	162	33.30	

Climatography of the United States NO. 84, 1971-2000

Daily Normals of

Temperature, Precipitation, and Heating and Cooling Degree Days

(includes monthly tables for precipitation probability and quintiles)

Station Name, State:	CHAMPION VAN RIPER PRK, MI	Station Number:	201439

Latitude: 46°31' Longitude: -87°59' Elevation: 1599ft Climate Division: 01

March

DATE	MAX	MIN	AVG	HDD	CDD	PRCP
1	33	6	19	46	0	0.06
2	33	6	20	46	0	0.06
3	33	6	20	45	0	0.06
4	34	7	20	45	0	0.06
5	34	7	20	45	0	0.07
6	34	7	21	44	0	0.07
7	35	8	21	44	0	0.07
8	35	8	22	44	0	0.07
9	35	8	22	43	0	0.07
10	36	9	22	43	0	0.07
11	36	9	23	42	0	0.07
12	37	9	23	42	0	0.07
13	37	10	23	42	0	0.08
14	37	10	24	41	0	0.08
15	38	10	24	41	0	0.08
16	38	11	24	41	0	0.08
17	38	11	25	40	0	0.08
18	39	12	25	40	0	0.08
19	39	12	26	39	0	0.08
20	40	12	26	39	0	0.08
21	40	13	26	39	0	0.08
22	40	13	27	38	0	0.08
23	41	14	27	38	0	0.08
24	41	14	28	37	0	0.08
25	42	14	28	37	0	0.08
26	42	15	28	36	0	0.08
27	43	15	29	36	0	0.08
28	43	16	29	36	0	0.08
29	43	16	30	35	0	0.08
30	44	16	30	35	0	0.08
31	44	17	31	34	0	0.08
MNTH:	38.2	11.0	24.6	1253	0	2.32

April

DATE	MAX	MIN	AVG	HDD	CDD	PRCP
1	45	17	31	34	0	0.08
2	45	18	31	33	0	0.08
3	46	18	32	33	0	0.08
4	46	19	32	33	0	0.08
5	47	19	33	32	0	0.08
6	47	19	33	32	0	0.08
7	47	20	34	31	0	0.08
8	48	20	34	31	0	0.08
9	48	21	35	30	0	0.08
10	49	21	35	30	0	0.08
11	49	22	36	29	0	0.08
12	50	22	36	29	0	0.08
13	50	22	36	28	0	0.08
14	51	23	37	28	0	0.08
15	51	23	37	28	0	0.08
16	52	24	38	27	0	0.08
17	53	24	38	27	0	0.08
18	53	24	39	26	0	0.08
19	54	25	39	26	0	0.08
20	54	25	40	25	0	0.08
21	55	26	40	25	0	0.08
22	55	26	41	24	0	0.08
23	56	27	41	24	0	0.08
24	56	27	42	23	0	0.08
25	57	27	42	23	0	0.08
26	57	28	43	22	0	0.08
27	58	28	43	22	0	0.08
28	59	29	44	22	0	0.08
29	59	29	44	21	0	0.09
30	60	29	45	21	0	0.09
MNTH:	51.9	23.4	37.7	819	0	2.42
Spring	52.4	23.2	37.8	2516	15	7.84
Annual	52.1	26.3	39.2	9548	162	33.30

May

DATE	MAX	MIN	AVG	HDD	CD
1	60	30	45	20	0
2	61	30	46	20	0
3	61	31	46	19	0
4	62	31	47	19	0
5	63	31	47	18	0
6	63	32	47	18	0
7	64	32	48	18	0
8	64	33	48	17	0
9	65	33	49	17	0
10	65	33	49	16	0
11	66	34	50	16	0
12	66	34	50	16	0
13	66	34	50	15	**
14	67	35	51	15	**
15	67	35	51	14	**
16	68	35	51	14	**
17	68	36	52	14	**
18	68	36	52	13	**
19	69	37	53	13	**
20	69	37	53	13	**
21	69	37	53	12	**
22	70	37	54	12	**
23	70	38	54	12	**
24	70	38	54	11	**
25	71	38	54	11	**
26	71	39	55	11	**
27	71	39	55	11	**
28	71	39	55	10	0
29	71	40	56	10	0
30	72	40	56	10	0
31	72	40	56	9	0
MNTH:	67.1	35.3	51.2	444	15

Climatography of the United States NO. 84, 1971-2000

Daily Normals of

Temperature, Precipitation, and Heating and Cooling Degree Days

(includes monthly tables for precipitation probability and quintiles)

Station Name, State:	CHAMPION VAN RIPER PRK, MI	Station Number:	201439

Latitude: 46°31' Longitude: -87°59' Elevation: 1599ft Climate Division: 01

June

DATE	MAX	MIN	AVG	HDD	CDD	PRCP
1	72	41	56	9	0	0.11
2	72	41	57	9	0	0.11
3	72	41	57	9	0	0.11
4	73	41	57	9	0	0.11
5	73	42	57	8	0	0.11
6	73	42	57	8	0	0.11
7	73	42	58	8	0	0.11
8	73	42	58	8	0	0.11
9	73	43	58	7	0	0.11
10	74	43	58	7	1	0.11
11	74	43	59	7	1	0.11
12	74	44	59	7	1	0.11
13	74	44	59	7	1	0.11
14	74	44	59	6	1	0.11
15	75	44	59	6	1	0.11
16	75	45	60	6	1	0.11
17	75	45	60	6	1	0.11
18	75	45	60	6	1	0.11
19	75	45	60	6	1	0.11
20	75	45	60	5	1	0.11
21	76	46	61	5	1	0.11
22	76	46	61	5	1	0.11
23	76	46	61	5	1	0.11
24	76	46	61	5	1	0.11
25	76	47	62	5	1	0.11
26	76	47	62	5	1	0.12
27	77	47	62	4	1	0.12
28	77	47	62	4	1	0.12
29	77	47	62	4	1	0.12
30	77	48	63	4	2	0.12
MNTH:	74.6	44.3	59.5	190	22	3.35

July

DATE	MAX	MIN	AVG	HDD	CDD	PRCP
1	78	48	63	4	2	0.12
2	78	48	63	4	2	0.12
3	78	48	63	4	2	0.12
4	78	49	63	4	2	0.12
5	78	49	63	3	2	0.12
6	78	49	63	3	2	0.12
7	78	49	64	3	2	0.12
8	79	49	64	3	2	0.12
9	79	49	64	3	2	0.12
10	79	50	64	3	2	0.12
11	79	50	64	3	2	0.12
12	79	50	64	3	2	0.12
13	79	50	64	3	2	0.12
14	79	50	64	3	2	0.12
15	79	50	64	3	2	0.13
16	79	50	64	3	2	0.13
17	79	50	65	3	2	0.13
18	79	50	65	3	2	0.13
19	79	50	65	3	3	0.13
20	79	50	65	3	3	0.13
21	79	50	65	3	3	0.13
22	79	50	65	3	3	0.13
23	79	50	65	3	3	0.12
24	80	50	65	3	3	0.12
25	79	51	65	3	3	0.12
26	79	51	65	3	3	0.12
27	79	51	65	3	3	0.12
28	79	50	65	2	2	0.12
29	79	50	65	3	2	0.12
30	79	50	65	3	2	0.12
31	79	50	65	3	2	0.12
MNTH:	78.8	49.7	64.3	96	71	3.80
Summer	76.7	47.5	62.1	414	144	10.89
Annual	52.1	26.3	39.2	9548	162	33.30

August

DATE	MAX	MIN	AVG	HDD	CD
1	79	50	65	3	2
2	79	50	65	3	2
3	79	50	65	3	2
4	79	50	64	3	2
5	79	50	64	3	2
6	79	50	64	3	2
7	78	50	64	3	2
8	78	50	64	3	2
9	78	50	64	3	2
10	78	49	64	3	2
11	78	49	64	3	2
12	78	49	64	3	2
13	78	49	63	3	2
14	77	49	63	4	2
15	77	49	63	4	2
16	77	49	63	4	2
17	77	48	63	4	2
18	77	48	62	4	2
19	76	48	62	4	2
20	76	48	62	4	2
21	76	48	62	5	1
22	76	48	62	5	1
23	75	47	61	5	1
24	75	47	61	5	1
25	75	47	61	5	1
26	74	47	61	5	1
27	74	47	60	6	1
28	74	46	60	6	1
29	73	46	60	6	1
30	73	46	59	6	1
31	73	46	59	7	1
MNTH:	76.6	48.4	62.5	128	51

Climatography of the United States NO. 84, 1971-2000

Daily Normals of

Temperature, Precipitation, and Heating and Cooling Degree Days

(includes monthly tables for precipitation probability and quintiles)

Station Name, State:	CHAMPION VAN RIPER PRK, MI	Station Number:	201439

Latitude: 46°31' Longitude: -87°59' Elevation: 1599ft Climate Division: 01

September

DATE	MAX	MIN	AVG	HDD	CDD	PRCP
1	72	45	59	7	1	0.13
2	72	45	58	7	1	0.13
3	72	45	58	7	1	0.13
4	71	44	58	8	0	0.13
5	71	44	58	8	0	0.13
6	70	44	57	8	0	0.13
7	70	44	57	8	0	0.13
8	70	43	57	9	0	0.13
9	69	43	56	9	0	0.13
10	69	43	56	9	0	0.13
11	69	43	56	10	0	0.13
12	68	42	55	10	0	0.13
13	68	42	55	10	0	0.13
14	68	42	55	10	0	0.13
15	67	41	54	11	0	0.13
16	67	41	54	11	0	0.13
17	67	41	54	11	0	0.13
18	66	41	53	12	0	0.13
19	66	40	53	12	0	0.13
20	66	40	53	12	0	0.13
21	65	40	52	13	0	0.13
22	65	39	52	13	0	0.13
23	64	39	52	13	0	0.13
24	64	39	51	13	0	0.13
25	64	38	51	14	0	0.13
26	63	38	51	14	0	0.13
27	63	38	51	14	0	0.13
28	63	38	50	15	0	0.13
29	62	37	50	15	0	0.12
30	62	37	50	15	0	0.12
MNTH:	67.1	41.2	54.2	328	3	3.88

October

DATE	MAX	MIN	AVG	HDD	CDD	PRCP
1	62	37	49	16	0	0.12
2	61	36	49	16	0	0.12
3	61	36	49	16	0	0.12
4	61	36	48	17	0	0.12
5	60	35	48	17	0	0.12
6	60	35	48	17	0	0.12
7	60	35	47	18	0	0.11
8	59	34	47	18	0	0.11
9	59	34	46	19	0	0.11
10	58	34	46	19	0	0.11
11	58	33	46	19	0	0.11
12	57	33	45	20	0	0.11
13	57	33	45	20	0	0.11
14	56	33	45	21	0	0.11
15	56	32	44	21	0	0.11
16	55	32	44	21	0	0.11
17	55	32	43	22	0	0.10
18	55	31	43	22	0	0.10
19	54	31	42	23	0	0.10
20	53	31	42	23	0	0.10
21	53	30	42	24	0	0.10
22	52	30	41	24	0	0.10
23	52	30	41	24	0	0.10
24	51	29	40	25	0	0.10
25	51	29	40	25	0	0.10
26	50	28	39	26	0	0.10
27	50	28	39	26	0	0.10
28	49	28	38	27	0	0.10
29	48	27	38	27	0	0.09
30	48	27	37	28	0	0.09
31	47	27	37	28	0	0.09
MNTH:	55.1	31.8	43.5	669	0	3.29
Autumn	53.5	31.2	42.4	2065	3	9.61
Annual	52.1	26.3	39.2	9548	162	33.30

November

DATE	MAX	MIN	AVG	HDD	CD
1	46	26	36	29	0
2	46	26	36	29	0
3	45	26	35	30	0
4	45	25	35	30	0
5	44	25	34	31	0
6	43	25	34	31	0
7	43	24	33	32	0
8	42	24	33	32	0
9	42	23	32	33	0
10	41	23	32	33	0
11	40	23	31	34	0
12	40	22	31	34	0
13	39	22	31	34	0
14	39	21	30	35	0
15	38	21	30	35	0
16	38	20	29	36	0
17	37	20	29	36	0
18	37	20	28	37	0
19	36	19	28	37	0
20	36	19	27	38	0
21	35	18	27	38	0
22	35	18	26	39	0
23	34	17	26	39	0
24	34	17	25	40	0
25	33	16	25	40	0
26	33	16	25	40	0
27	33	15	24	41	0
28	32	15	24	41	0
29	32	15	23	42	0
30	31	14	23	42	0
MNTH:	38.3	20.5	29.4	1068	0

Climatography of the United States NO. 84, 1971-2000

Precipitation Probability and Quintiles

Station Name, State:	CHAMPION VAN RIPER PRK, MI	Station Number:	201439

Latitude: 46°31' Longitude: -87°59' Elevation: 1599ft Climate Division: 01

Probability that the monthly precipitation will be equal to or less than the indicated amount

Monthly Precipitation (inches)

Probability	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0.005	0.24	0.14	0.31	0.36	0.34	0.68	0.43	0.65	0.84	0.74	0.36	0.27	20.00
0.010	0.30	0.18	0.39	0.45	0.44	0.81	0.55	0.79	1.00	0.88	0.45	0.34	21.07
0.050	0.54	0.35	0.70	0.78	0.83	1.28	1.04	1.30	1.53	1.33	0.77	0.58	24.18
0.100	0.71	0.47	0.92	1.01	1.12	1.59	1.40	1.66	1.89	1.63	1.01	0.76	25.96
0.200	0.97	0.66	1.25	1.35	1.57	2.03	1.94	2.17	2.40	2.06	1.35	1.01	28.23
0.300	1.19	0.83	1.53	1.64	1.96	2.41	2.42	2.60	2.82	2.41	1.64	1.23	29.95
0.400	1.41	1.00	1.81	1.92	2.35	2.76	2.89	3.02	3.22	2.74	1.93	1.44	31.47
0.500	1.64	1.17	2.09	2.21	2.76	3.12	3.39	3.44	3.62	3.08	2.22	1.66	32.94
0.600	1.89	1.36	2.41	2.52	3.21	3.51	3.93	3.90	4.06	3.44	2.54	1.90	34.46
0.700	2.19	1.59	2.78	2.89	3.74	3.96	4.58	4.44	4.56	3.86	2.92	2.18	36.13
0.800	2.57	1.89	3.26	3.37	4.44	4.53	5.42	5.14	5.21	4.39	3.41	2.54	38.15
0.900	3.17	2.36	4.00	4.12	5.53	5.42	6.74	6.20	6.19	5.20	4.17	3.10	41.08
0.950	3.73	2.79	4.70	4.80	6.56	6.23	7.97	7.19	7.08	5.94	4.87	3.62	43.61
0.990	4.93	3.75	6.19	6.28	8.78	7.94	10.64	9.28	8.98	7.50	6.38	4.73	48.62
0.995	5.42	4.14	6.80	6.88	9.69	8.63	11.74	10.13	9.74	8.13	7.00	5.19	50.54

Precipitation Quintiles (inches)

Level	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0<	0.72	0.46	0.52	0.76	0.17	1.00	0.90	0.48	0.75	1.19	0.71	0.28
1	0.72	0.46	0.52	0.76	0.17	1.00	0.90	0.48	0.75	1.19	0.71	0.28
	0.97	0.66	1.25	1.35	1.57	2.03	1.94	2.17	2.40	2.06	1.35	1.01
2	0.98	0.67	1.26	1.36	1.58	2.04	1.95	2.18	2.41	2.07	1.36	1.02
	1.41	1.00	1.81	1.92	2.35	2.76	2.89	3.02	3.22	2.74	1.93	1.44
3	1.42	1.01	1.82	1.93	2.36	2.77	2.90	3.03	3.23	2.75	1.94	1.45
	1.89	1.36	2.41	2.52	3.21	3.51	3.93	3.90	4.06	3.44	2.54	1.90
4	1.90	1.37	2.42	2.53	3.22	3.52	3.94	3.91	4.07	3.45	2.55	1.91
	2.57	1.89	3.26	3.37	4.44	4.53	5.42	5.14	5.21	4.39	3.41	2.54
5	2.58	1.90	3.27	3.38	4.45	4.54	5.43	5.15	5.22	4.40	3.42	2.55
	4.74	3.53	4.19	7.42	6.77	6.27	7.50	8.92	7.81	5.73	4.94	3.38

6>	4.74	3.53	4.19	7.42	6.77	6.27	7.50	8.92	7.81	5.73	4.94	3.38

(These values were determined from the incomplete Gamma Distribution)

Abbreviations:
AVG = Average Temperature (degrees Fahrenheit)
CDD = Cooling Degree Days (base 65)
HDD = Heating Degree Days (base 65)
MAX = Maximum Temperature (degrees Fahrenheit)
MIN = Minimum Temperature (degrees Fahrenheit)
MNTH = Monthly Means and Totals
PRCP = Precipitation Amount (inches and hundredths)

Notes:

- The daily values presented in these tables are not simple means of observed values. They are interpolated from the much less variable monthly normals by use of the natural spline function. Daily precipitation normals were also computed using the natural spline function and do not exhibit the typical daily random patterns. However, they may be used to compute precipitation over time intervals
- The seasonal values that are provided with each page are calculated from the daily values for each month in the season. For example the winter maximum temperature is an average of the December, January, and February daily maximum temperatures.
- Daily Leap Year values: In leap years, use the February 28th values for the 29th and adjust the degree day and precipitation monthly totals accordingly.
- (n/a) occurs to fill values for stations that do not have data.
- (**) occurs as a degree day value for some locations. It's used to represent a value of less than one degree day, but more than zero degree days.
- (**) If this symbol appears in the Precipitation Probabilities tables statistics not computed because less than six years out of thirty had measurable precipitation.
- Complete Documentation and other normals product information is available by clicking on the link.

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National Oceanic & Atmospheric Administration
National Environmental Satellite, Data,
and Information Service

Climatography of the United States No. 20 1971-2000

National Climatic Data Center
Federal Building
151 Patton Avenue
Asheville, North Carolina 28801
www.ncdc.noaa.gov

Station: CHAMPION VAN RIPER PRK, MI **COOP ID: 201439**

Climate Division: MI 1 **NWS Call Sign:** **Elevation: 1,565 Feet** **Lat: 46°31N** **Lon: 87°59W**

Temperature (°F)

	Mean (1)			Extremes										Degree Days (1) Base Temp 65		Mean Number of Days (3)					
Month	Daily Max	Daily Min	Mean	Highest Daily(2)	Year	Day	Highest Month(1) Mean	Year	Lowest Daily(2)	Year	Day	Lowest Month(1) Mean	Year	Heating	Cooling	Max >= 100	Max >= 90	Max >= 50	Max <= 32	Min <= 32	Min <= 0
Jan	22.4	.2	11.3	54	1973	26	22.6	1990	-40	1977	9	1.9	1994	1664	0	.0	.0	@	26.5	31.0	15.0
Feb	28.2	2.1	15.2	61+	1976	24	27.1	1998	-44	1979	17	5.9	1979	1396	0	.0	.0	.9	19.1	28.1	12.3
Mar	38.2	11.0	24.6	69	1989	27	33.6	1973	-33	1989	2	18.2	1972	1253	0	.0	.0	4.3	9.3	29.8	7.8
Apr	51.9	23.4	37.7	92	1980	22	45.4	1987	-17	1954	4	30.5	1975	819	0	.0	@	16.1	1.6	24.6	1.2
May	67.1	35.3	51.2	93	1969	28	60.1	1977	11	1954	6	42.7	1997	444	15	.0	.1	28.7	.0	13.2	.0
Jun	74.6	44.3	59.5	97	1963	30	64.3	1976	17	1998	5	53.5	1982	190	22	.0	.5	30.0	.0	3.4	.0
Jul	78.8	49.7	64.3	98	1988	28	69.4	1983	26	2000	19	59.0	1992	96	71	.0	1.3	31.0	.0	.5	.0
Aug	76.6	48.4	62.5	96	1976	19	67.7	1983	27	1992	13	58.3	1977	128	51	.0	.6	31.0	.0	1.1	.0
Sep	67.1	41.2	54.2	94+	1976	7	58.5	1978	15	2000	28	49.7	1974	328	3	.0	.2	29.1	.0	6.3	.0
Oct	55.1	31.8	43.5	86+	1976	1	51.2	1971	5	1969	23	38.8	1980	669	0	.0	.0	21.2	.3	18.0	.0
Nov	38.3	20.5	29.4	73	1978	3	35.2	1999	-13	1976	29	19.4	1995	1068	0	.0	.0	3.9	9.8	27.2	1.3
Dec	26.3	7.4	16.9	60	1998	3	23.9	1997	-38	1983	19	7.5	2000	1493	0	.0	.0	.3	22.9	30.9	9.3
Ann	52.1	26.3	39.2	98	Jul 1988	28	69.4	Jul 1983	-44	Feb 1979	17	1.9	Jan 1994	9548	162	.0	2.7	196.5	89.5	214.1	46.9

+ Also occurred on an earlier date(s)

@ Denotes mean number of days greater than 0 but less than .05

Complete documentation available from: www.ncdc.noaa.gov/oa/climate/normals/usnormals.html

Issue Date: February 2004

(1) From the 1971-2000 Monthly Normals

(2) Derived from station's available digital record: 1949-2001

(3) Derived from 1971-2000 serially complete daily data

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Station: CHAMPION VAN RIPER PRK, MI

COOP ID: 201439

Climate Division: MI 1 **NWS Call Sign:** **Elevation: 1,565 Feet** **Lat: 46°31N** **Lon: 87°59W**

Precipitation (inches)

Precipitation Totals

Month	Means/ Medians(1) Mean	Means/ Medians(1) Median	Extremes Highest Daily(2)	Year	Day	Highest Monthly(1)	Year	Lowest Monthly(1)	Year
Jan	1.82	1.50	1.52	1996	27	4.74	1997	.72	1995
Feb	1.32	.98	1.27	1984	12	3.53	1971	.46	1994
Mar	2.32	2.25	2.13	1984	22	4.19	1979	.52	1993
Apr	2.42	2.36	2.49	1985	19	7.42	1985	.76	1971
May	3.10	2.83	1.79	1975	20	6.77	1999	.17	1986
Jun	3.35	3.17	2.96	1989	8	6.27	1981	1.00	1988
Jul	3.80	3.66	3.61	1992	2	7.50	1992	.90	1989
Aug	3.74	3.54	3.33	1951	31	8.92	1988	.48	1976
Sep	3.88	3.50	4.41	1957	2	7.81	1972	.75	1976
Oct	3.29	3.06	2.49	1966	15	5.73	1979	1.19	1976
Nov	2.44	2.18	1.49	1992	20	4.94	1988	.71	1997
Dec	1.82	1.93	2.05	1949	11	3.38	1996	.28	1994
Ann	33.30	33.10	4.41	Sep 1957	2	8.92	Aug 1988	.17	May 1986

Mean Number of Days (3)

Daily Precipitation

Month	>= 0.01	>= 0.10	>= 0.50	>= 1.00
Jan	14.9	5.4	.5	.1
Feb	10.9	3.8	.4	.1
Mar	11.3	5.7	1.2	.2
Apr	9.8	5.3	1.5	.5
May	10.6	6.5	2.0	.3
Jun	12.3	7.4	2.2	.6
Jul	12.3	7.1	2.5	.9
Aug	12.2	6.9	2.6	.9
Sep	14.2	8.5	2.3	.7
Oct	14.2	7.6	1.9	.7
Nov	13.8	6.7	1.4	.2
Dec	14.2	5.6	.7	.0
Ann	150.7	76.5	19.2	5.2

Precipitation Probabilities (1)

Probability that the monthly/annual precipitation will be equal to or less than the indicated amount

Monthly/Annual Precipitation vs Probability Levels
These values were determined from the incomplete gamma distribution

Month	.05	.10	.20	.30	.40	.50	.60	.70	.80	.90	.95
Jan	.54	.71	.97	1.19	1.41	1.64	1.89	2.19	2.57	3.17	3.73
Feb	.35	.47	.66	.83	1.00	1.17	1.36	1.59	1.89	2.36	2.79
Mar	.70	.92	1.25	1.53	1.81	2.09	2.41	2.78	3.26	4.00	4.70
Apr	.78	1.01	1.35	1.64	1.92	2.21	2.52	2.89	3.37	4.12	4.80
May	.83	1.12	1.57	1.96	2.35	2.76	3.21	3.74	4.44	5.53	6.56
Jun	1.28	1.59	2.03	2.41	2.76	3.12	3.51	3.96	4.53	5.42	6.23
Jul	1.04	1.40	1.94	2.42	2.89	3.39	3.93	4.58	5.42	6.74	7.97
Aug	1.30	1.66	2.17	2.60	3.02	3.44	3.90	4.44	5.14	6.20	7.19
Sep	1.53	1.89	2.40	2.82	3.22	3.62	4.06	4.56	5.21	6.19	7.08
Oct	1.33	1.63	2.06	2.41	2.74	3.08	3.44	3.86	4.39	5.20	5.94
Nov	.77	1.01	1.35	1.64	1.93	2.22	2.54	2.92	3.41	4.17	4.87
Dec	.58	.76	1.01	1.23	1.44	1.66	1.90	2.18	2.54	3.10	3.62
Ann	24.18	25.96	28.23	29.95	31.47	32.94	34.46	36.13	38.15	41.08	43.61

\+ Also occurred on an earlier date(s)
\# Denotes amounts of a trace
@ Denotes mean number of days greater than 0 but less than .05
** Statistics not computed because less than six years out of thirty had measurable precipitation

(1) From the 1971-2000 Monthly Normals
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Station: CHAMPION VAN RIPER PRK, MI **COOP ID: 201439**

Climate Division: MI 1 **NWS Call Sign:** **Elevation: 1,565 Feet** **Lat: 46°31N** **Lon: 87°59W**

Snow (inches)

Snow Totals

Means/Medians (1)

Month	Snow Fall Mean	Snow Fall Median	Snow Depth Mean	Snow Depth Median
Jan	29.1	27.3	20	20
Feb	20.1	19.7	24	23
Mar	22.8	20.5	22	22
Apr	9.7	8.3	8	6
May	1.1	.0	#	0
Jun	.0	.0	0	0
Jul	.0	.0	0	0
Aug	.0	.0	0	0
Sep	.1	.0	#	0
Oct	5.4	2.2	#	#
Nov	19.1	17.3	3	2
Dec	25.4	26.8	11	10
Ann	132.8	122.1	N/A	N/A

Extremes (2)

Month	Highest Daily Snow Fall	Year	Day	Highest Monthly Snow Fall	Year	Highest Daily Snow Depth	Year	Day	Highest Monthly Mean Snow Depth	Year
Jan	21.5	1996	27	63.4	1997	54	1996	31	33+	1997
Feb	13.3	1975	25	40.0	1971	60	1996	20	55	1996
Mar	17.0	1986	19	45.5	1976	53	1996	8	41	1997
Apr	19.3	1977	5	31.5	1996	44	1996	5	33	1996
May	8.7	1990	10	11.7	1990	19	1996	1	5	1996
Jun	.0	0	0	.0	0	0	0	0	0	0
Jul	.0	0	0	.0	0	0	0	0	0	0
Aug	.0	0	0	.0	0	0	0	0	0	0
Sep	2.1	1989	23	2.1	1989	#+	1995	22	#+	1995
Oct	11.9	1989	21	19.6	1979	7	1990	18	1	1992
Nov	21.3	1991	24	56.1	1991	24	1991	27	9	1991
Dec	18.7	1990	4	43.4	1977	31	1996	25	26	1995
Ann	21.5	Jan 1996	27	63.4	Jan 1997	60	Feb 1996	20	55	Feb 1996

Mean Number of Days (1)

Snow Fall >= Thresholds

Month	0.1	1.0	3.0	5.0	10.0
Jan	14.9	8.0	3.0	1.4	.1
Feb	10.2	5.4	1.7	.7	.2
Mar	8.4	5.3	2.5	1.4	.3
Apr	3.9	2.5	.9	.5	.1
May	.6	.2	.1	@	.0
Jun	.0	.0	.0	.0	.0
Jul	.0	.0	.0	.0	.0
Aug	.0	.0	.0	.0	.0
Sep	.1	@	.0	.0	.0
Oct	2.6	1.5	.5	.3	@
Nov	8.7	5.6	2.0	.9	.1
Dec	13.4	8.1	2.6	1.2	.2
Ann	62.8	36.6	13.3	6.4	1.0

Snow Depth >= Thresholds

Month	1	3	5	10
Jan	30.5	30.5	30.5	29.5
Feb	27.9	27.9	27.9	27.6
Mar	28.1	27.2	26.7	25.2
Apr	14.5	12.4	11.3	8.8
May	.4	.2	.1	.0
Jun	.0	.0	.0	.0
Jul	.0	.0	.0	.0
Aug	.0	.0	.0	.0
Sep	.0	.0	.0	.0
Oct	1.6	.8	.2	.0
Nov	16.5	9.2	5.4	1.5
Dec	29.2	28.0	24.5	16.5
Ann	148.7	136.2	126.6	109.1

+ Also occurred on an earlier date(s) #Denotes trace amounts

@ Denotes mean number of days greater than 0 but less than .05

-9/-9.9 represents missing values
Annual statistics for Mean/Median snow depths are not appropriate

(1) Derived from Snow Climatology and 1971-2000 daily data

(2) Derived from 1971-2000 daily data

Complete documentation available from:
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Climate Division: MI 1 **NWS Call Sign:** **Elevation: 1,565 Feet** **Lat: 46°31N** **Lon: 87°59W**

Freeze Data

Spring Freeze Dates (Month/Day)

Temp (F)	Probability of later date in spring (thru Jul 31) than indicated(*)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	8/01	7/24	7/18	7/14	7/09	7/05	6/30	6/24	6/16
32	7/20	7/11	7/05	6/29	6/24	6/19	6/14	6/07	5/29
28	6/25	6/19	6/14	6/11	6/07	6/03	5/30	5/26	5/19
24	6/09	6/04	5/31	5/27	5/24	5/21	5/17	5/13	5/07
20	5/20	5/16	5/13	5/10	5/07	5/05	5/02	4/29	4/25
16	5/06	5/02	4/28	4/26	4/23	4/21	4/18	4/15	4/10

Fall Freeze Dates (Month/Day)

Temp (F)	Probability of earlier date in fall (beginning Aug 1) than indicated(*)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	8/01	8/07	8/11	8/14	8/17	8/20	8/24	8/27	9/02
32	8/10	8/16	8/21	8/24	8/28	9/01	9/05	9/09	9/16
28	8/28	9/02	9/06	9/10	9/13	9/16	9/19	9/23	9/29
24	9/14	9/20	9/24	9/28	10/01	10/04	10/08	10/12	10/17
20	9/29	10/04	10/08	10/11	10/14	10/17	10/20	10/24	10/29
16	10/11	10/18	10/23	10/27	10/30	11/03	11/07	11/12	11/18

Freeze Free Period

Temp (F)	Probability of longer than indicated freeze free period (Days)								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
36	64	55	49	43	38	33	28	22	13
32	98	87	78	71	64	57	50	41	30
28	125	115	109	103	97	92	86	79	70
24	152	144	139	134	129	125	120	114	107
20	180	173	168	163	159	155	150	145	138
16	211	204	198	194	190	185	181	176	168

* Probability of observing a temperature as cold, or colder, later in the spring or earlier in the fall than the indicated date.

0/00 Indicates that the probability of occurrence of threshold temperature is less than the indicated probability.

Derived from 1971-2000 serially complete daily data

Complete documentation available from:
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Degree Days to Selected Base Temperatures (°F)

Heating Degree Days (1)

Base Below	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
65	1664	1396	1253	819	444	190	96	128	328	669	1068	1493	9548
60	1509	1256	1098	672	313	93	30	50	195	515	918	1338	7987
57	1416	1172	1005	585	246	53	12	22	129	425	828	1245	7138
55	1354	1116	943	528	207	34	6	12	93	367	768	1183	6611
50	1199	976	788	393	124	9	0	1	33	235	618	1028	5404
32	651	491	281	68	6	0	0	0	0	11	165	493	2166

Cooling Degree Days (1)

Base Above	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
32	10	19	51	238	600	823	999	946	664	365	87	24	4826
55	0	0	0	9	87	167	292	245	68	8	0	0	876
57	0	0	0	6	65	126	236	193	44	4	0	0	674
60	0	0	0	2	39	76	161	127	20	1	0	0	426
65	0	0	0	0	15	22	71	51	3	0	0	0	162
70	0	0	0	0	4	5	19	12	0	0	0	0	40

Growing Degree Units (2)

Base	Growing Degree Units (Monthly)												Growing Degree Units (Accumulated Monthly)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
40	0	0	10	92	360	584	753	703	427	168	14	1	0	0	10	102	462	1046	1799	2502	2929	3097	3111	3112
45	0	0	0	50	235	438	598	548	289	85	6	0	0	0	0	50	285	723	1321	1869	2158	2243	2249	2249
50	0	0	0	23	139	295	443	394	175	37	0	0	0	0	0	23	162	457	900	1294	1469	1506	1506	1506
55	0	0	0	10	76	178	291	251	88	8	0	0	0	0	0	10	86	264	555	806	894	902	902	902
60	0	0	0	4	36	86	165	131	36	1	0	0	0	0	0	4	40	126	291	422	458	459	459	459
Base	**Growing Degree Units for Corn (Monthly)**												**Growing Degree Units for Corn (Accumulated Monthly)**											
50/86	0	0	11	94	278	392	495	457	275	122	12	0	0	0	11	105	383	775	1270	1727	2002	2124	2136	2136

(1) Derived from the 1971-2000 Monthly Normals
(2) Derived from 1971-2000 serially complete daily data
Note: For corn, temperatures below 50 are set to 50, and temperatures above 86 are set to 86

Complete documentation available from:
www.ncdc.noaa.gov/oa/climate/normals/usnormals.html

Notes

a. The monthly means are simple arithmetic averages computed by summing the monthly values for the period 1971-2000 and dividing by thirty. Prior to averaging, the data are adjusted if necessary to compensate for data quality issues, station moves or changes in station reporting practices. Missing months are replaced by estimates based on neighboring stations.

b. The median is defined as the middle value in an ordered set of values. The median is being provided for the snow and precipitation elements because the mean can be a misleading value for precipitation normals.

c. Only observed validated values were used to select the extreme daily values.

d. Extreme monthly temperature/precipitation means were selected from the monthly normals data.
Monthly snow extremes were calculated from daily values quality controlled to be consistent with the Snow Climatology.

e. Degree Days were derived using the same techniques as the 1971-2000 normals.
Compete documentation for the 1971-2000 Normals is available on the internet from:
www.ncdc.noaa.gov/oa/climate/normals/usnormals.html

f. Mean "number of days statistics" for temperature and precipitation were calculated from a serially complete daily data set .
Documentation of the serially complete data set is available from the link below:

g. Snowfall and snow depth statistics were derived from the Snow Climatology.
Documentation for the Snow Climatology project is available from the link under references.

Data Sources for Tables

Several different data sources were used to create the Clim20 climate summaries. In some cases the daily extremes appear inconsistent with the monthly extremes and or the mean number of days statistics. For example, a high daily extreme value may not be reflected in the highest monthly value or the mean number of days threshold that is less than and equal to the extreme value. Some of these difference are caused by different periods of record. Daily extremes are derived from the station's entire period of record while the serial data and normals data were are for the 1971-2000 period. Therefore extremes observed before 1971 would not be included in the 1971-2000 normals or the 1971-2000 serial daily data set. Inconsistencies can also occur when monthly values are adjusted to reflect the current observing conditions or were replaced during the 1971-2000 Monthly Normals processing and are not reconciled with the Summary of the Day data.

a. Temperature/ Precipitation Tables
   1. 1971-2000 Monthly Normals
   2. Cooperative Summary of the Day
   3. National Weather Service station records
   4. 1971-2000 serially complete daily data

b. Degree Day Table
   1. Monthly and Annual Heating and Cooling Degree Days Normals to Selected Bases derived from 1971-2000 Monthly Normals
   2. Daily Normal Growing Degree Units to Selected Base Temperatures derived from 1971-2000 serially complete daily data

c. Snow Tables
   1. Snow Climatology
   2. Cooperative Summary of the Day

d. Freeze Data Table
   1971-2000 serially complete daily data

References

U.S. Climate Normals 1971-2000, www.ncdc.noaa.gov/normals.html
U.S. Climate Normals 1971-2000-Products Clim20, www.ncdc.noaa.gov/oa/climate/normals/usnormalsprods.html
Snow Climatology Project Description, www.ncdc.noaa.gov/oa/climate/monitoring/snowclim/mainpage.html
Eischeid, J. K., P. Pasteris, H. F. Diaz, M. Plantico, and N. Lott, 2000: Creating a serially complete, national daily time series of temperature and precipitation for the Western United States. J. Appl. Meteorol., 39, 1580-1591,
www1.ncdc.noaa.gov/pub/data/special/ serialcomplete_jam_0900.pdf

Attachment 6

National Resources Conservation Service

Maximum 24-Hour Rainfall Events

Average Rainfall and Evaporation by Month

For Marquette County

http://www.mi.nrcs.usda.gov/technical/engineering/climate.html

24-Hour Rainfall in Michigan (inches)						
County	2-year	5-year	10-year	25-year	50-year	100-year
ALCONA	2.33	2.86	3.25	3.75	4.17	4.62
ALGER	2.30	2.68	3.00	3.50	4.00	4.50
ALLEGAN	2.67	3.45	3.95	4.50	5.25	5.87
ALPENA	2.30	2.80	3.17	3.68	4.13	4.56
ANTRIM	2.36	2.85	3.20	3.75	4.13	4.56
ARENAC	2.41	2.96	3.35	3.87	4.33	4.81
BARAGA	2.44	2.92	3.30	3.80	4.25	4.68
BARRY	2.60	3.25	3.70	4.37	4.87	5.43
BAY	2.43	2.98	3.37	3.87	4.37	4.90
BENZIE	2.45	3.00	3.40	3.95	4.43	4.87
BERRIEN	2.80	3.58	4.00	4.50	5.50	6.00
BRANCH	2.58	3.17	3.62	4.25	4.75	5.20
CALHOUN	2.57	3.15	3.60	4.25	4.75	5.12
CASS	2.73	3.47	4.00	4.50	5.25	5.87
CHARLEVOIX	2.31	2.77	3.12	3.62	4.00	4.50
CHEBOYGAN	2.26	2.72	3.05	3.56	4.00	4.50
CHIPPEWA	2.20	2.60	3.00	3.50	4.00	4.50
CLARE	2.48	3.07	3.50	4.12	4.56	5.00
CLINTON	2.51	3.05	3.45	4.00	4.50	4.96
CRAWFORD	2.40	2.92	3.30	3.87	4.31	4.70
DELTA	2.36	2.77	3.05	3.50	4.00	4.50
DICKINSON	2.45	2.90	3.25	3.68	4.13	4.50
EATON	2.55	3.10	3.50	4.12	4.62	5.00
EMMET	2.26	2.72	3.05	3.50	4.00	4.50
GENESEE	2.40	2.92	3.32	3.78	4.28	4.78
GLADWIN	2.45	3.02	3.40	3.96	4.43	4.90
GOGEBIC	2.57	3.15	3.60	4.25	4.69	5.20
GRAND TRAVERSE	2.42	2.97	3.36	3.93	4.38	4.81
GRATIOT	2.51	3.05	3.47	4.06	4.50	4.96
HILLSDALE	2.54	3.05	3.45	4.00	4.48	4.96
HOUGHTON	2.40	2.92	3.35	3.87	4.30	4.80
HURON	2.32	2.87	3.27	3.65	4.16	4.65
INGHAM	2.50	2.98	3.38	3.95	4.43	4.90
IONIA	2.56	3.17	3.60	4.25	4.75	5.25
IOSCO	2.37	2.90	3.30	3.78	4.28	4.70
IRON	2.49	3.00	3.37	3.87	4.30	4.77
ISABELLA	2.51	3.12	3.55	4.15	4.62	5.10
JACKSON	2.51	2.98	3.38	3.95	4.43	4.93
KALAMAZOO	2.65	3.33	3.85	4.50	5.06	5.62
KALKASKA	2.41	2.95	3.32	3.90	4.31	4.75
KENT	2.62	3.30	3.80	4.50	5.06	5.62
KEWEENAW	2.35	2.82	3.25	3.68	4.13	4.58
LAKE	2.53	3.20	3.65	4.31	4.81	5.37
LAPEER	2.35	2.88	3.28	3.68	4.19	4.68
LEELANAU	2.38	2.90	3.25	3.81	4.18	4.62
LENAWEE	2.50	2.97	3.36	3.87	4.37	4.83
LIVINGSTON	2.46	2.95	3.34	3.83	4.33	4.81
LUCE	2.20	2.60	3.00	3.50	4.00	4.50
MACKINAC	2.20	2.62	3.00	3.50	4.00	4.50

MACOMB	2.32	2.85	3.25	3.62	4.10	4.61
MANISTEE	2.50	3.10	3.50	4.12	4.62	5.12
MARQUETTE	2.40	2.82	3.15	3.62	4.00	4.50
MASON	2.55	3.25	3.70	4.37	4.93	5.50
MECOSTA	2.55	3.20	3.65	4.31	4.81	5.31
MENOMINEE	2.45	2.90	3.20	3.68	4.13	4.50
MIDLAND	2.47	3.03	3.43	3.96	4.46	4.93
MISSAUKEE	2.45	3.10	3.45	4.00	4.50	4.93
MONROE	2.43	2.92	3.30	3.77	4.23	4.73
MONTCALM	2.56	3.17	3.65	4.25	4.75	5.25
MONTMORENCY	2.32	2.82	3.17	3.71	4.13	4.56
MUSKEGON	2.65	3.40	3.95	4.50	5.25	5.87
NEWAYGO	2.60	3.30	3.80	4.50	5.00	5.60
OAKLAND	2.37	2.88	3.28	3.71	4.22	4.70
OCEANA	2.60	3.32	3.85	4.50	5.13	5.75
OGEMAW	2.42	2.95	3.35	3.87	4.37	4.78
ONTONAGON	2.51	3.70	3.50	4.12	4.56	5.10
OSCEOLA	2.51	3.15	3.55	4.22	4.73	5.18
OSCODA	2.37	2.90	3.27	3.81	4.25	4.68
OTSEGO	2.33	2.83	3.20	3.75	4.13	4.50
OTTAWA	2.67	3.43	3.95	4.50	5.31	5.87
PRESQUE ISLE	2.26	2.75	3.10	3.62	4.00	4.50
ROSCOMMON	2.43	3.00	3.37	3.96	4.43	4.87
SAGINAW	2.45	2.97	3.37	3.87	4.37	4.87
SANILAC	2.31	2.85	3.25	3.62	4.13	4.62
SCHOOLCRAFT	2.27	2.67	3.00	3.50	4.00	4.50
SHIAWASSEE	2.46	2.97	3.37	3.90	4.37	4.87
ST CLAIR	2.30	2.83	3.23	3.56	4.06	4.56
ST JOSEPH	2.66	3.32	3.82	4.50	5.04	5.50
TUSCOLA	2.37	2.91	3.31	3.71	4.25	4.71
VAN BUREN	2.73	3.47	4.00	4.50	5.35	5.87
WASHTENAW	2.45	2.93	3.33	3.83	4.31	4.81
WAYNE	2.37	2.86	3.27	3.65	4.19	4.68
WEXFORD	2.47	3.10	3.50	4.06	4.56	5.00

Monthly Rainfall by County for Michigan
(inches)

County	Jan_P	Feb_P	Mar_P	Apr_P	May_P	Jun_P	Jul_P	Aug_P	Sep_P	Oct_P	Nov_P	Dec_P	Annual
Alcona	1.63	1.32	1.89	2.47	2.75	2.89	3.04	3.34	3.49	2.49	2.43	1.97	29.71
Alger	2.02	1.48	1.97	2.36	2.8	3.19	3.05	3.53	3.68	2.83	2.87	2.33	32.11
Allegan	2.21	1.67	2.48	3.53	3.14	3.56	3.39	3.33	3.64	2.96	3.03	2.78	35.72
Alpena	1.63	1.32	1.89	2.47	2.75	2.89	3.04	3.34	3.49	2.49	2.43	1.97	29.71
Antrim	1.94	1.41	1.87	2.69	2.58	2.94	2.86	3.3	3.83	2.91	2.79	2.23	31.35
Arenac	1.67	1.46	2.17	2.7	2.67	3.06	2.78	3.17	3.52	2.55	2.54	2.1	30.39
Baraga	1.86	1.35	2	2.4	3.25	3.62	3.39	3.78	3.61	2.81	2.62	2.08	32.77
Barry	1.7	1.53	2.3	3.19	3.04	3.58	3.28	3.36	3.24	2.53	2.58	2.2	32.53
Bay	1.67	1.46	2.17	2.7	2.67	3.06	2.78	3.17	3.52	2.55	2.54	2.1	30.39
Benzie	1.94	1.41	1.87	2.69	2.58	2.94	2.86	3.3	3.83	2.91	2.79	2.23	31.35
Berrien	2.21	1.67	2.48	3.53	3.14	3.56	3.39	3.33	3.64	2.96	3.03	2.78	35.72
Branch	1.7	1.53	2.3	3.19	3.04	3.58	3.28	3.36	3.24	2.53	2.58	2.2	32.53
Calhoun	1.7	1.53	2.3	3.19	3.04	3.58	3.28	3.36	3.24	2.53	2.58	2.2	32.53
Cass	2.21	1.67	2.48	3.53	3.14	3.56	3.39	3.33	3.64	2.96	3.03	2.78	35.72
Charlevoix	1.94	1.41	1.87	2.69	2.58	2.94	2.86	3.3	3.83	2.91	2.79	2.23	31.35
Cheboygar	1.63	1.32	1.89	2.47	2.75	2.89	3.04	3.34	3.49	2.49	2.43	1.97	29.71
Chippewa	2.02	1.48	1.97	2.36	2.8	3.19	3.05	3.53	3.68	2.83	2.87	2.33	32.11
Clare	1.65	1.34	2.15	2.98	2.86	3.15	2.76	3.57	3.66	2.68	2.59	2.14	31.53
Clinton	1.7	1.53	2.3	3.19	3.04	3.58	3.28	3.36	3.24	2.53	2.58	2.2	32.53
Crawford	1.63	1.32	1.89	2.47	2.75	2.89	3.04	3.34	3.49	2.49	2.43	1.97	29.71
Delta	2.02	1.48	1.97	2.36	2.8	3.19	3.05	3.53	3.68	2.83	2.87	2.33	32.11
Dickinson	1.86	1.35	2	2.4	3.25	3.62	3.39	3.78	3.61	2.81	2.62	2.08	32.77
Eaton	1.7	1.53	2.3	3.19	3.04	3.58	3.28	3.36	3.24	2.53	2.58	2.2	32.53
Emmet	1.94	1.41	1.87	2.69	2.58	2.94	2.86	3.3	3.83	2.91	2.79	2.23	31.35
Genesee	1.73	1.66	2.38	3.08	2.82	3.35	3.03	3.23	2.88	2.37	2.64	2.32	31.49
Gladwin	1.65	1.34	2.15	2.98	2.86	3.15	2.76	3.57	3.66	2.68	2.59	2.14	31.53
Gogebic	1.86	1.35	2	2.4	3.25	3.62	3.39	3.78	3.61	2.81	2.62	2.08	32.77
Grand Trav	1.94	1.41	1.87	2.69	2.58	2.94	2.86	3.3	3.83	2.91	2.79	2.23	31.35
Gratiot	1.65	1.34	2.15	2.98	2.86	3.15	2.76	3.57	3.66	2.68	2.59	2.14	31.53
Hillsdale	1.7	1.53	2.3	3.19	3.04	3.58	3.28	3.36	3.24	2.53	2.58	2.2	32.53
Houghton	1.86	1.35	2	2.4	3.25	3.62	3.39	3.78	3.61	2.81	2.62	2.08	32.77
Huron	1.67	1.46	2.17	2.7	2.67	3.06	2.78	3.17	3.52	2.55	2.54	2.1	30.39
Ingham	1.7	1.53	2.3	3.19	3.04	3.58	3.28	3.36	3.24	2.53	2.58	2.2	32.53
Ionia	1.7	1.53	2.3	3.19	3.04	3.58	3.28	3.36	3.24	2.53	2.58	2.2	32.53
Iosco	1.63	1.32	1.89	2.47	2.75	2.89	3.04	3.34	3.49	2.49	2.43	1.97	29.71
Iron	1.86	1.35	2	2.4	3.25	3.62	3.39	3.78	3.61	2.81	2.62	2.08	32.77

Monthly Rainfall by County for Michigan
(inches)

Isabella	1.65	1.34	2.15	2.98	2.86	3.15	2.76	3.57	3.66	2.68	2.59	2.14	31.53
Jackson	1.7	1.53	2.3	3.19	3.04	3.58	3.28	3.36	3.24	2.53	2.58	2.2	32.53
Kalamazoo	2.21	1.67	2.48	3.53	3.14	3.56	3.39	3.33	3.64	2.96	3.03	2.78	35.72
Kalkaska	1.94	1.41	1.87	2.69	2.58	2.94	2.86	3.3	3.83	2.91	2.79	2.23	31.35
Kent	2.21	1.67	2.48	3.53	3.14	3.56	3.39	3.33	3.64	2.96	3.03	2.78	35.72
Keweenaw	1.86	1.35	2	2.4	3.25	3.62	3.39	3.78	3.61	2.81	2.62	2.08	32.77
Lake	2.22	1.62	2.3	3.14	2.71	2.9	2.71	3.62	3.57	3.16	3.1	2.55	33.6
Lapeer	1.73	1.66	2.38	3.08	2.82	3.35	3.03	3.23	2.88	2.37	2.64	2.32	31.49
Leelanau	1.94	1.41	1.87	2.69	2.58	2.94	2.86	3.3	3.83	2.91	2.79	2.23	31.35
Lenawee	1.73	1.66	2.38	3.08	2.82	3.35	3.03	3.23	2.88	2.37	2.64	2.32	31.49
Livingston	1.73	1.66	2.38	3.08	2.82	3.35	3.03	3.23	2.88	2.37	2.64	2.32	31.49
Luce	2.02	1.48	1.97	2.36	2.8	3.19	3.05	3.53	3.68	2.83	2.87	2.33	32.11
Mackinac	2.02	1.48	1.97	2.36	2.8	3.19	3.05	3.53	3.68	2.83	2.87	2.33	32.11
Macomb	1.73	1.66	2.38	3.08	2.82	3.35	3.03	3.23	2.88	2.37	2.64	2.32	31.49
Manistee	1.94	1.41	1.87	2.69	2.58	2.94	2.86	3.3	3.83	2.91	2.79	2.23	31.35
Marquette	1.86	1.35	2	2.4	3.25	3.62	3.39	3.78	3.61	2.81	2.62	2.08	32.77
Mason	2.22	1.62	2.3	3.14	2.71	2.9	2.71	3.62	3.57	3.16	3.1	2.55	33.6
Mecosta	1.65	1.34	2.15	2.98	2.86	3.15	2.76	3.57	3.66	2.68	2.59	2.14	31.53
Menominee	1.86	1.35	2	2.4	3.25	3.62	3.39	3.78	3.61	2.81	2.62	2.08	32.77
Midland	1.65	1.34	2.15	2.98	2.86	3.15	2.76	3.57	3.66	2.68	2.59	2.14	31.53
Missaukee	1.94	1.41	1.87	2.69	2.58	2.94	2.86	3.3	3.83	2.91	2.79	2.23	31.35
Monroe	1.73	1.66	2.38	3.08	2.82	3.35	3.03	3.23	2.88	2.37	2.64	2.32	31.49
Montcalm	1.65	1.34	2.15	2.98	2.86	3.15	2.76	3.57	3.66	2.68	2.59	2.14	31.53
Montmoren	1.63	1.32	1.89	2.47	2.75	2.89	3.04	3.34	3.49	2.49	2.43	1.97	29.71
Muskegon	2.22	1.62	2.3	3.14	2.71	2.9	2.71	3.62	3.57	3.16	3.1	2.55	33.6
Newaygo	2.22	1.62	2.3	3.14	2.71	2.9	2.71	3.62	3.57	3.16	3.1	2.55	33.6
Oakland	1.73	1.66	2.38	3.08	2.82	3.35	3.03	3.23	2.88	2.37	2.64	2.32	31.49
Oceana	2.22	1.62	2.3	3.14	2.71	2.9	2.71	3.62	3.57	3.16	3.1	2.55	33.6
Ogemaw	1.63	1.32	1.89	2.47	2.75	2.89	3.04	3.34	3.49	2.49	2.43	1.97	29.71
Ontonagon	1.86	1.35	2	2.4	3.25	3.62	3.39	3.78	3.61	2.81	2.62	2.08	32.77
Osceola	1.65	1.34	2.15	2.98	2.86	3.15	2.76	3.57	3.66	2.68	2.59	2.14	31.53
Oscoda	1.63	1.32	1.89	2.47	2.75	2.89	3.04	3.34	3.49	2.49	2.43	1.97	29.71
Otsego	1.63	1.32	1.89	2.47	2.75	2.89	3.04	3.34	3.49	2.49	2.43	1.97	29.71
Ottawa	2.21	1.67	2.48	3.53	3.14	3.56	3.39	3.33	3.64	2.96	3.03	2.78	35.72
Presque Is	1.63	1.32	1.89	2.47	2.75	2.89	3.04	3.34	3.49	2.49	2.43	1.97	29.71
Roscommo	1.63	1.32	1.89	2.47	2.75	2.89	3.04	3.34	3.49	2.49	2.43	1.97	29.71
Saginaw	1.67	1.46	2.17	2.7	2.67	3.06	2.78	3.17	3.52	2.55	2.54	2.1	30.39

Monthly Rainfall by County for Michigan
(inches)

St Clair	1.73	1.66	2.38	3.08	2.82	3.35	3.03	3.23	2.88	2.37	2.64	2.32	31.49
St Joseph	1.7	1.53	2.3	3.19	3.04	3.58	3.28	3.36	3.24	2.53	2.58	2.2	32.53
Sanilac	1.67	1.46	2.17	2.7	2.67	3.06	2.78	3.17	3.52	2.55	2.54	2.1	30.39
Schoolcraf	2.02	1.48	1.97	2.36	2.8	3.19	3.05	3.53	3.68	2.83	2.87	2.33	32.11
Shiawasse	1.7	1.53	2.3	3.19	3.04	3.58	3.28	3.36	3.24	2.53	2.58	2.2	32.53
Tuscola	1.67	1.46	2.17	2.7	2.67	3.06	2.78	3.17	3.52	2.55	2.54	2.1	30.39
Van Buren	2.21	1.67	2.48	3.53	3.14	3.56	3.39	3.33	3.64	2.96	3.03	2.78	35.72
Washtenav	1.73	1.66	2.38	3.08	2.82	3.35	3.03	3.23	2.88	2.37	2.64	2.32	31.49
Wayne	1.73	1.66	2.38	3.08	2.82	3.35	3.03	3.23	2.88	2.37	2.64	2.32	31.49
Wexford	1.94	1.41	1.87	2.69	2.58	2.94	2.86	3.3	3.83	2.91	2.79	2.23	31.35

Monthly Evaporation by County for Michigan
(inches)

State	County	Station	JanE	FebE	MarE	AprE	MayE	JunE	JulE	AugE	SepE	OctE	NovE	DecE
MI	Alcona	MIO HYDRO PLANT MI5531	0.193	0.386	1.158	1.737	2.123	2.702	3.667	3.474	2.316	0.965	0.386	0.193
MI	Alger	MI1484	0.187	0.374	1.122	1.683	2.057	2.618	3.553	3.366	2.244	0.935	0.374	0.187
MI	Allegan	ALLEGAN MI0128	0.252	0.504	1.512	2.268	2.772	3.528	4.788	4.536	3.024	1.26	0.504	0.252
MI	Alpena	ALPENA WSO AP MI0164	0.192	0.384	1.152	1.728	2.112	2.688	3.648	3.456	2.304	0.96	0.384	0.192
MI	Antrim	EAST JORDAN MI2381	0.194	0.388	1.164	1.746	2.134	2.716	3.686	3.492	2.328	0.97	0.388	0.194
MI	Arenac	STANDISH 4 SSE MI7820	0.198	0.396	1.188	1.782	2.178	2.772	3.762	3.564	2.376	0.99	0.396	0.198
MI	Baraga	HERMAN MI3744	0.196	0.392	1.176	1.764	2.156	2.744	3.724	3.528	2.352	0.98	0.392	0.196
MI	Barry	HASTINGS MI3661	0.275	0.55	1.65	2.475	3.025	3.85	5.225	4.95	3.3	1.375	0.55	0.275
MI	Bay	STANDISH 4 SSE MI7820	0.2	0.4	1.2	1.8	2.2	2.8	3.8	3.6	2.4	1	0.4	0.2
MI	Benzie	FRANKFORT 2 NE MI2984	0.195	0.39	1.17	1.755	2.145	2.73	3.705	3.51	2.34	0.975	0.39	0.195
MI	Berrien	AIRPORT MI0710	0.28	0.56	1.68	2.52	3.08	3.92	5.32	5.04	3.36	1.4	0.56	0.28
MI	Branch	SCHOOL MI1675	0.295	0.59	1.77	2.655	3.245	4.13	5.605	5.31	3.54	1.475	0.59	0.295
MI	Calhoun	MI0552	0.28	0.56	1.68	2.52	3.08	3.92	5.32	5.04	3.36	1.4	0.56	0.28
MI	Cass	DOWAGIAC 1 W MI2250	0.288	0.575	1.725	2.588	3.1625	4.025	5.463	5.175	3.45	1.438	0.575	0.2875
MI	Charlevoix	BOYNE FALLS MI0925	0.192	0.384	1.152	1.728	2.112	2.688	3.648	3.456	2.304	0.96	0.384	0.192
MI	Cheboygan	CHEBOYGAN MI1492	0.19	0.38	1.14	1.71	2.09	2.66	3.61	3.42	2.28	0.95	0.38	0.19
MI	Chippewa	MI2298	0.178	0.356	1.068	1.602	1.958	2.492	3.382	3.204	2.136	0.89	0.356	0.178
MI	Clare	GLADWIN MI3170	0.2	0.4	1.2	1.8	2.2	2.8	3.8	3.6	2.4	1	0.4	0.2
MI	Clinton	ST JOHNS MI7280	0.263	0.525	1.575	2.363	2.8875	3.675	4.988	4.725	3.15	1.313	0.525	0.2625
MI	Crawford	GRAYLING MI3391	0.195	0.39	1.17	1.755	2.145	2.73	3.705	3.51	2.34	0.975	0.39	0.195
MI	Delta	ESCANABA MI2626	0.192	0.384	1.152	1.728	2.112	2.688	3.648	3.456	2.304	0.96	0.384	0.192
MI	Dickinson	WATERWKS MI4090	0.2	0.4	1.2	1.8	2.2	2.8	3.8	3.6	2.4	1	0.4	0.2
MI	Eaton	CHARLOTTE MI1476	0.275	0.549	1.647	2.471	3.0195	3.843	5.216	4.941	3.294	1.373	0.549	0.2745
MI	Emmet	PELLSTON FAA AP MI6438	0.19	0.38	1.14	1.71	2.09	2.66	3.61	3.42	2.28	0.95	0.38	0.19
MI	Genesee	GLADWIN MI3170	0.25	0.5	1.5	2.25	2.75	3.5	4.75	4.5	3	1.25	0.5	0.25
MI	Gladwin	CLARE FAA AP	0.199	0.397	1.191	1.787	2.1835	2.779	3.772	3.573	2.383	0.993	0.397	0.1985
MI	Gogebic	IRONWOOD MI4104	0.201	0.402	1.206	1.809	2.211	2.814	3.819	3.618	2.412	1.005	0.402	0.201
MI	Traverse	MI8251	0.195	0.39	1.17	1.755	2.145	2.73	3.705	3.51	2.34	0.975	0.39	0.195
MI	Gratiot	ALMA MI0146	0.25	0.5	1.5	2.25	2.75	3.5	4.75	4.5	3	1.25	0.5	0.25
MI	Hillsdale	HILLSDALE MI3823	0.299	0.598	1.794	2.691	3.289	4.186	5.681	5.382	3.588	1.495	0.598	0.299
MI	Houghton	MI3908	0.195	0.39	1.17	1.755	2.145	2.73	3.705	3.51	2.34	0.975	0.39	0.195
MI	Huron	BAD AXE MI0417	0.198	0.395	1.185	1.778	2.1725	2.765	3.753	3.555	2.37	0.988	0.395	0.1975
MI	Ingham	EAST LANSING 4 S MI2395	0.275	0.55	1.65	2.475	3.025	3.85	5.225	4.95	3.3	1.375	0.55	0.275
MI	Ionia	IONIA 1 WNW MI4078	0.263	0.525	1.575	2.363	2.8875	3.675	4.988	4.725	3.15	1.313	0.525	0.2625

Monthly Evaporation by County for Michigan
(inches)

MI	Iosco	HALE LOUD DAM MI3529	0.196	0.392	1.176	1.764	2.156	2.744	3.724	3.528	2.352	0.98	0.392	0.196
MI	Iron	MI1922	0.201	0.402	1.206	1.809	2.211	2.814	3.819	3.618	2.412	1.005	0.402	0.201
MI	Isabella	UNIVERSITY MI5662	0.225	0.45	1.35	2.025	2.475	3.15	4.275	4.05	2.7	1.125	0.45	0.225
MI	Jackson	JACKSON FAA AP MI4150	0.288	0.575	1.725	2.588	3.1625	4.025	5.463	5.175	3.45	1.438	0.575	0.2875
MI	Kalamazoo	MI3504	0.282	0.564	1.692	2.538	3.102	3.948	5.358	5.076	3.384	1.41	0.564	0.282
MI	Kalkaska	MI8251	0.195	0.39	1.17	1.755	2.145	2.73	3.705	3.51	2.34	0.975	0.39	0.195
MI	Kent	MI3333	0.26	0.52	1.56	2.34	2.86	3.64	4.94	4.68	3.12	1.3	0.52	0.26
MI	Keweenaw	ROYALE MI5637	0.19	0.38	1.14	1.71	2.09	2.66	3.61	3.42	2.28	0.95	0.38	0.19
MI	Lake	BALDWIN MI0446	0.2	0.4	1.2	1.8	2.2	2.8	3.8	3.6	2.4	1	0.4	0.2
MI	Lapeer	LAPEER MI4655	0.225	0.45	1.35	2.025	2.475	3.15	4.275	4.05	2.7	1.125	0.45	0.225
MI	Leelanau	MAPLE CITY MI5097	0.195	0.389	1.167	1.751	2.1395	2.723	3.696	3.501	2.334	0.973	0.389	0.1945
MI	Lenawee	ADRIAN 2 NNE MI0032	0.3	0.6	1.8	2.7	3.3	4.2	5.7	5.4	3.6	1.5	0.6	0.3
MI	Livingston	GRND MI5452	0.275	0.55	1.65	2.475	3.025	3.85	5.225	4.95	3.3	1.375	0.55	0.275
MI	Luce	HOSPITAL MI5816	0.18	0.36	1.08	1.62	1.98	2.52	3.42	3.24	2.16	0.9	0.36	0.18
MI	Mackinac	MANISTIQUE MI5073	0.182	0.363	1.089	1.634	1.9965	2.541	3.449	3.267	2.178	0.908	0.363	0.1815
MI	Macomb	BASE MI5650	0.24	0.48	1.44	2.16	2.64	3.36	4.56	4.32	2.88	1.2	0.48	0.24
MI	Manistee	MANISTEE 3 SE MI5065	0.197	0.394	1.182	1.773	2.167	2.758	3.743	3.546	2.364	0.985	0.394	0.197
MI	Marquette	MARQUETTE MI5178	0.192	0.384	1.152	1.728	2.112	2.688	3.648	3.456	2.304	0.96	0.384	0.192
MI	Mason	LUDINGTON 4 SE MI4954	0.198	0.396	1.188	1.782	2.178	2.772	3.762	3.564	2.376	0.99	0.396	0.198
MI	Mecosta	WATERWORKS MI0779	0.225	0.45	1.35	2.025	2.475	3.15	4.275	4.05	2.7	1.125	0.45	0.225
MI	Menominee	MI7867	0.2	0.4	1.2	1.8	2.2	2.8	3.8	3.6	2.4	1	0.4	0.2
MI	Midland	UNIVERSITY MI5662	0.205	0.41	1.23	1.845	2.255	2.87	3.895	3.69	2.46	1.025	0.41	0.205
MI	Missaukee	MI4502	0.198	0.395	1.185	1.778	2.1725	2.765	3.753	3.555	2.37	0.988	0.395	0.1975
MI	Monroe	MONROE MI5558	0.3	0.6	1.8	2.7	3.3	4.2	5.7	5.4	3.6	1.5	0.6	0.3
MI	Montcalm	MI3429	0.24	0.48	1.44	2.16	2.64	3.36	4.56	4.32	2.88	1.2	0.48	0.24
MI	y	ATLANTA 5 WNW MI0343	0.193	0.385	1.155	1.733	2.1175	2.695	3.658	3.465	2.31	0.963	0.385	0.1925
MI	Muskegon	MONTAGUE 4 NW MI5567	0.225	0.45	1.35	2.025	2.475	3.15	4.275	4.05	2.7	1.125	0.45	0.225
MI	Newaygo	MI5712	0.225	0.45	1.35	2.025	2.475	3.15	4.275	4.05	2.7	1.125	0.45	0.225
MI	Oakland	HOSPITAL MI6658	0.26	0.52	1.56	2.34	2.86	3.64	4.94	4.68	3.12	1.3	0.52	0.26
MI	Oceana	HART MI3632	0.2	0.4	1.2	1.8	2.2	2.8	3.8	3.6	2.4	1	0.4	0.2
MI	Ogemaw	MI8800	0.196	0.392	1.176	1.764	2.156	2.744	3.724	3.528	2.352	0.98	0.392	0.196
MI	Ontonagon	BERGLAND DAM MI0718	0.2	0.4	1.2	1.8	2.2	2.8	3.8	3.6	2.4	1	0.4	0.2
MI	Osceola	EVART MI2671	0.2	0.4	1.2	1.8	2.2	2.8	3.8	3.6	2.4	1	0.4	0.2
MI	Oscoda	MIO	0.195	0.389	1.167	1.751	2.1395	2.723	3.696	3.501	2.334	0.973	0.389	0.1945
MI	Otsego	GAYLORD MI3096	0.193	0.385	1.155	1.733	2.1175	2.695	3.658	3.465	2.31	0.963	0.385	0.1925

Monthly Evaporation by County for Michigan
(inches)

MI	Ottawa	MI3290	0.25	0.5	1.5	2.25	2.75	3.5	4.75	4.5	3	1.25	0.5	0.25
MI	Presque Isle	MI6184	0.19	0.38	1.14	1.71	2.09	2.66	3.61	3.42	2.28	0.95	0.38	0.19
MI	Roscommon	MI3936	0.198	0.395	1.185	1.778	2.1725	2.765	3.753	3.555	2.37	0.988	0.395	0.1975
MI	Saginaw	SAGINAW FAA AP MI7227	0.23	0.46	1.38	2.07	2.53	3.22	4.37	4.14	2.76	1.15	0.46	0.23
MI	Sanilac	SANDUSKY MI7350	0.198	0.396	1.188	1.782	2.178	2.772	3.762	3.564	2.376	0.99	0.396	0.198
MI	Schoolcraft	MANISTIQUE MI5073	0.187	0.374	1.122	1.683	2.057	2.618	3.553	3.366	2.244	0.935	0.374	0.187
MI	Shiawassee	OWOSSO 3 SSW MI6300	0.26	0.52	1.56	2.34	2.86	3.64	4.94	4.68	3.12	1.3	0.52	0.26
MI	St. Clair	PORT HURON MI6680	0.205	0.41	1.23	1.845	2.255	2.87	3.895	3.69	2.46	1.025	0.41	0.205
MI	St. Joseph	THREE RIVERS MI8184	0.29	0.58	1.74	2.61	3.19	4.06	5.51	5.22	3.48	1.45	0.58	0.29
MI	Tuscola	MI1299	0.2	0.4	1.2	1.8	2.2	2.8	3.8	3.6	2.4	1	0.4	0.2
MI	Van Buren	BLOOMINGDALE MI0864	0.275	0.55	1.65	2.475	3.025	3.85	5.225	4.95	3.3	1.375	0.55	0.275
MI	Washtenaw	MI0230	0.288	0.575	1.725	2.588	3.1625	4.025	5.463	5.175	3.45	1.438	0.575	0.2875
MI	Wayne	MI2103	0.275	0.55	1.65	2.475	3.025	3.85	5.225	4.95	3.3	1.375	0.55	0.275
MI	Wexford	CADILLAC MI1176	0.198	0.395	1.185	1.778	2.1725	2.765	3.753	3.555	2.37	0.988	0.395	0.1975

Attachment 7

United States Geological Service

Stream Gauging Data

Near Humboldt, Michigan

http://nwis.waterdata.usgs.gov/mi/nwis/sw

Water Resources National Water Information System: Web Interface

Data Category: Surface Water Geographic Area: Michigan GO

Peak Streamflow for Michigan

USGS 04062200 PESHEKEE RIVER NEAR CHAMPION, MI

Available data for this site Surface-water: Peak streamflow GO

Marquette County, Michigan
Hydrologic Unit Code 04030107
Latitude 46°33'25", Longitude 88°00'09" NAD27
Drainage area 133 square miles
Gage datum 1,557.49 feet above sea level NGVD29

Output formats

- Table
- Graph
- Tab-separated file
- WATSTORE formatted file
- Reselect output format

Water Year	Date	Gage Height (feet)	Stream-flow (cfs)
1962	Apr. 28, 1962	5.44	1,830
1963	Apr. 04, 1963	7.01	2,860
1964	Apr. 18, 1964	6.73	2,650
1965	May 08, 1965	8.01	3,610
1966	Apr. 25, 1966	6.25	2,290
1967	Apr. 18, 1967	6.87	2,750
1968	Mar. 30, 1968	5.76	1,920
1969	Apr. 22, 1969	6.98	2,840
1970	Apr. 28, 1970	5.56	1,770
1971	Apr. 21, 1971	6.62	2,560
1972	May 06, 1972	6.76	2,670
1973	May 08, 1973	5.92	2,040
1974	Apr. 22, 1974	6.11	2,180
1975	May 04, 1975	6.83	2,720
1976	Apr. 18, 1976	7.92	3,540
1977	Apr. 17, 1977	6.10	2,160
1978	Sep. 12, 1978	6.89	2,770
1979	Apr. 26, 1979	7.73	3,400
1980	Apr. 25, 1980	5.96	2,070
1981	Apr. 04, 1981	5.26	1,540
1982	Apr. 26, 1982	6.84	2,730
1985	Apr. 21, 1985	10.90	6,100
2001	Apr. 24, 2001	6.84	2,550
2002	Apr. 18, 2002	10.73	6,740[1]
2003	May 13, 2003	7.64	3,260
2004	Apr. 19, 2004	8.01	3,610
2005	Apr. 08, 2005	6.08	1,960

Peak Streamflow Qualification Codes.

- 1 -- Discharge is a Maximum Daily Average

USGS Water Resources

National Water Information System: Web Interface

Data Category: Surface Water | Geographic Area: Michigan | GO

Peak Streamflow for Michigan

USGS 04062200 PESHEKEE RIVER NEAR CHAMPION, MI

Available data for this site Surface-water: Peak streamflow | GO

Marquette County, Michigan
Hydrologic Unit Code 04030107
Latitude 46°33'25", Longitude 88°00'09" NAD27
Drainage area 133 square miles
Gage datum 1,557.49 feet above sea level NGVD29

Output formats

- Table
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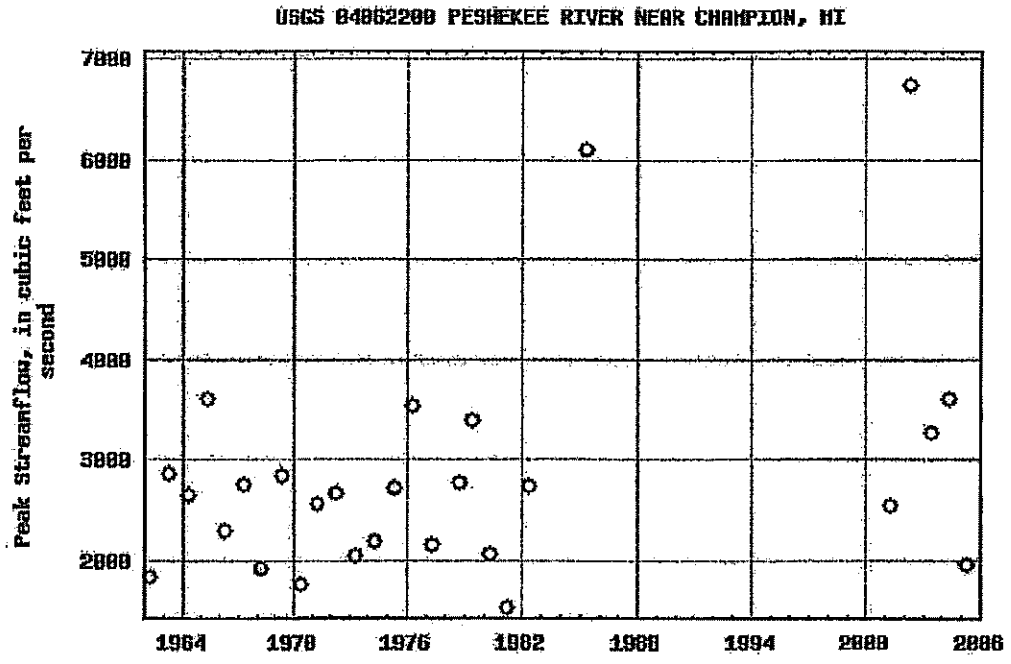
- Tab-separated file
- WATSTORE formatted file
- Reselect output format



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Water Resources

Data Category: Surface Water | Geographic Area: Michigan

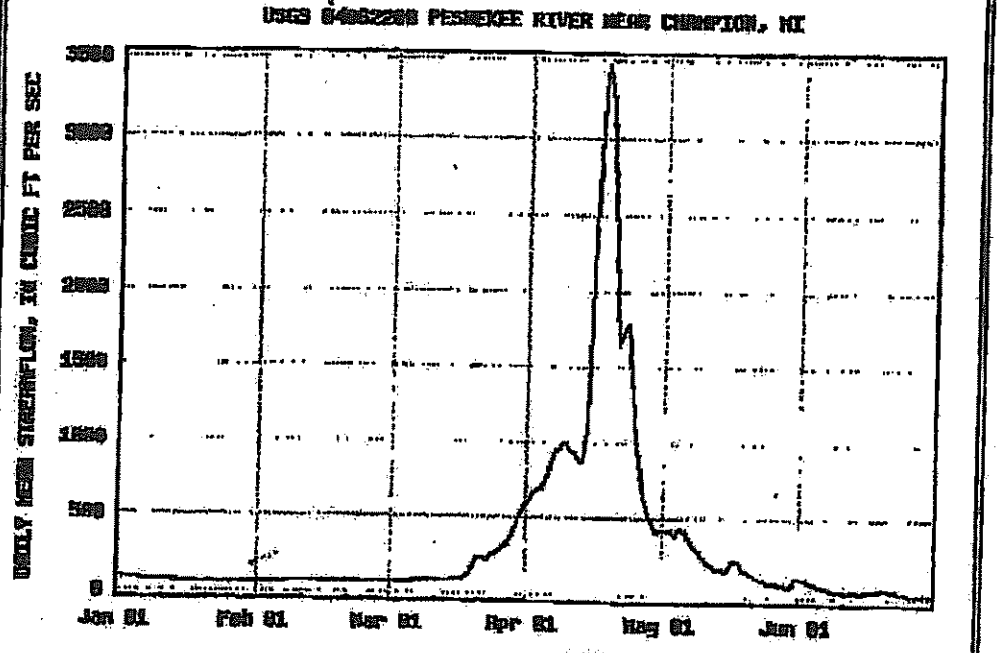
Daily Streamflow for Michigan

USGS 04062200 FESHEKEE RIVER NEAR CHAMPION, MI

Available data for this site: Surface-water: Daily streamflow

Marquette County, Michigan
Hydrologic Unit Code 04030107
Latitude 46°33'25", Longitude 88°00'09" NAD27
Drainage area 133.00 square miles
Gage datum 1,557.49 feet above sea level NGVD29

Output formats
Tab-separated data file
Graph
Reselect output format



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Feedback on this website: Michigan NWISWeb Maintainer
Surface Water for Michigan: Daily Streamflow
http://waterdata.usgs.gov/mi/nwis/discharge?

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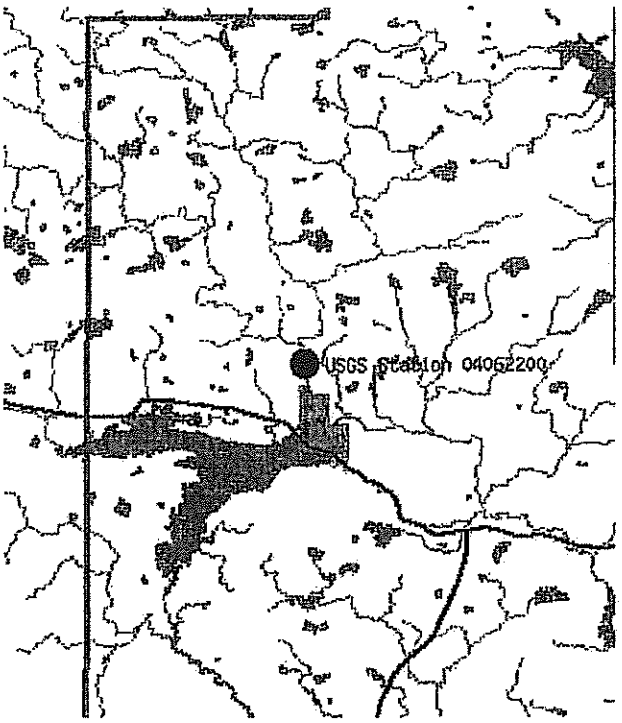
Department of the Interior, U.S. Geological Survey


USGS station 04062200

Water Resources National Water Information System: Web Interface

Data Category: Surface Water | Geographic Area: Michigan | GO

Peak Streamflow for Michigan

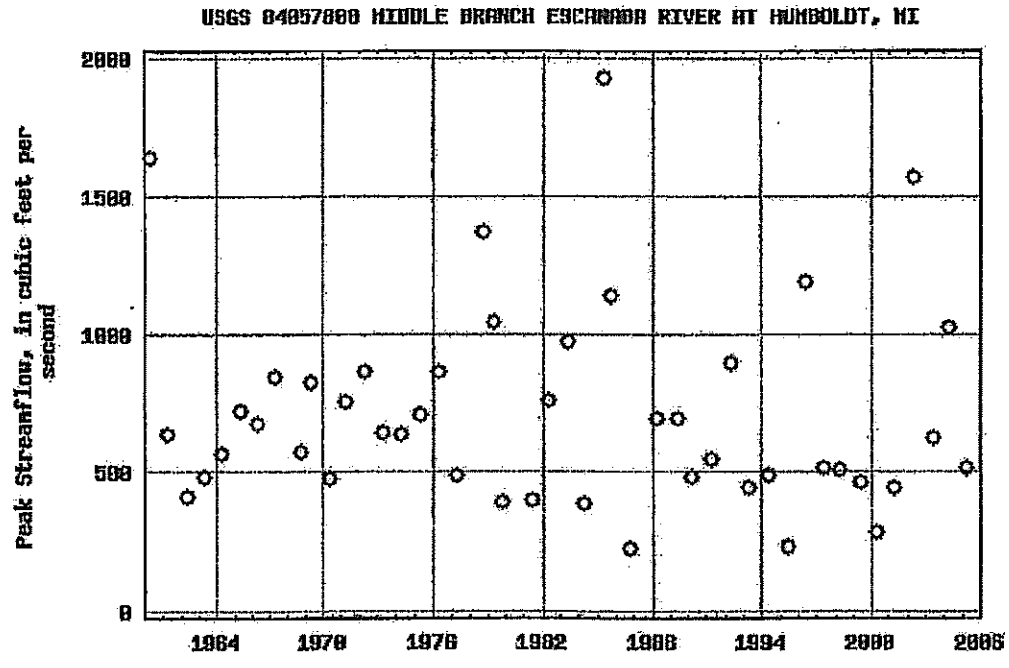
USGS 04057800 MIDDLE BRANCH ESCANABA RIVER AT HUMBOLDT, MI

Available data for this site Surface-water: Peak streamflow | GO

Marquette County, Michigan
Hydrologic Unit Code 04030110
Latitude 46°29'57", Longitude 87°53'11" NAD27
Drainage area 46 square miles
Gage datum 1,521.20 feet above sea level NGVD29

Output formats

- Table
- Graph
- Tab-separated file
- WATSTORE formatted file
- Reselect output format



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JSGS Water Resources of Michigan
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Water Resources

National Water Information System: Web Interface

Data Category: Surface Water | Geographic Area: Michigan | GO

Peak Streamflow for Michigan

USGS 04057800 MIDDLE BRANCH ESCANABA RIVER AT HUMBOLDT, MI

Available data for this site: Surface-water: Peak streamflow | GO

Marquette County, Michigan
Hydrologic Unit Code 04030110
Latitude 46°29'57", Longitude 87°53'11" NAD27
Drainage area 46 square miles
Gage datum 1,521.20 feet above sea level NGVD29

Output formats: Table | Graph | Tab-separated file | WATSTORE formatted file | Reselect output format

Water Year	Date	Gage Height (feet)	Stream-flow (cfs)
1960	Apr. 24, 1960	8.30	1,640
1961	Apr. 22, 1961	5.84	639
1962	Apr. 29, 1962	4.96	410
1963	Apr. 04, 1963	5.58	485
1964	Apr. 18, 1964	5.63	569
1965	May 09, 1965	6.15	723
1966	Apr. 25, 1966	5.89	677
1967	Apr. 18, 1967	6.38	843
1968	Sep. 10, 1968	5.85	575
1969	Apr. 17, 1969	6.32	822
1970	Jun. 01, 1970	5.18	475
1971	Apr. 21, 1971	6.12	752
1972	May 04, 1972	6.43	860
1973	Apr. 17, 1973	5.85	642
1974	Apr. 22, 1974	5.84	639
1975	May 04, 1975	6.04	706
1976	Apr. 17, 1976	6.43	862
1983	May 30, 1983	6.70	970
1984	Apr. 16, 1984	5.00	385
1985	Apr. 20, 1985	9.21	1,930
1986	Oct. 06, 1985	7.88	1,140
1987	Oct. 13, 1986	4.24	228
1988	Apr. 07, 1988	6.16	698
1989	Jun. 09, 1989	6.14	692
1990	Mar. 17, 1990	5.39	485
1991	Apr. 09, 1991	5.81	546
1992	Apr. 22, 1992	6.79	894
1993	Apr. 29, 1993	5.23	447
1994	Apr. 27, 1994	5.57	492
1995	May 29, 1995	4.14	235
1996	May 20, 1996	7.58	1,190
1997	Apr. 29, 1997	5.66	517
1998	Mar. 31, 1998	5.48	507
1999	May 26, 1999	5.31	466

1977	Apr. 14, 1977	5.27	492	2000	Mar. 28, 2000	4.44	283
1978	Sep. 12, 1978	7.73	1,370	2001	Apr. 14, 2001	5.33	445
1979	Apr. 26, 1979	7.36	1,040	2002	Apr. 17, 2002	8.47	1,570
1980	Oct. 24, 1979	5.19	390	2003	May 13, 2003	5.93	627
1981	Jun. 16, 1981	5.22	402	2004	Apr. 19, 2004	7.16	1,020
1982	Apr. 26, 1982	6.54	762	2005	Apr. 08, 2005	5.52	517

Questions about data? Top
Feedback on this web site Explanation of terms

Surface Water for Michigan: Peak Streamflow
http://waterdata.usgs.gov/mi/nwis/peak?

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USGS Water Resources of Michigan
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F-2

Screening Analysis for Michigan Toxic Air Contaminants

TOXIC AIR CONTAMINANTS
Allowable Emission Rate Methodology - Rule 227(1)(a)

Facility Name:	**Humboldt Mill Project - Ore Processing**	**Contact Name:**	
Facility Address:		**Contact Phone Number:**	
Geocoordinates (if known):		**Contact Email Address:**	

Chemical Name	CAS No.	Screening Level			AQD Screening Level?	AQD Footnote	Allowable Emission Rate (AER)				Proposed Emission Rate (ER)			Is Proposed Emission Rate less than AER?	
							ITSL		IRSL or SRSL						
		ITSL µg/m³	ITSL Avg Time	IRSL or SRSL µg/m³			lbs per month, 24-hr, 8-hr or 1-hr	Max lbs per hour	lbs per month	Max lbs per hour	Rate	Rate Units	Max Hourly ER lbs/hour	Screening Level Specific ER	Max Hourly Rate
Antimony	7440-36-0	0.2	24-hr				0.024	0.01			7.1E-05	lbs/24-hr	2.96E-06	yes	yes
Arsenic	7440-38-2			0.0002	Y				0.008	0.0001	0.013	lbs/month	1.78E-05	no	yes
Barium	7440-39-3	5	8-hr				0.1	0.1			3.06E-04	lbs/8-hr	3.82E-05	yes	yes
Beryllium	7440-41-7	0.02	24-hr				0.0024	0.001			8.99E-06	lbs/24-hr	3.75E-07	yes	yes
Cadmium	7440-43-9			0.0006	Y				0.024	0.0003	3.46E-03	lbs/month	4.81E-06	yes	yes
Chromium, Trivalent	16065-83-1	5	8-hr				0.1	0.1			9.24E-03	lbs/8-hr	1.15E-03	yes	yes
Cobalt	7440-48-4	0.2	8-hr				0.004	0.004			7.66E-03	lbs/8-hr	9.58E-04	no	yes
Copper	7440-50-8	2	8-hr				0.04	0.04			0.3232349	lbs/8-hr	4.04E-02	no	no
Magnesium	7439-95-4	100	8-hr				2	2			0.7208801	lbs/8-hr	9.01E-02	yes	yes
Manganese	7439-96-5	0.05	24-hr				0.006	0.003			3.34E-02	lbs/24-hr	1.39E-03	no	yes
Mercury	7439-97-6	0.3	24-hr				0.036	0.015			1.54E-06	lbs/24-hr	6.42E-08	yes	yes
Nickel	7440-02-0			0.0042	Y				0.168	0.0023	28.474734	lbs/month	3.95E-02	no	no
Selenium	7782-49-2	2	8-hr				0.04	0.04			4.02E-04	lbs/8-hr	5.03E-05	yes	yes
Silver -soluble	7440-22-4	0.1	8-hr				0.002	0.002			9.64E-05	lbs/8-hr	1.20E-05	yes	yes
Tin	7440-31-5	20	8-hr				0.4	0.4			4.82E-05	lbs/8-hr	6.02E-06	yes	yes
MIBC	108-11-2	1000	8-hr				20	20			0.0037	lbs/8-hr	0.00046	yes	yes
Sodium Sulfite	7757-83-7	0.028	annual				1.12	0.015			0.288	lbs/month	0.0004	yes	yes
Palladium	7740-05-3	0.1	annual				4	0.054			5.88E-05	lbs/month	8.16E-08	yes	yes
Phosphorus (total)	7723-14-0	1	8-hr				0.02	0.02			1.69E-04	lbs/8-hr	2.12E-05	yes	yes
Beryllium	7440-41-7			0.0004	Y				0.016	0.0002	2.70E-04	lbs/month	3.75E-07	yes	yes

F-3

Memorandum on Deposition Impact Analysis

Memorandum

December 16, 2008

TO: Steve Donohue, Foth Infrastructure & Environment, LLC

CC: Master File 06W003-6000

FR: Andrea Martin P.E., Foth Infrastructure & Environment, LLC
Curtis Dungey, Foth Infrastructure & Environment, LLC

RE: Humboldt Mill - Air Deposition Impact Analysis
Metals/Sulfide Deposition Screening Assessment

Purpose

The purpose of this analysis is to evaluate the potential environmental impacts of atmospheric deposition of airborne pollutants from the proposed Kennecott Eagle Minerals Company (KEMC) Humboldt Mill operation. An analysis of five metals and one non-metal emitted from the proposed facility was performed. The proposed project is the Humboldt Mill, a Brownfield site that will be rehabilitated to operate as an ore processing facility. The Michigan Department of Environmental Quality (MDEQ) will regulate the facility under Natural Resources and Environmental Protection Act (NREPA) Part 632 Nonferrous Metallic Mining regulations (Michigan Administrative Rules codified under R 425.01 et.seq.) Under those regulations, preparation of an Environmental Impact Assessment (EIA) must be included in a Mining Permit application. This analysis addresses R 425.202(1)(b) and R 425.202(2)(ff), cumulative impact from air emissions.

Air emissions have been estimated from the proposed operation as documented in the *Michigan Air Use Permit- Permit to Install Application* (Foth, 2008a). Particulate matter (PM) emissions are the only significant criteria pollutant emitted from the facility, generated from vehicle traffic and ore and concentrate handling. The PM generated from ore and concentrate handling is expected to contain metals and sulfur above a native soil composition. Cumulative impact from ore and concentrate handling activities are evaluated for the metals arsenic (As), cobalt (Co), copper (Cu), manganese (Mn), and nickel (Ni) and non-metal sulfur (S). In the air permit application (Foth, 2008a), the five metals were identified as Michigan Toxic Air Contaminants (TACs) not passing the initial screening evaluation per R 336.1227(a)(1). They were modeled in a dispersion modeling analysis to demonstrate compliance with air quality standards.

Sulfur is in the ore and concentrate in the form of sulfides, which are not considered a TAC according to Michigan Air Toxics rules R 336.1225. Sulfur deposition is included in this evaluation, however, to address possible concerns of any deposited sulfides converting to sulfuric acid (H_2SO_4). The methodology employed in this deposition analysis is similar to that of the deposition analysis performed by MDEQ for the Kennecott Eagle Project (MDEQ, 2007).

Methodology

Methodologies are presented for the following parts of this evaluation:

- Deposition modeling,
- Soil evaluation of five metals,
- Sulfur deposition rates and the Minnesota Acid Deposition Standard, and
- Background atmospheric deposition rates for metals and sulfur.

The basis of all evaluations is the maximum controlled emission rates of each contaminant. The maximum controlled emission rates are shown in Attachment 1.

Deposition Modeling

Deposition impact from five metals and sulfur was evaluated by conducting air deposition modeling using the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD). While this is the same software used to evaluate air quality impacts for the Humboldt Mill (Foth, 2008a), additional data regarding particle size, particle density and mass fraction were added to the input files to estimate wet and dry particulate deposition rates. Maximum emission rates from the air permit application (Foth, 2008a) for 19 emission points at the site were included in the evaluation. These included four point sources (stacks) and 15 volume sources (fugitive emissions from buildings). Identity of the emission points are provided in Attachment 1, along with the number of volume source segments.

Since actual particle size data for the proposed operations are not available, assumptions were made regarding particle size and density as input into the air deposition model. Particle diameters were taken from AP-42, Appendix B.2, Table B.2.2, Generalized Particle Size Distributions (USEPA, 1990). Particle size fractions from Category 3 for use with aggregate materials that are mechanically generated were used for this evaluation. This broad category includes emissions from milling, grinding and crushing these types of materials. Particle diameters were estimated from the range of particle sizes in Table B.2.2. A calculated mean particle size range calculation was included for each size range using the methodology specified by USEPA in the document *Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities* (USEPA, 2005). Input values for particle size are included as Attachment 2.

Meteorological data used in the model were from Sawyer International Airport (SAW) near Gwinn, Michigan. This weather observation station is the closest to the Humboldt Mill for which preprocessed meteorological data are available. This is also the meteorological data used for air dispersion modeling in the air permit application (Foth, 2008a). For the deposition evaluation, the three most recent years of meteorological data (2005, 2006 and 2007) were used in modeling runs for each of the five metals and sulfur. However, SAW does not have precipitation data available. In consultation with MDEQ, Foth was advised to use rainfall data

from the Escanaba weather observation station (ESC). This station is the closest to SAW having representative precipitation data.

Three receptor grids were placed over the site out to 10 kilometers (km) based on methodology outlined by USEPA (USEPA, 2005) and guidance provided by MDEQ. A fine grid was close to the site with a grid spacing of 50 meters. This grid extended to 1 km from a center point of the mill operations. A second grid was placed from 1 kilometer to 3 kilometers at 100 meter spacing, while a third grid was from 3 to 10 kilometers at 500 meter spacing. Receptors within the property fence line were not included in the deposition model because this area will not be accessible to the public. Any deposition within the fence will be addressed as part of ongoing operations and mine reclamation activities at the end of operations.

In the *Air Quality Impact Analysis* prepared for the air permit application (Foth, 2008a), air dispersion model runs were set up to determine compliance with certain averaging periods associated with either federal or state air quality standards. This deposition analysis was set up to determine cumulative impacts on an annual basis and over the expected lifetime of the facility. Therefore, deposition results are expressed in terms of grams or micrograms per square meter per year ($g/m^2/yr$ or $ug/m^2/yr$).

Under guidance from MDEQ, roadway traffic emissions were not included in this evaluation. Metal emissions associated with roadway traffic are minimal (Foth, 2008a) and, therefore, were not included.

Deposition Evaluation for Metals

The deposition impact of five metals over the ten year facility life was evaluated by estimating the increase in metals concentration within the top centimeter of soil and comparing that increment to several clean up criteria. This comparison provides a perspective on the size of the increment compared to the most stringent and protective standards for a contaminant. The increment is based on applying the highest deposition rate shown in the modeling results over ten years for a total deposition. In actuality, since maximum emission and deposition rates are not sustained over the life of the project and the deposition rate drops fairly rapidly from the maximum location, very little area will experience the highest predicted deposition. The predicted worst case soil concentration increase was compared to Direct Contact Criteria and Risk Based Screening Levels (DCC & RBSLs), Drinking Water Protection Criteria and RBSLs, (DWPC & RBSLs), and Groundwater Surface Water Interface Protection Criteria and RBSLs (GSI PC & RBSLs) shown on *Table 2. Soil: Residential and Commercial I Part 201 Generic Soil Clean up Criteria*, RRD Operational Memorandum No. 1 (MDEQ, 2006).

Of the five metals, Cu, Mn, and Ni have GSI PC criteria dependant on water hardness. Two locations have been selected to represent GSI PC values, Middle Branch Escanaba River (Station MER-002) north of the facility and West Branch Black River (Station WBR-003) south of the facility.

Additional criteria are available for arsenic and copper from the US Department of the Interior, Bureau of Land Management criteria (US Department of Interior, 2004) and are included for comparison.

Sulfur Deposition Rates and the Minnesota Acid Deposition Standard

Nationwide sulfate ion deposition rates are tracked and available from the National Atmospheric Deposition Program (NADP) National Trends Network (NTN). The Humboldt Mill is approximately halfway between two NTN sites: MI48 Seney Wildlife Refuge, and MI99 Chassell, both in Michigan. The average of the 2007 annual values for the two stations is used to predict the sulfate deposition rate in Humboldt (Table 1). Although the proposed facility will not emit sulfate ion (SO_4^{-2}), a comparison is performed by converting various rates and standards from sulfate to sulfur using the molecular weight ratio of those constituents (Table 1). The converted rates and standards can be compared to the sulfide/sulfur deposition rate the model provides.

Michigan does not have a standard for sulfate ion deposition, however, Minnesota recognizes an acid rain standard of 11 kilograms of sulfate ion per hectare per year (kg/ha/yr) to be protective of sensitive aquatic and terrestrial ecosystems. Table 1 provides the Minnesota standard in the form of a sulfur deposition rate.

Table 1
Background Sulfate and Sulfur Deposition Rates and the Minnesota Standard

Location	Sulfate Ion (SO_4^{-2}) Deposition (kg/ha/yr)	Sulfate Ion Deposition ($g/m^2/yr$)	Sulfur (S) Deposition (kg/ha/yr)	Sulfur Deposition ($g/m^2/yr$)
Seney (Background) [1]	5.70			
Chassell (Background) [1]	7.89			
Humboldt Mill[2] (Predicted Background)	6.8	0.680	2.27	0.227
Minnesota Standard	11	1.1	3.67	0.367

[1] 2007 NADP NTN Data
[2] Average of Seney and Chassell values

Prepared by: AKM
Checked by: CED1

Background Atmospheric Deposition Rates for As, Cu, Mn, Ni, and S

Atmospheric deposition of metals is recognized as an ongoing phenomenon and is identified as a contributor to pollutant inputs to the Great Lakes and other water bodies. Deposition originates from both natural and anthropogenic sources. Natural sources include geological sources and volcanoes. Anthropogenic sources include coal-fired utility boilers and waste incinerators. Deposition at a given location includes pollutants atmospherically transported from far away.

Comparable background deposition rates in the Great Lakes region are available for As, Cu, Mn, and Ni (Sweet et al., 1997). The maximum deposition rates from the proposed facility are compared to the background rates, providing perspective on how much contribution the proposed

facility will have on overall deposition rates in the vicinity of the mill. The regional background deposition rate of cobalt was not available at this location.

Results

Deposition Modeling

Results of the model runs were analyzed to determine the first highest annual deposition at all receptors for each metal and sulfur for all emission sources included in the model. Table 2 provides the highest deposition rate for all parameters for the three years of meteorological data evaluated. Results show that while the annual results were similar from year to year, 2006 represents the year with the highest deposition rate at a single receptor point for As, Co, Cu, Mn and S. The highest Ni deposition occurred in 2007.

Table 2
Highest Deposition Rate for Metals and Sulfur from Proposed Facility
Years 2005, 2006 and 2007
(gram/m^2/year)

Parameter	2005	2006	2007
As	2.07E-07	2.37E-07[1]	2.26E-07
Co	0.00018	0.00020[1]	0.00018
Cu	0.00763	0.00881[1]	0.00770
Mn	0.00021	0.00021[1]	0.00021
Ni	0.00163	0.00150	0.00187[1]
S	0.06064	0.06115[1]	0.05864

[1] Highest value of three years modeled.

Prepared by: AKM
Checked by: CED1

Contour maps for the five metals and sulfur appear in Attachment 3 for the year of highest deposition rate. The contours shown are based on the actual data output from the model overlain on a site figure. The contours are approximated and interpolated from the data set; however between receptors, they do not represent actual data points. They are intended to provide the reader with a general sense of the resulting impact from each parameter within the general vicinity of the 10 km area.

Two figures are provided for each metal and sulfur. The facility is outlined in red with contour lines extending outward. All deposition rates are shown in g/m^2/year except for arsenic, which has extremely low emission and deposition rates and is shown in ug/m^2/year. The first figure for each parameter shows a close view of the facility and the location of highest deposition rate. In all cases, the highest deposition rate is located at a fence line either north or south of the facility buildings.

The second figure for each parameter shows the regional setting of the facility with contours. In all cases, the drop off in deposition rate is fairly rapid away from the property line.

Soil Deposition Evaluation for Metals

Three sets of criteria are listed in Table 3 that represent protective standards by which to consider the incremental metals concentration increase predicted from the proposed facility. Part 201 Generic Cleanup Criteria and Screening Levels have been developed by MDEQ as protective of human health and environment. Depending on pathways to exposure, (MDEQ, 2006), a certain set of criteria may apply. Criteria for safe direct contact (DCC), drinking water (DWPC), and the groundwater surface water interface (GSI) are provided in Table 3 along with the BLM published standards for arsenic and copper.

Assuming the deposited mass of each metal will mix homogeneously with the top centimeter of soil (soil specific gravity = 1.6), the column on the far right of Table 3 is the incremental impact of ten years of deposition at maximum rates. In all cases, the incremental impact is well below all criteria listed.

Table 3
Soil Concentration Comparison
with Part 201 Clean Up Standards

Metal	DCC & RBSL[1] (ppm)	DWPC & RBSL[2] (ppm)	GSI PC & RBSL[3] (ppm)	BLM RMC for Metals in Soils[4] (ppm)	10 Year Incremental Increase in Top Centimeter of Soil (ppm)
As	7.6	4.6	23	4	~0
Co	2,600	0.8	2.0	N/A	0.13
Cu	20,000	5,800	21.5[5], 29.1[6]	7	5.5
Mn	25,000	1	15.7[5], 21.5[6]	N/A	0.13
Ni	4,000	100	22.7[5], 30.7[6]	N/A	1.2

[1]Direct Contact Criteria and Risk Based Screening Levels
[2]Drinking Water Protection Criteria and Risk Based Screening Levels
[3]Groundwater Surface Water Interface Protection Criteria and Risk Based Screening Levels
[4]As presented in Technical Note 390, (U.S. Department of Interior, 2004).
[5]M. Branch Escanaba River (Station MER-002) H=35.9 mg $CaCO_3$/L.
[6]W. Branch Black River (Station WBR-003) H=51.3 mg $CaCO_3$/L.

Prepared by: AKM
Checked by: CED1

Sulfur Deposition Rates and the Minnesota Acid Deposition Standard

The background deposition rate of sulfur and the worst-case predicted deposition rate from the proposed facility are shown in Table 4 and compared against the Minnesota standard. The total predicted sulfur deposition rate of the proposed facility is below the Minnesota standard as shown.

Table 4
Sulfur Deposition Rates and Standards

Location	Background Sulfur Deposition[1] ($g/m^2/yr$)	Facility Sulfur Deposition Rate[2] ($g/m^2/yr$)	Total Predicted Sulfur Deposition Rate ($g/m^2/yr$)	Minnesota Standard[1] (Sulfur) ($g/m^2/yr$)
Humboldt Mill	0.227	0.0612	0.288	0.367

[1] Table 1
[2] Table 2, 2006

Prepared by: AKM
Checked by: CED1

Atmospheric Background Deposition Rates of As, Cu, Mn, Ni and S

Background atmospheric deposition rates of trace metals near Lake Superior are available (Sweet et al., 1997) and summarized in Table 5. Sulfur deposition is discussed previously and is included in Table 5 along with maximum facility deposition rates. Maximum deposition rates of As, Mn, and S from the facility are well below comparable background deposition rates. Maximum deposition rates for nickel and copper are approximately twice the background rate. A higher deposition rate for these two metals is consistent with a facility processing nickel and copper bearing ore. As can be seen on the contour maps, the location of the maximum rate is close to the facility. Deposition rates drop off steeply within a short distance of the facility. This, combined with the soil evaluation showing minimal environmental effect of the maximum deposition, indicate the increased deposition rates for nickel and copper should not result in significant environmental impacts. The concentration of nickel and copper in the ambient air is in compliance with air quality standards as shown in the air permit application, (Foth, 2008a).

Table 5
Background and Incremental Deposition Rates
of Trace Metals and Sulfur

Metal	Background Dry Deposition Rate ($g/m^2/yr$)	Background Wet Deposition Rate ($g/m^2/yr$)	Background Total Deposition Rate ($g/m^2/yr$)	Facility Maximum Deposition Rate ($g/m^2/yr$)
As[1]	0.000091	0.00008	0.00017	2.37E – 07
Co	N/A	N/A	N/A	0.0002
Cu[1]	0.0024	0.0007	0.0031	0.0088
Mn[1]	0.0019	0.0023	0.0042	0.0002
Ni[1]	0.00057	0.00023	0.0008	0.0019
S[2]			0.227	0.0612

[1] Sweet, et al., 1997.
[2]Taken from Table 4.

Prepared by: AKM
Checked by: CED1

Conclusion

From the perspectives of soil impacts and comparison to background deposition rates, the predicted worst case contribution of the Humboldt Mill operation to deposition of five metals and sulfur will be protective of the environment and public health and will not result in undue cumulative environmental impacts. The analysis of the worst case deposition rate over 10 years is a conservative approach to this analysis. Because the emission rates and therefore deposition rates will not sustain the maximum rate over the life of the facility, an analysis based on these rates produces an overestimation of deposition impacts.

References

Foth Infrastructure & Environment, LLC. 2008a. *Humboldt Mill Michigan Air Use Permit – Permit to Install Application.*

Foth Infrastructure & Environment, LLC. 2008b. *Humboldt Mill Mining Permit Application Volume II, Environmental Impact Assessment,* Appendix B-1.

Michigan Department of Environmental Quality. January 23, 2006. *MDEQ RRD Operational Memorandum No. 1, Part 201 Cleanup Criteria, Part 213 Risk-Based Screening Levels, Attachment 1 Table 2. Soil: Residential and Industrial-Commercial I Part 201 Generic Cleanup Criteria and Screening Levels: Part 213 Tier 1 Risk-Based Screening Levels (RBSLs).*

Michigan Department of Environmental Quality. December 14, 2007. *Kennecott Deposition Impact Analysis.*

Sweet, Clyde W., A. Weiss, S. J. Vermette. 1997. *Atmospheric Deposition of Trace Metals at Three Sites Near the Great Lakes,* Illinois State Water Survey, Champaign, Illinois.

US Department of the Interior. 2004. *Risk Management Criteria of Metals at BLM Sites.* Karl L. Ford. Bureau of Land Management, National Science and Technology Center, Denver, CO. Table 4. Wildlife and Livestock Risk Management Criteria for Metals in Soils. (Technical Note 390, rev. Oct. 2004).

US Environmental Protection Agency. 1990. *AP 42, Fifth Edition. Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources. Appendix B.2 Generalized Particle Size Distributions* (Revision 9/90, Reformatted 1/95).

US Environmental Protection Agency. 2005. *Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities, Chapter 3, Air Dispersion and Deposition Modeling.*

Attachment 1

Emission Rates – Modeling Input

Client:	Kennecott Eagle Minerals Company	Scope ID.:	06W003
Project:	Humboldt Mill Project - Deposition Analysis		
Prepared by:	AKM	Date:	11/24/08
Checked by:	CED1	Date:	12/10/08

Humboldt Mill Air Deposition Model Input Data
Emission Rates of Michgan Toxic Air Contaminants and Sulfur

Point Sources

Emission Source	Michigan Toxic Air Contaminants and Sulfur						
	Arsenic[3]	Cobalt	Copper	Manganese	Nickel[3]	Sulfur[4]	Units
SV2NDCRUSHER	7.35E-12	2.72E-05	1.15E-03	3.75E-05	8.67E-06	0.010	**g/sec**
SVFINEORESTORAGE	1.95E-14	7.21E-06	3.03E-04	9.94E-06	2.30E-06	0.003	**g/sec**
SVCONVLOAD	1.58E-15	5.13E-09	2.23E-07	3.65E-10	1.65E-08	6.50E-07	**g/sec**
SVAUXLOAD	1.76E-16	5.13E-09	2.23E-07	3.65E-10	1.83E-09	6.50E-07	**g/sec**

Volume Sources

Emission Source	No. of Volume Source Segments	Michigan Toxic Air Contaminants and Sulfur						
		Arsenic[3]	Cobalt	Copper	Manganese	Nickel[3]	Sulfur[4]	Units
COSA Truck Dump	**1**	8.16E-10	8.76E-07	3.68E-05	1.21E-06	8.86E-06	0.0003	**g/sec**
COSA Building	**3**	6.47E-09	6.95E-06	3.05E-04	9.99E-06	7.03E-05	0.003	**g/sec**
Secondary Crusher Building	**4**	3.34E-09	3.58E-06	1.51E-04	4.94E-06	3.62E-05	0.001	**g/sec**
Mill Feeder Transfer Station	**1**	1.77E-09	1.90E-06	7.98E-05	2.62E-06	1.92E-05	0.001	**g/sec**
Fine Ore Bins Gallery Area 1	**4**	8.61E-09	3.56E-06	1.50E-04	4.90E-06	9.35E-05	0.001	**g/sec**
Fine Ore Bins Gallery Area 2	**4**	8.6E-09	3.56E-06	1.50E-04	4.90E-06	9.35E-05	0.001	**g/sec**
Concentrate Load-Out Building	**2**	1.93E-08	1.67E-05	7.22E-04	1.19E-06	6.22E-05	0.002	**g/sec**
Haul Truck Roadway Emissions (paved)	**30**	na[5]	na[5]	na[5]	na[5]	na[5]	na[5]	**g/sec**
Haul Truck Roadway Emissions (unpaved)	**18**	na[5]	na[5]	na[5]	na[5]	na[5]	na[5]	**g/sec**

Notes:

[1] Each Michigan air toxic concentration is for each volume source segment.

[2] TAC and sulfur emission rates are based on PM emission composition as shown in *Michigan Air Use Permit - Permit to Install* (Foth, 2008a), Appendix C, page 4 .

[3] Arsenic and nickel have screening levels evaluated on an annual basis, therefore the modeling rates on a g/sec basis have been averaged over the year. Calculation performed by annual emissions in lb/yr /8760 hr/yr x appropriate composition of As/Ni x conversion to g/sec.

[4] Sulfur is present in the ore and concentrate in the form of sulfides.

[5] Roadway emissions were not included in deposition analysis.

Attachment 2

Particle Size Distribution

Client:	Kennecott Eagle Minerals Company	Scope ID.:	06W003
Project:	Humboldt Mill Project - Deposition Analysis		
Prepared by:	CED1	Date:	11/24/08
Checked by:	AKM	Date:	12/08/08

Ore Density [1] = 3.7 g/cm^3
Conc't Density [1] = 3.4 g/cm^3

Mean Particle Size Range Calculations [2]

Low Cut (μm)	High Cut (μm)	Mean Size (μm)
0	1	0.63
1	2	1.55
2	2.5	2.26
2.5	3	2.76
3	4	3.52
4	5	4.52
5	6	5.52
6	10	8.16
10	15	12.66

Point Sources [3]

SV2NDCRUSHER
SVFINEORESTORAGE

Ore Material Density = 3.7 g/cm^3
Controlled with Baghouse

Particle Size Range (μm)	Cum Size (%)	Cum Wt. (g/cm^3)	Mass (g/cm^3)	Uncontrolled Mass Fraction	Control (%)	Controlled Mass (g/cm^3)	Controlled Mass Fraction
1	4	0.148	0.148	0.04	99	0.0015	0.072
2	11	0.407	0.259	0.07	99	0.0026	0.126
2.5	15	0.555	0.148	0.04	99.5	0.0007	0.036
3	18	0.666	0.111	0.03	99.5	0.0006	0.027
4	25	0.925	0.259	0.07	99.5	0.0013	0.063
5	30	1.11	0.185	0.05	99.5	0.0009	0.045
6	34	1.258	0.148	0.04	99.5	0.0007	0.036
10	51	1.887	0.629	0.17	99.5	0.0031	0.153
15	100	3.7	1.813	0.49	99.5	0.0091	0.441
Totals			3.7	1.0		0.021	1.0

SVCONVLOAD
SVAUXLOAD

Concentrate Material Density = 3.4 g/cm^3
Controlled with Baghouse

Particle Size Range (μm)	Cum Size (%)	Cum Wt. (g/cm^3)	Mass (g/cm^3)	Uncontrolled Mass Fraction	Control (%)	Controlled Mass (g/cm^3)	Controlled Mass Fraction
1	4	0.14	0.14	0.04	99	0.0014	0.072
2	11	0.37	0.24	0.07	99	0.0024	0.126
2.5	15	0.51	0.14	0.04	99.5	0.0007	0.036
3	18	0.61	0.10	0.03	99.5	0.0005	0.027
4	25	0.85	0.24	0.07	99.5	0.0012	0.063
5	30	1.02	0.17	0.05	99.5	0.0009	0.045
6	34	1.16	0.14	0.04	99.5	0.0007	0.036
10	51	1.73	0.58	0.17	99.5	0.0029	0.153
15	100	3.40	1.67	0.49	99.5	0.0083	0.441
Totals			3.40	1.0		0.019	1.0

Client:	Kennecott Eagle Minerals Company	Scope ID.:	06W003
Project:	Humboldt Mill Project - Deposition Analysis		
Prepared by:	CED1	Date:	11/24/08
Checked by:	AKM	Date:	12/08/08

Ore Density [1] = 3.7 g/cm^3
Conc't Density [1] = 3.4 g/cm^3

Mean Particle Size Range Calculations [2]

Low Cut (μm)	High Cut (μm)	Mean Size (μm)
0	1	0.63
1	2	1.55
2	2.5	2.26
2.5	3	2.76
3	4	3.52
4	5	4.52
5	6	5.52
6	10	8.16

Volume Sources [3]

COSA Truck Dump
COSA Building
Secondary Crusher Building
Mill Feeder Transfer Station
Fine Ore Bins Gallery

Ore Material Density = 3.7 g/cm^3
No Control Devices Added to Mechanically Change Particle Size

Particle Size Range (μm)	Cum Size (%)	Cum Wt. (g/cm^3)	Mass (g/cm^3)	Mass Fraction
1	4	0.148	0.148	0.04
2	11	0.407	0.259	0.07
2.5	15	0.555	0.148	0.04
3	18	0.666	0.111	0.03
4	25	0.925	0.259	0.07
5	30	1.11	0.185	0.05
6	34	1.258	0.148	0.04
10	51	1.887	0.629	0.17
15	100	3.7	1.813	0.49
Totals			3.7	1.0

Concentrate Load-Out Bldg

Concentrate Material Density = 3.4 g/cm^3
No Control Devices Added to Mechanically Change Particle Size

Particle Size Range (μm)	Cum Size (%)	Cum Wt. (g/cm^3)	Mass (g/cm^3)	Mass Fraction
1	4	0.1361	0.1361	0.04
2	11	0.3742	0.2381	0.07
2.5	15	0.5103	0.1361	0.04
3	18	0.6123	0.1021	0.03
4	25	0.8505	0.2381	0.07
5	30	1.0206	0.1701	0.05
6	34	1.1567	0.1361	0.04
10	51	1.7350	0.5783	0.17
15	100	3.4019	1.6669	0.49
Totals			3.40	1.0

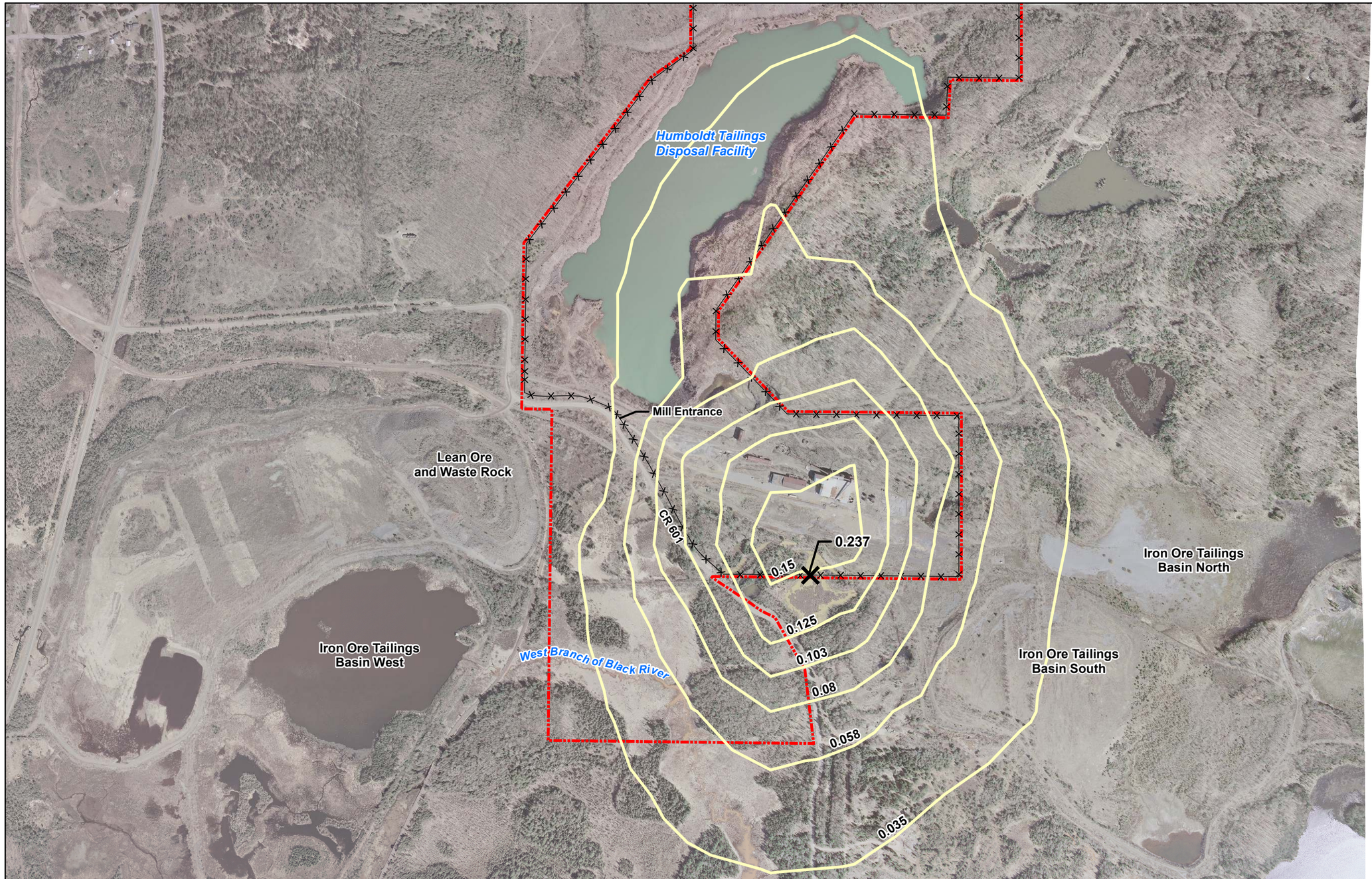
Notes:

1. Material density for ore was taken directly from the *Michigan Air Use Permit to Install* for the Kennecott Eagle Minerals Company (KEMC) Humboldt Mill site. Material density for concentration was obtained from M3 Engineering, a mining consultant engineering firm for KEMC.
2. The methodology for determining the mean particle size range is taken from the *Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities*, Chapter 3, Air Dispersion and Deposition Modeling.

3. Certain assumptions were made regarding particle size and density for input files to the air deposition model. Particle diameters were taken from Appendix B.2, Table B.2.2 to AP-42, Generalized Particle Size Distributions. Table B.2.2 is for use with aggregate and unprocessed ores that are mechanically generated. This broad category includes emissions from milling, grinding and crushing of these types of materials.

Attachment 3

Contour Maps



NOTES

1. Orthophotography supplied by Aero-Metric Engineering, Sheboygan, Wisconsin. Date of photography: April 27, 2006.
2. Horizontal datum based on NAD 83/96. Horizontal coordinates based on Michigan State Plane North.
3. Site Location - Project Site within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.
4. Deposition modeling was performed using EPA AERMOD software that has been adjusted to include particle density and size criteria.

M:\06w003\mxd\Air_Modeling\kmc_humboldt_DepModelArsenic1_11x17.mxd December 9, 2008

LEGEND

- Receptor Point Where Maximum Annual Deposition Rate Occurs (micrograms/square meter/year)
- Deposition Contours (micrograms/square meter/year)
- Fence
- KEMC Project Location

N

Foth
Foth Infrastructure & Environment, LLC

Foth Infrastructure & Environment, LLC

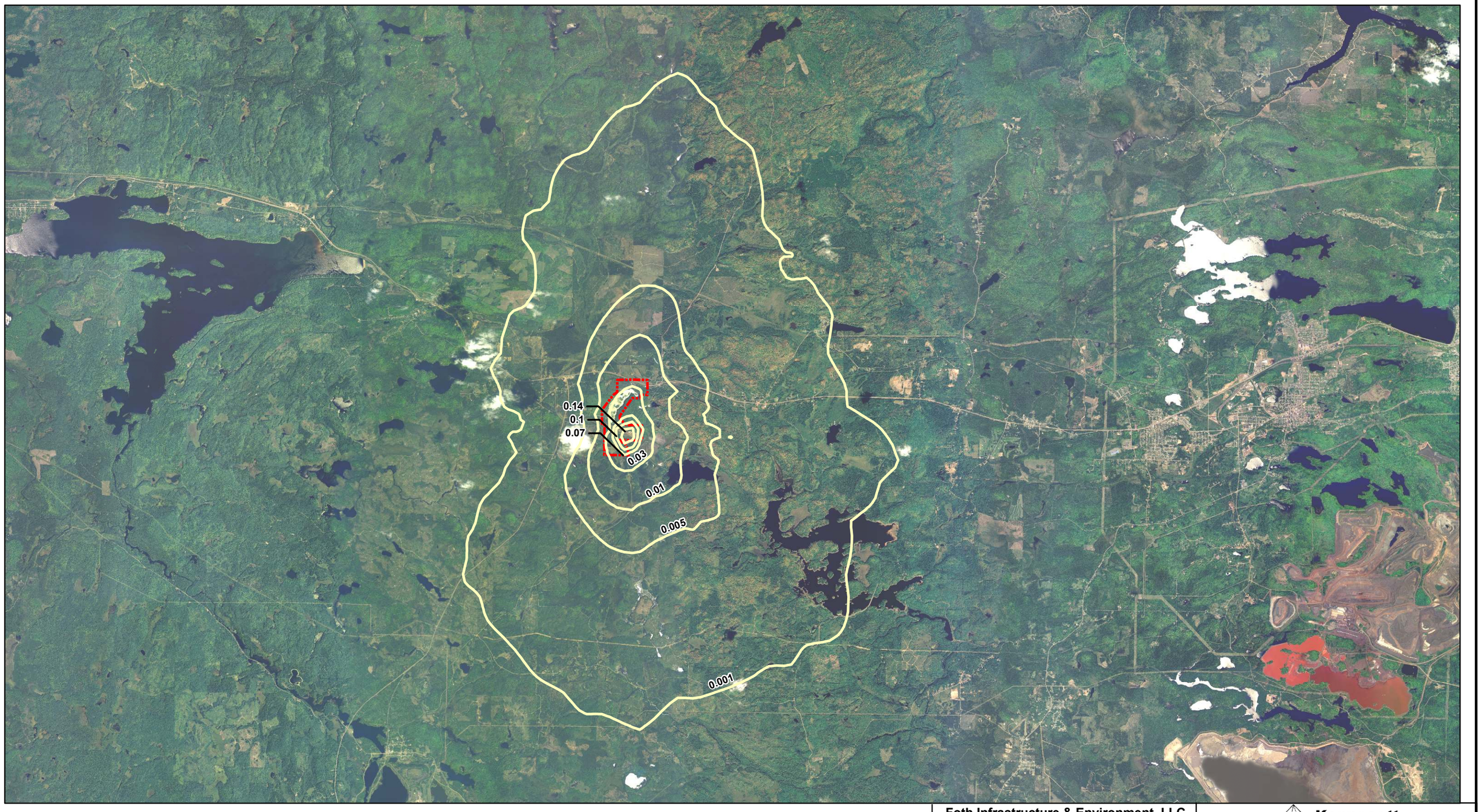
REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	CED1	DATE: DEC. '08	
APPROVED BY:	SVD1	DATE: DEC. '08	
APPROVED BY:		DATE:	

Kennecott
Eagle Minerals

FIGURE 1
HUMBOLDT MILL PROJECT
DEPOSITION MODELING RESULTS - ARSENIC, 2006
FACILITY VIEW

Scale: 0 400 800 Feet	Date: DECEMBER, 2008
Prepared by: DAT	Project No: 06W003



NOTES

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2. Horizontal datum based on NAD 83/96. Horizontal coordinates based on Michigan State Plane North.
3. Site Location - Project Site within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.
4. Deposition Modeling was performed using EPA AERMOD software that has been adjusted to include particle density and size criteria.

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LEGEND

Deposition Contours (micrograms/square meter/year)

KEMC Project Location

N

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Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	CED1	DATE: DEC. '08
APPROVED BY:	SVD1	DATE: DEC. '08
APPROVED BY:		DATE:

Kennecott
Eagle Minerals

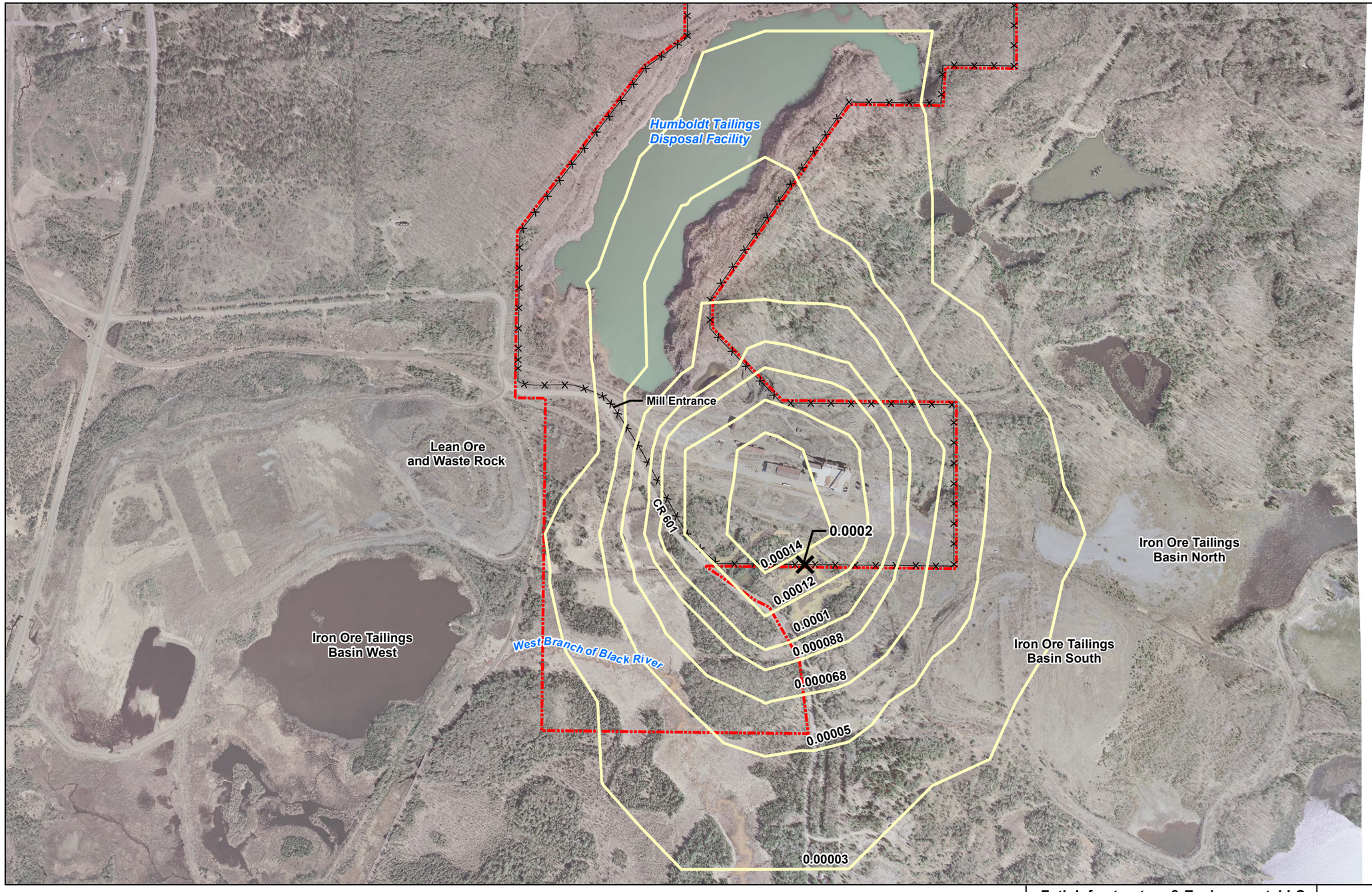
FIGURE 2
HUMBOLDT MILL PROJECT
DEPOSITION MODELING RESULTS - ARSENIC, 2006
REGIONAL VIEW

Scale: 0 4,000 8,000 Feet

Date: DECEMBER, 2008

Prepared by: DAT

Project No: 06W003



NOTES

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2. Horizontal datum based on NAD 83/96. Horizontal coordinates based on Michigan State Plane North.
3. Site Location - Project Site within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.
4. Deposition modeling was performed using EPA AERMOD software that has been adjusted to include particle density and size criteria.

M:\06w003\mxd\Air_Modeling\kmc_humboldt_DepModelCobalt1_11x17.mxd December 9, 2008

LEGEND

- Receptor Point Where Maximum Annual Deposition Rate Occurs (grams/square meter/year)
- Deposition Contours (grams/square meter/year)
- Fence
- KEMC Project Location

N

Foth Infrastructure & Environment, LLC

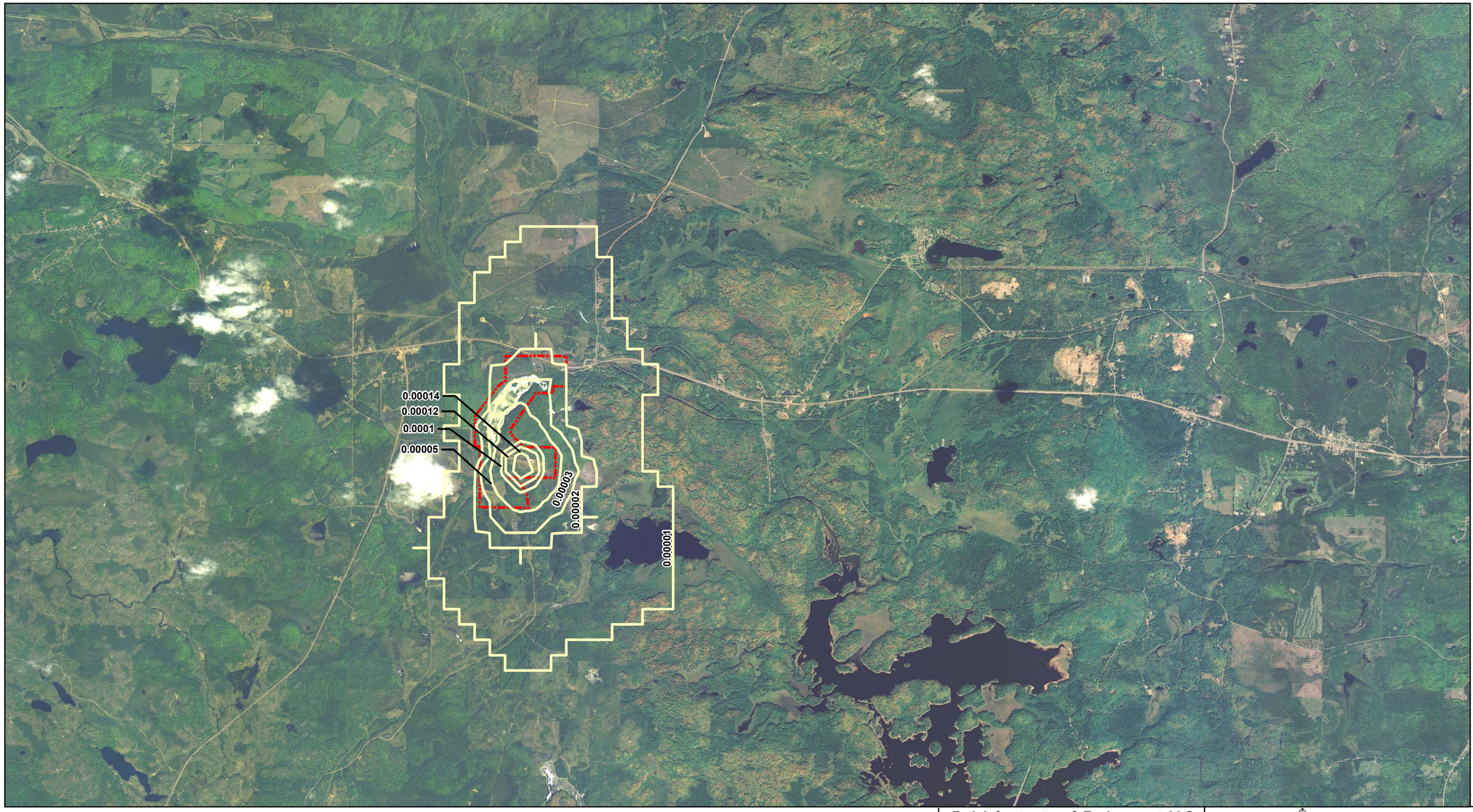
REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	CED1	DATE: DEC. '08
APPROVED BY:	SVD1	DATE: DEC. '08
APPROVED BY:		DATE:

Kennecott
Eagle Minerals

FIGURE 3
HUMBOLDT MILL PROJECT
DEPOSITION MODELING RESULTS - COBALT, 2006
FACILITY VIEW

Scale: 0 400 800 Feet	Date: DECEMBER, 2008
Prepared by: DAT	Project No: 06W003



NOTES

1. Orthophotography supplied by Aero-Metric Engineering, Sheboygan, Wisconsin. Date of photography: April 27, 2006.
2. Horizontal datum based on NAD 83/96. Horizontal coordinates based on Michigan State Plane North.
3. Site Location - Project Site within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.
4. Deposition Modeling was performed using EPA AERMOD software that has been adjusted to include particle density and size criteria.

LEGEND

Deposition Contours (grams/square meter/year)

KEMC Project Location

N

Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	CED1	DATE: DEC. '08
APPROVED BY:	SVD1	DATE: DEC. '08
APPROVED BY:		DATE:

Kennecott Eagle Minerals

FIGURE 4
HUMBOLDT MILL PROJECT
DEPOSITION MODELING RESULTS - COBALT, 2006
REGIONAL VIEW

Scale: 0 2,000 4,000 Feet

Date: DECEMBER, 2008

Prepared by: DAT

Project No: 06W003

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Humboldt Tailings Disposal Facility

Mill Entrance

Lean Ore and Waste Rock

CR 601

0.0088

0.0063

0.0055

0.0047

0.004

0.003

0.0022

0.00132

Iron Ore Tailings Basin North

Iron Ore Tailings Basin West

Iron Ore Tailings Basin South

West Branch of Black River

NOTES

1. Orthophotography supplied by Aero-Metric Engineering, Sheboygan, Wisconsin. Date of photography: April 27, 2006.
2. Horizontal datum based on NAD 83/96. Horizontal coordinates based on Michigan State Plane North.
3. Site Location - Project Site within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.
4. Deposition modeling was performed using EPA AERMOD software that has been adjusted to include particle density and size criteria.

M:\06w003\mxd\Air_Modeling\kmc_humboldt_DepModelCopper1_11x17.mxd December 9, 2008

LEGEND

- Receptor Point Where Maximum Annual Deposition Rate Occurs (grams/square meter/year)
- Deposition Contours (grams/square meter/year)
- Fence
- KEMC Project Location

N

Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	CED1	DATE: DEC. '08	
APPROVED BY:	SVD1	DATE: DEC. '08	
APPROVED BY:		DATE:	

Kennecott Eagle Minerals

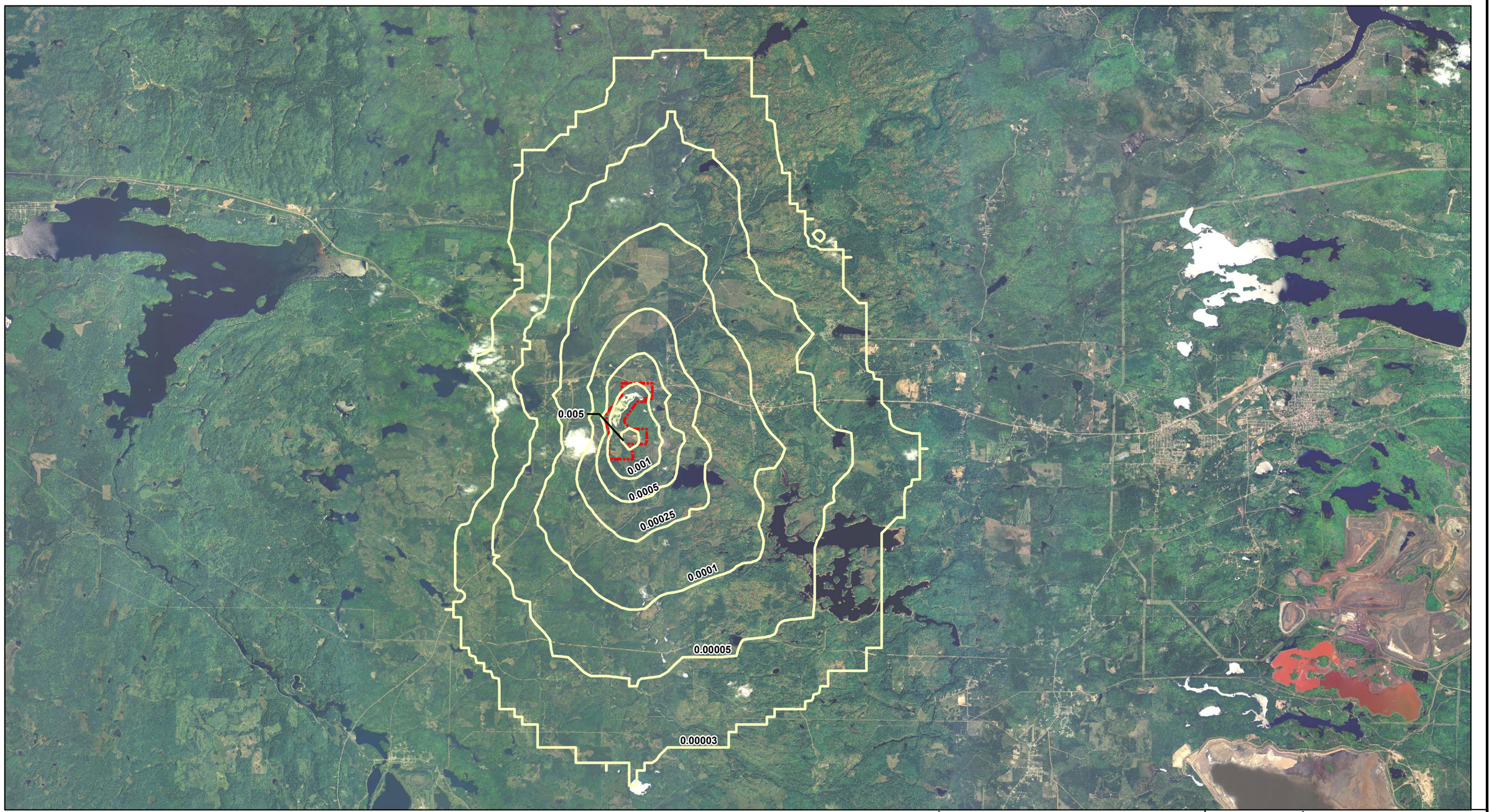
FIGURE 5
HUMBOLDT MILL PROJECT
DEPOSITION MODELING RESULTS - COPPER, 2006
FACILITY VIEW

Scale: 0 400 800 Feet

Date: DECEMBER, 2008

Prepared by: DAT

Project No: 06W003



NOTES

1. Orthophotography supplied by Aero-Metric Engineering, Sheboygan, Wisconsin. Date of photography: April 27, 2006.
2. Horizontal datum based on NAD 83/96. Horizontal coordinates based on Michigan State Plane North.
3. Site Location - Project Site within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.
4. Deposition Modeling was performed using EPA AERMOD software that has been adjusted to include particle density and size criteria.

LEGEND

Deposition Contours (grams/square meter/year)

KEMC Project Location

Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	CED1	DATE: DEC. '08
APPROVED BY:	SVD1	DATE: DEC. '08
APPROVED BY:		DATE:

Kennecott Eagle Minerals

FIGURE 6
HUMBOLDT MILL PROJECT
DEPOSITION MODELING RESULTS - COPPER, 2006
REGIONAL VIEW

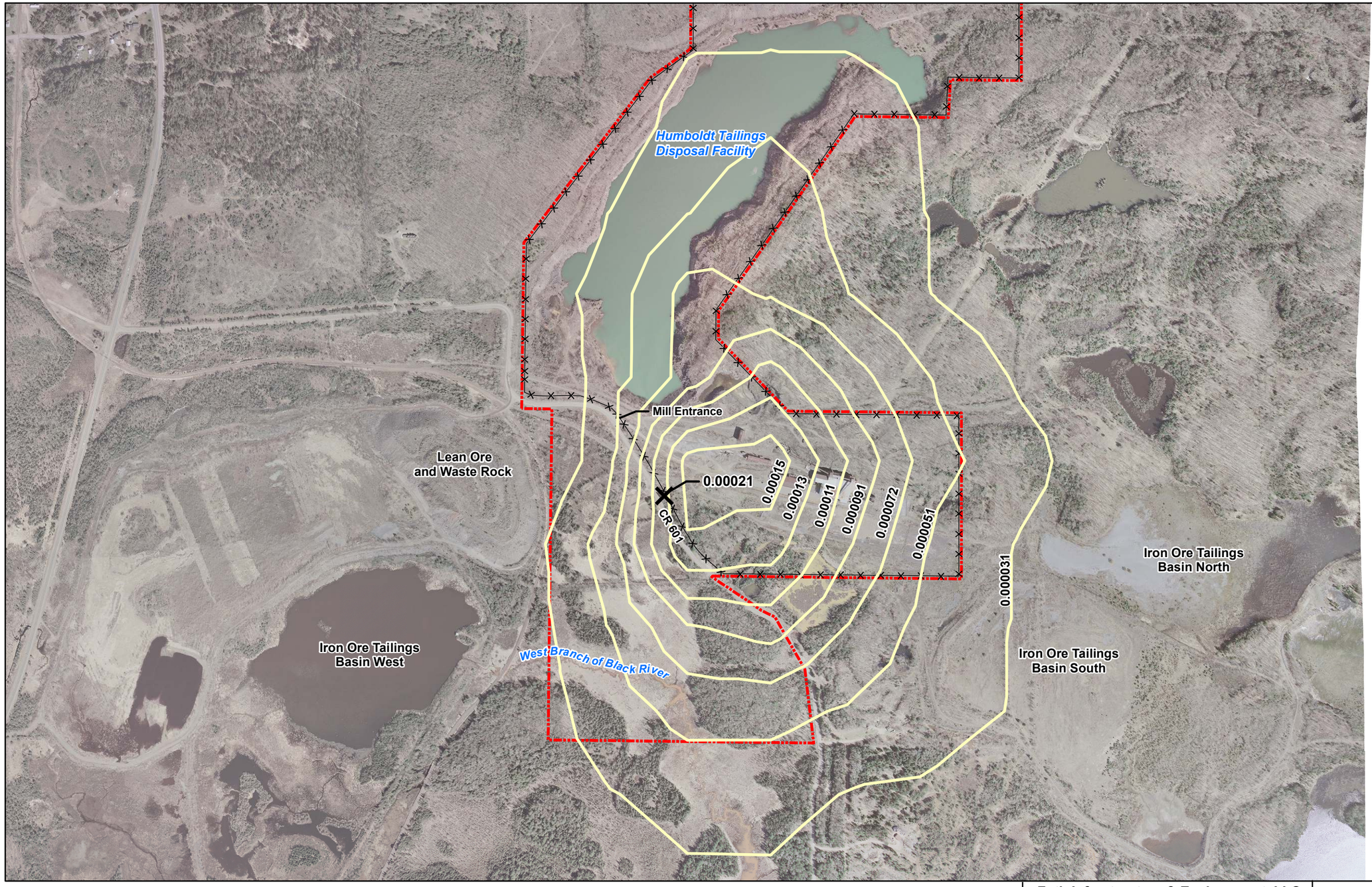
Scale: 0 4,000 8,000 Feet

Date: DECEMBER, 2008

Prepared by: DAT

Project No: 06W003

M:\06w003\mxd\Air_Modeling\kmc_humboldt_DepModelCopper2_11x17.mxd December 9, 2008



NOTES

1. Orthophotography supplied by Aero-Metric Engineering, Sheboygan, Wisconsin. Date of photography: April 27, 2006.
2. Horizontal datum based on NAD 83/96. Horizontal coordinates based on Michigan State Plane North.
3. Site Location - Project Site within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.
4. Deposition modeling was performed using EPA AERMOD software that has been adjusted to include particle density and size criteria.

M:\06w003\mxd\Air_Modeling\kmc_humboldt_DepModelManganese1_11x17.mxd December 9, 2008

LEGEND

- Receptor Point Where Maximum Annual Deposition Rate Occurs (grams/square meter/year)
- Deposition Contours (grams/square meter/year)
- Fence
- KEMC Project Location

N

Foth Infrastructure & Environment, LLC

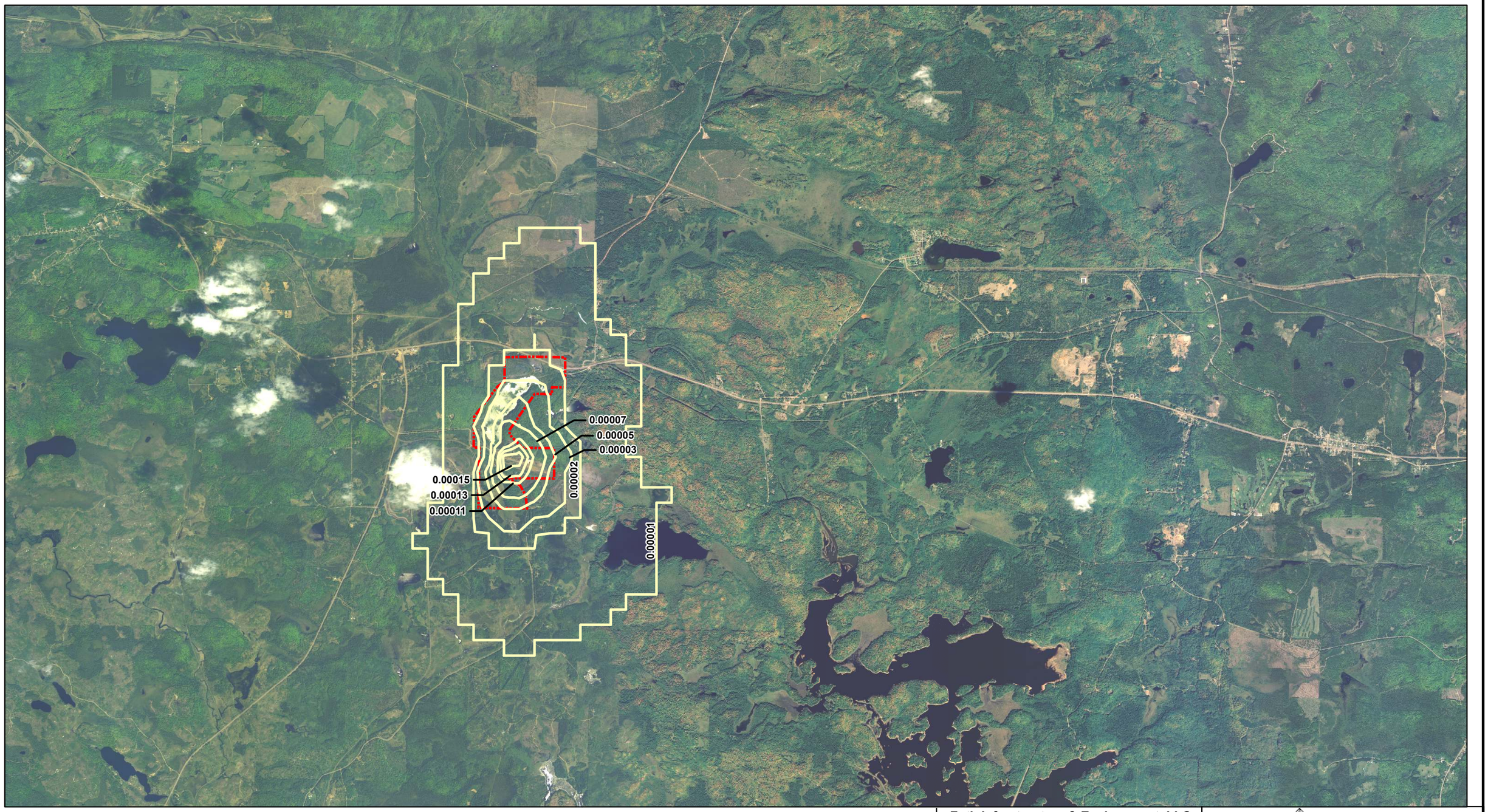
REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	CED1	DATE: DEC. '08
APPROVED BY:	SVD1	DATE: DEC. '08
APPROVED BY:		DATE:

Kennecott
Eagle Minerals

FIGURE 7
HUMBOLDT MILL PROJECT
DEPOSITION MODELING RESULTS - MANGANESE, 2006
FACILITY VIEW

Scale: 0 400 800 Feet	Date: DECEMBER, 2008
Prepared by: DAT	Project No: 06W003



NOTES

1. Orthophotography supplied by Aero-Metric Engineering, Sheboygan, Wisconsin. Date of photography: April 27, 2006.
2. Horizontal datum based on NAD 83/96. Horizontal coordinates based on Michigan State Plane North.
3. Site Location - Project Site within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.
4. Deposition Modeling was performed using EPA AERMOD software that has been adjusted to include particle density and size criteria.

M:\06w003\mxd\Air_Modeling\kmc_humboldt_DepModelManganese2_11x17.mxd December 9, 2008

LEGEND

Deposition Contours (grams/square meter/year)

KEMC Project Location

N

Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	CED1	DATE: DEC. '08	
APPROVED BY:	SVD1	DATE: DEC. '08	
APPROVED BY:		DATE:	

Kennecott Eagle Minerals

FIGURE 8

HUMBOLDT MILL PROJECT

DEPOSITION MODELING RESULTS - MANGANESE, 2006

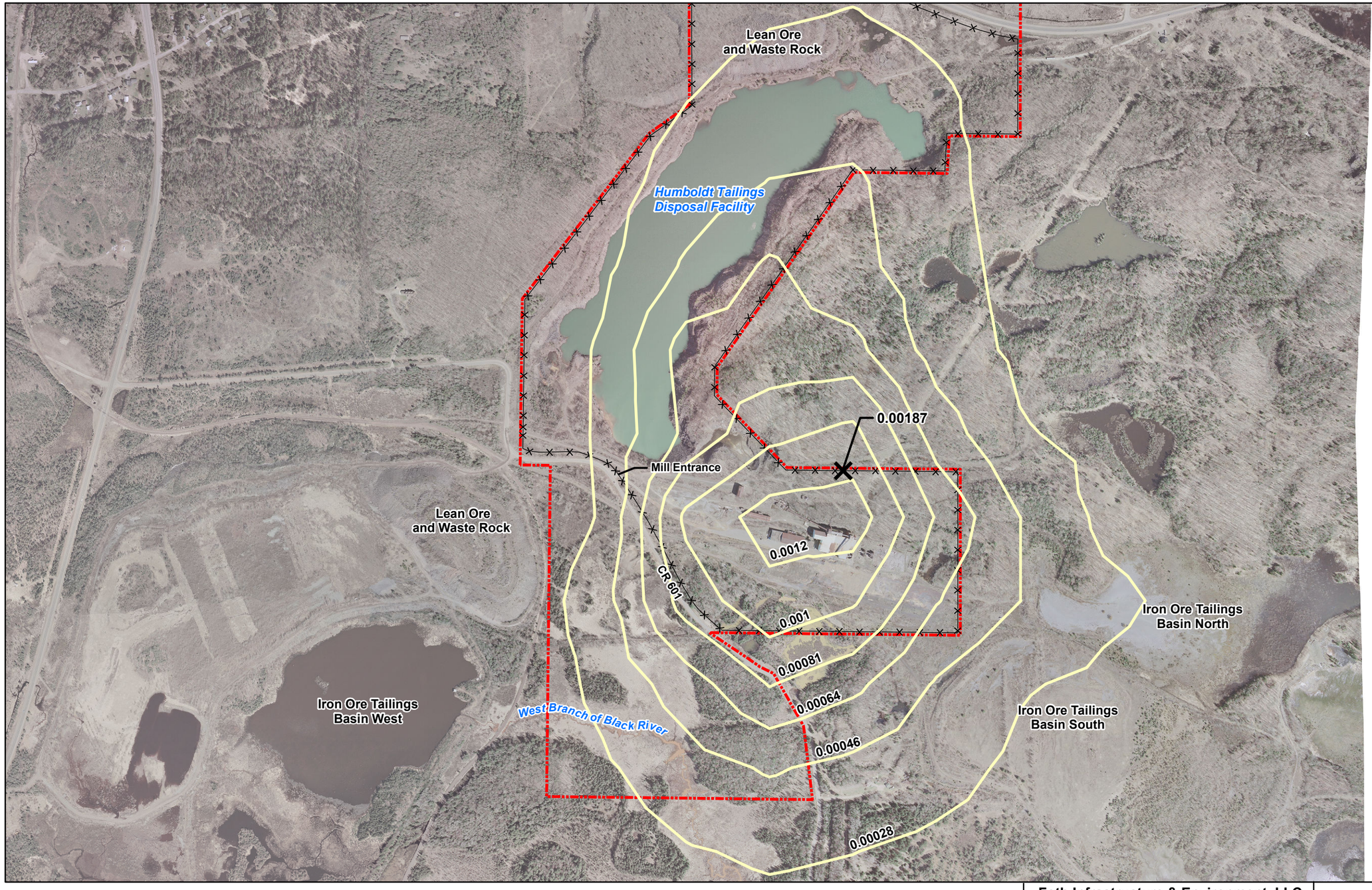
REGIONAL VIEW

Scale: 0 2,000 4,000 Feet

Date: DECEMBER, 2008

Prepared by: DAT

Project No: 06W003



NOTES

1. Orthophotography supplied by Aero-Metric Engineering, Sheboygan, Wisconsin. Date of photography: April 27, 2006.
2. Horizontal datum based on NAD 83/96. Horizontal coordinates based on Michigan State Plane North.
3. Site Location - Project Site within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.
4. Deposition modeling was performed using EPA AERMOD software that has been adjusted to include particle density and size criteria.

M:\06w003\mxd\Air_Modeling\kmc_humboldt_DepModelNickel1_11x17.mxd December 9, 2008

LEGEND

- Receptor Point Where Maximum Annual Deposition Rate Occurs (grams/square meter/year)
- Deposition Contours (grams/square meter/year)
- Fence
- KEMC Project Location

N

Foth Infrastructure & Environment, LLC

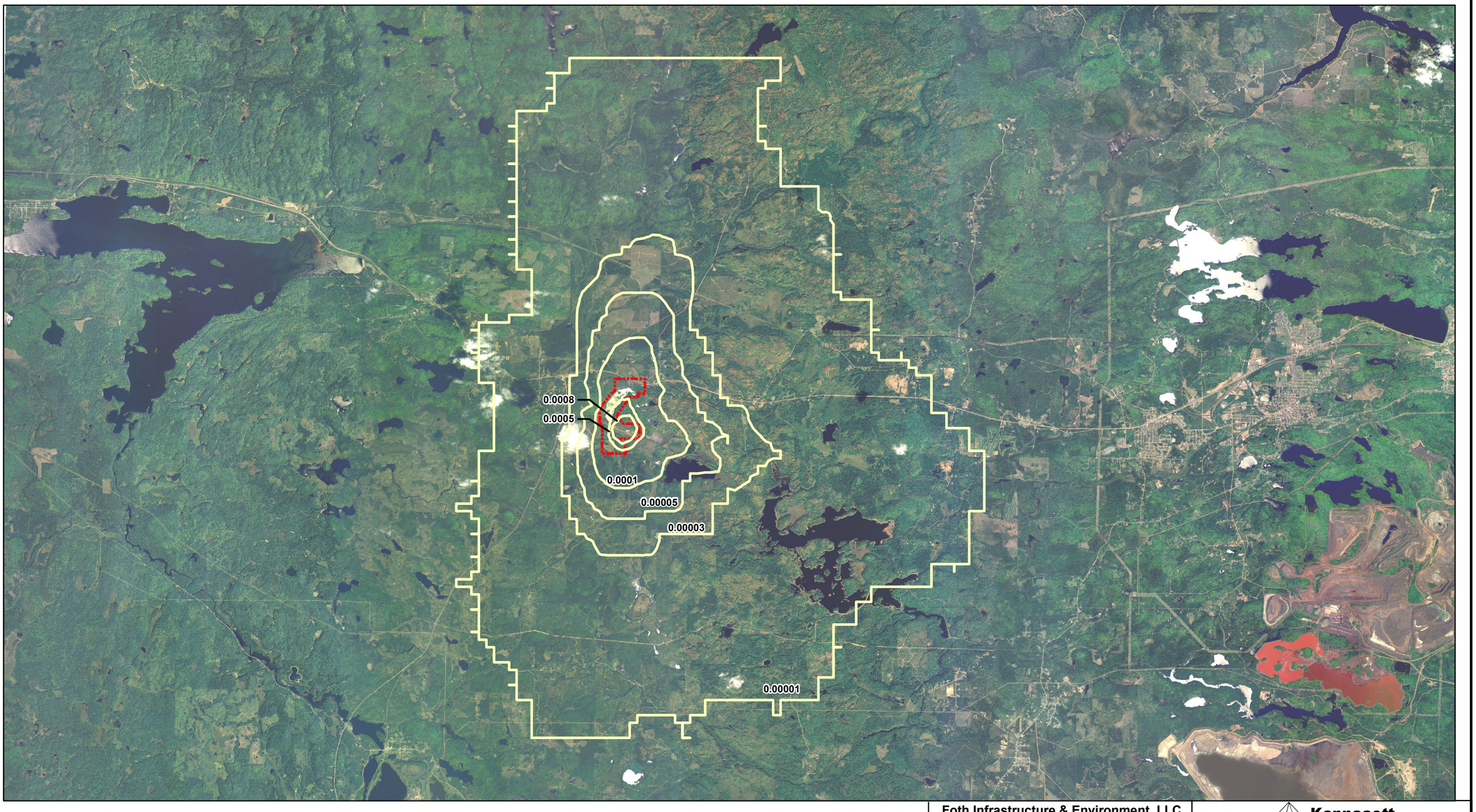
REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	CED1	DATE: DEC. '08	
APPROVED BY:	SVD1	DATE: DEC. '08	
APPROVED BY:		DATE:	

Kennecott
Eagle Minerals

FIGURE 9
HUMBOLDT MILL PROJECT
DEPOSITION MODELING RESULTS - NICKEL, 2007
FACILITY VIEW

Scale: 0 400 800 Feet	Date: DECEMBER, 2008
Prepared by: DAT	Project No: 06W003



NOTES

1. Orthophotography supplied by Aero-Metric Engineering, Sheboygan, Wisconsin. Date of photography: April 27, 2006.
2. Horizontal datum based on NAD 83/96. Horizontal coordinates based on Michigan State Plane North.
3. Site Location - Project Site within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.
4. Deposition Modeling was performed using EPA AERMOD software that has been adjusted to include particle density and size criteria.

M:\06w003\mxd\Air_Modeling\kmc_humboldt_DepModelNickel2_11x17.mxd December 9, 2008

LEGEND

Deposition Contours (grams/square meter/year)

KEMC Project Location

N

Foth
Foth Infrastructure & Environment, LLC

Foth Infrastructure & Environment, LLC

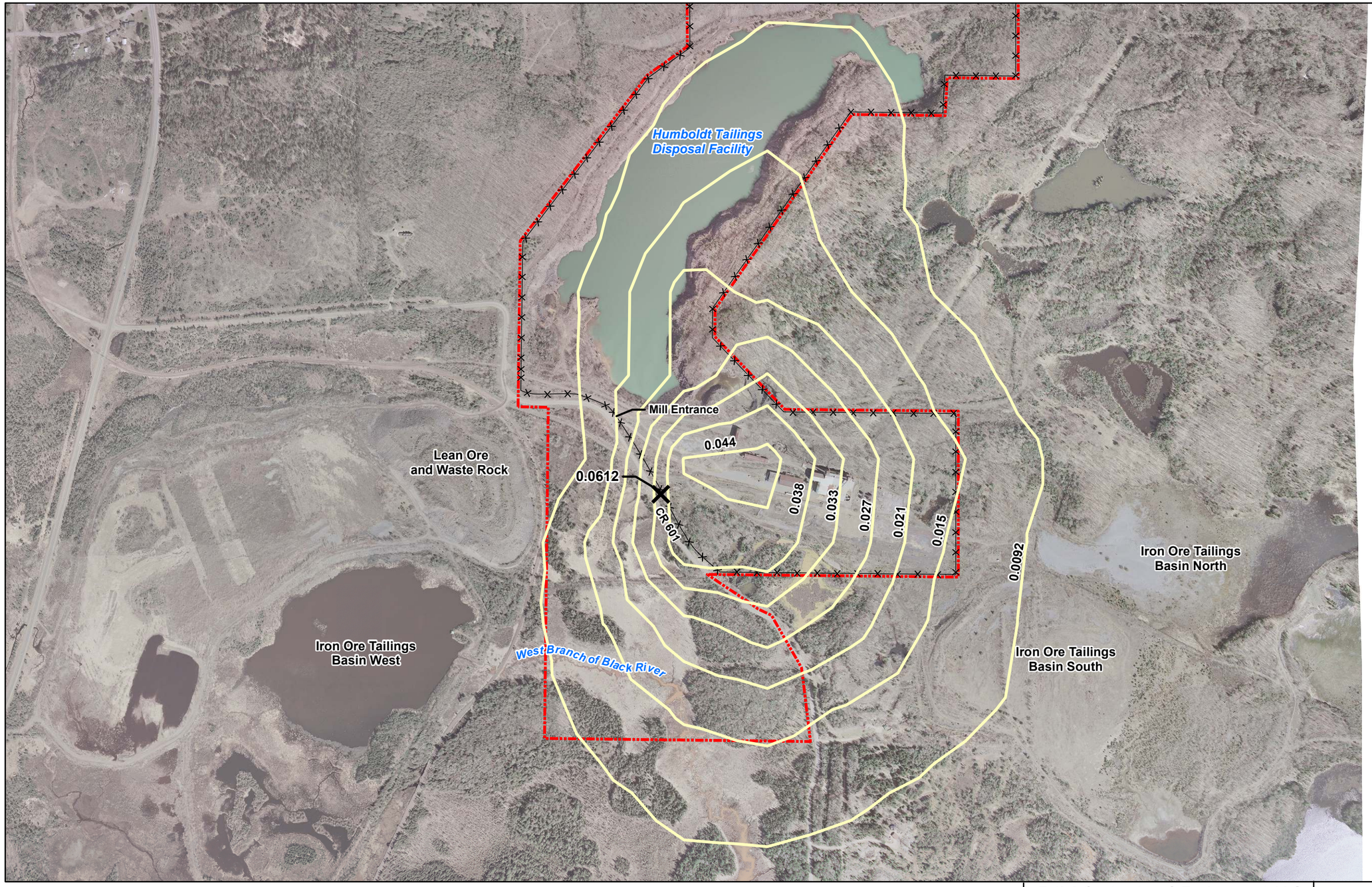
REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	CED1	DATE: DEC. '08
APPROVED BY:	SVD1	DATE: DEC. '08
APPROVED BY:		DATE:

Kennecott
Eagle Minerals

FIGURE 10
HUMBOLDT MILL PROJECT
DEPOSITION MODELING RESULTS - NICKEL, 2007
REGIONAL VIEW

Scale: 0 4,000 8,000 Feet	Date: DECEMBER, 2008
Prepared by: DAT	Project No: 06W003



NOTES

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2. Horizontal datum based on NAD 83/96. Horizontal coordinates based on Michigan State Plane North.
3. Site Location - Project Site within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.
4. Deposition modeling was performed using EPA AERMOD software that has been adjusted to include particle density and size criteria.

M:\06w003\mxd\Air_Modeling\kmc_humboldt_DepModelSulfur1_11x17.mxd December 9, 2008

LEGEND

- Receptor Point Where Maximum Annual Deposition Rate Occurs (grams/square meter/year)
- Deposition Contours (grams/square meter/year)
- Fence
- KEMC Project Location

N

Foth Infrastructure & Environment, LLC

Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	CED1	DATE: DEC. '08
APPROVED BY:	SVD1	DATE: DEC. '08
APPROVED BY:		DATE:

Kennecott
Eagle Minerals

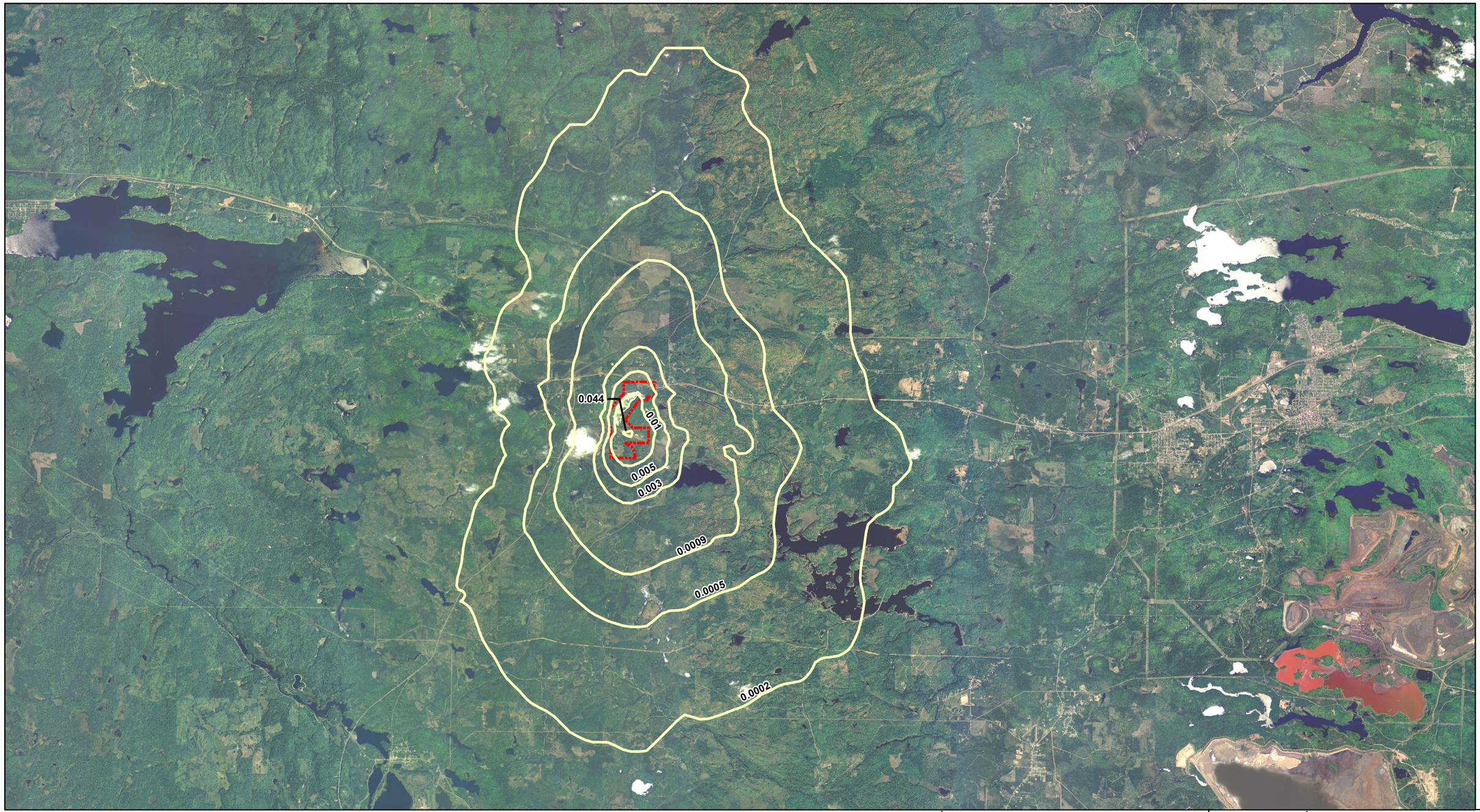
FIGURE 11
HUMBOLDT MILL PROJECT
DEPOSITION MODELING RESULTS - SULFUR, 2006
FACILITY VIEW

Scale: 0 400 800 Feet

Date: DECEMBER, 2008

Prepared by: DAT

Project No: 06W003



NOTES

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3. Site Location - Project Site within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.
4. Deposition Modeling was performed using EPA AERMOD software that has been adjusted to include particle density and size criteria.

M:\06w003\mxd\Air_Modeling\kmc_humboldt_DepModelSulfur2_11x17.mxd December 9, 2008

LEGEND

Deposition Contours (grams/square meter/year)

KEMC Project Location

N

Foth
Foth Infrastructure & Environment, LLC

Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	CED1	DATE: DEC. '08
APPROVED BY:	SVD1	DATE: DEC. '08
APPROVED BY:		DATE:

Kennecott
Eagle Minerals

FIGURE 12
HUMBOLDT MILL PROJECT
DEPOSITION MODELING RESULTS - SULFUR, 2006
REGIONAL VIEW

Scale: 0 4,000 8,000 Feet

Date: DECEMBER, 2008

Prepared by: DAT

Project No: 06W003

Appendix G

Humboldt Mill Baseline Noise and Light Survey

Memorandum

December 10, 2007

TO: Steve Donohue, Foth Infrastructure & Environment, LLC

CC: Master File 06W003-6001

FR: Scott Janssen – Foth Infrastructure & Environment, LLC
Andrea Martin – Foth Infrastructure & Environment, LLC

RE: Humboldt Mill Baseline Noise and Light Survey

Purpose

The purpose of this memo is to summarize the noise and light survey conducted at the Humboldt Mill site on December 3 and 4, 2007. The survey provides baseline data for light and noise levels at the site and surrounding area, located 24 miles west of Marquette, Michigan, in the area of US Highway 41 (US 41), and State Highway 95 (M-95). The Humboldt Mill site street address is 4547 County Road 601.

Equipment

Equipment used to perform the survey included a light meter and a noise meter. Light was measured with Testo 545, QC-10, Serial number 00695616/206. Noise was measured with a Quest model 2900, Serial number CD8110040 to one significant decimal point, and frequency meter OB-100, Serial number HW5050001.

Foth personnel obtained the meters through the rental company, Argus/Hazco, Dayton, Ohio. Both meters were most recently factory calibrated in July 2007. A certification of compliance with calibration procedure with accuracy traceable to the National Institute of Standards and Technology was provided by the rental company.

The noise meter was calibrated in the field to known decibel frequency and no adjustments were required in the field prior to measurements.

Procedure

On the evening of December 3, 2007, Scott Janssen of Foth Infrastructure & Environment, LLC went to 25 locations inside and outside of the Humboldt Mill project area as shown in Figure 1. Global Positioning System (GPS) locations, light and sound measurements were recorded at all survey locations as presented in Table 1. Private property was not accessed to conduct measurements. The weather was cloudy with snow showers, wind was 10-20 miles per hour (mph) from the north. The moon was nine days past the full moon (November 24, 2007), moonlight was diluted due to cloud cover. The ground had snow cover. All data from sampling points were recorded between 18:30 and 21:05 Eastern Standard Time on December 3, 2007.

Sampling points were chosen on the basis of human activity and/or travel. These locations are expected to experience the widest range and higher levels of both light and noise. Light at the sampling locations was permanent artificial background light such as street lights and yard lights, or temporary artificial lighted areas such as vehicle traffic areas and Christmas lights. With no heavy industry or large structures (airports and the like), this rural area experiences incidental noise from specific human activity such as vehicle traffic or natural background noise such as wind.

Light measurements were taken at eye level with the sensor pointed at the source of light being produced. Where appropriate, light sources were measured directly under the light source. At sample locations with no direct influence of artificial light, the sensor was pointed at the strongest visible source to obtain the most conservative measurement. The readings were recorded in Lumens per square meter (LUX).

A grab sound measurement was recorded. The sound measurements were taken at ear level. Decibels (dB) were recorded over a wide range of frequency. A range of decibels were recorded when there was activity in the area being recorded, such as a vehicle driving by.

On December 4, 2007, The Quest Model 2900 sound meter was set-up to log day background noise from 07:30 a.m. to 12:00 p.m. at the mill entrance as shown on Figure 1. This time period was chosen to monitor the highest amount of traffic and background activity. The weather conditions were partly cloudy with scattered snow showers, wind was from the northwest at 6-12 mph, the temperature ranged from 9ºF to 20ºF. The logging function was set to record data entry every 3 seconds.

Summary of Data

Light Survey Results

In general for the light survey, all areas where artificial lighting was not present, the light reading recorded was 0 LUX. This would be expected, since a full moon light is equal to 1 LUX (Engineering Toolbox, 2007). Readings at locations not in the study area were recorded as reference: under the canopy at the Holiday Gas Station in Negaunee, 220 LUX and the Holiday Inn parking lot in Marquette, Michigan, 28 LUX.

The height, location and number of the light sources in the immediate area determined the LUX measured. The radius of influence of artificial lighting was generally less than 200 feet. Christmas lights measured from the road locations did not register on the meter.

Sound Survey Results

In general, background measurements at most survey locations were between 40 and 50 dB. Any increase from this range is attributed to artificial factors such as traffic, electrical generators, transformers, or general artificial noise based on activity. Natural factors such as wind blowing through conifer trees were also noted to increase background noises. The highest readings recorded were generally from traffic, specifically heavy trucks and snow plows.

During the logged sound survey at the mill entrance on December 4, 2007, time and type of disturbance was recorded in a field book. During the 4.5 hour data logging period, 26 small vehicles passed by the station, one school bus, one logging truck, one helicopter and two jet fly-over events were noted. In addition, vehicle traffic on US 41 and M-95 could also be heard, along with occasional barking dogs. The meter was checked every 1.5 hours for operation status causing an increase in background noise from walking up to the meter. During this time period, sound levels ranged from a minimum of 42.1 dB to a maximum of 98.7 dB. The equivalent continuous noise level (LEQ), an average integrated sound level calculated in the instrument, was 59.9 dB.

References

Engineering Toolbox, 2007. http://www.engineeringtoolbox.com/light-level-rooms-d_708.html. Illuminance – Recommended Light Levels.

Client: Kennecott Eagle Minerals Company Project ID.: 06W003
Project: Humboldt Mill Project - Noise and Light Data from Dec 07 Survey
Prepared by: SDJ Date: 12/05/07
Checked by: AKM Date: 12/10/07

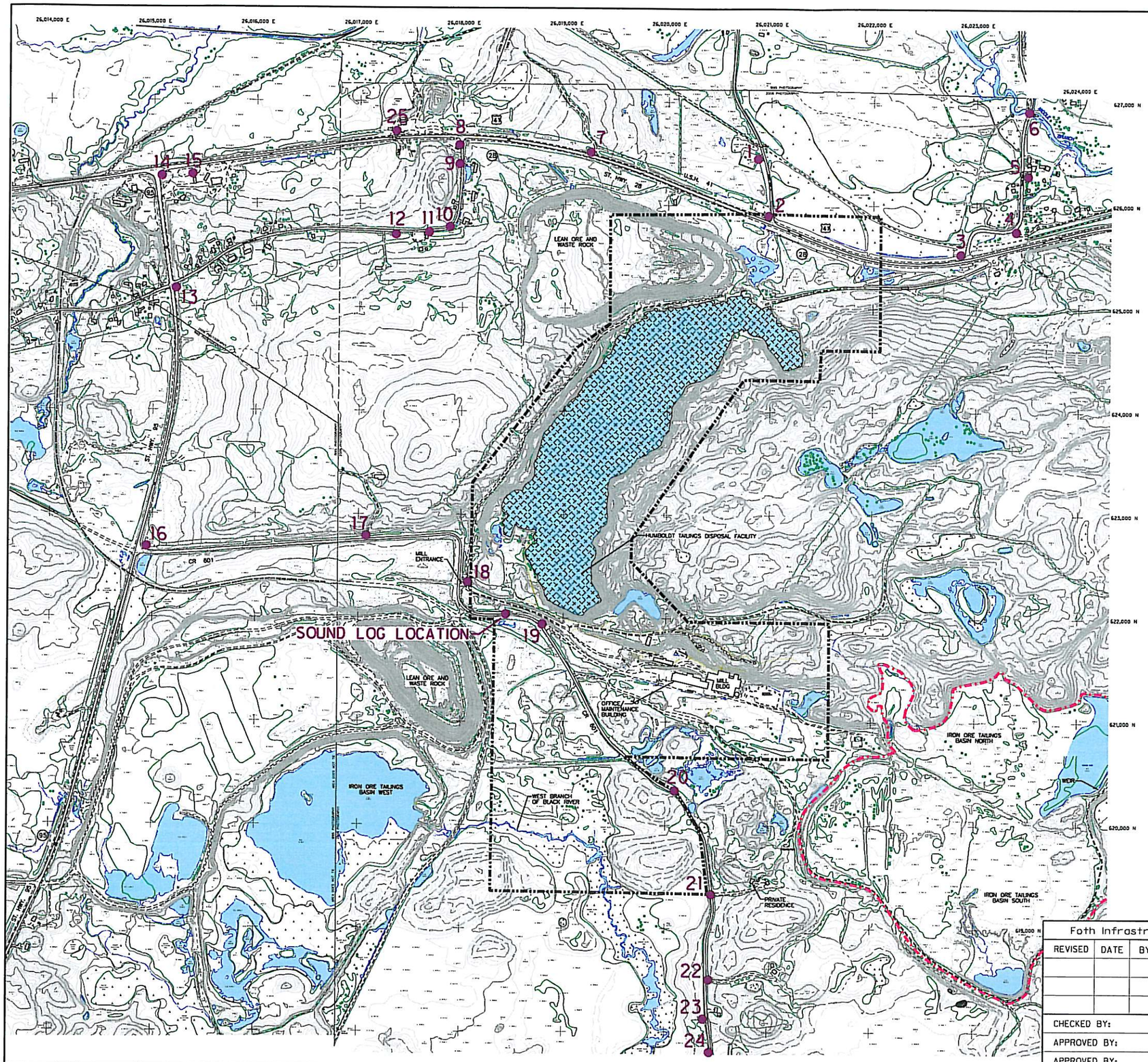
Table 1

Station	12/3/2007 Time	Location (GPS)		Light LUX	Sound db	Comments
1	18:42	431199	5149752	7	47-57	measurements taken at gate approximately 150 feet from source, yard light
2	18:55	431221	5149671	0	49	No Vehicles on 41
				7	98	Vehicles on 41
3	19:05	431790	5149462	3	54	2 street lights on opposite corners No vehicles
				17	97	Vehicles on 41
4	19:10	431947	5149647	0	45	first residence no lights on
5	19:15	431967	5149697	32	50	under sreet light around next set of street lights
6	19:20	431988	5149900	0	62	Bridge running water
7	19:30	430681	5149758	0	51	could always hear vehilces on 41
				9	105	Logging truck
8	19:38	430301	5149791	22	62	under street light no vehicles
					90	Vehicles on 41
9	19:45	430300	5149690	17	45-55	under street light no vehicles
10	19:50	430155	5149630	31	46-48	
11	19:55	430155	5149630	31	46-48	light hum from street light
12	20:00	430019	5149538	0	50	wind blowing through trees location between street lights
13	20:05	429457	5149383	33	52	No Vehicles on 41, 95 or road
					90	Vehicles on 41
14	20:10	429433	5149643	58	78	Idling truck corner of 95 & 41
					107	Vehicles on 41
15	20:15	429517	5149694	160	72	BP Gas Station, under lights no vehicle
				8	100	BP Gas Station between Islands Vehicles on 41
16	20:20	429358	5148682	20	51	corner cr 601 & 95 no vehicles 2 street lights
					88	vehicles on 95
17	20:25	430023	5148623	0	44	2299 cr 601
18	20:30	430298	5148532	0	45	
19	20:35	430564	5148364	0	44-48	Humbolt Mill Gate, can see one yard light on in mill yard
20	20:40	430911	5147894	0	45	Humbolt Mill Gate, can see one yard light on in mill yard
21	20:45	431053	5147686	16	46	street light
22	20:50	431037	5147326	0	45	
23	20:55	431048	5147171	2	44	light on house
24	21:00	431055	5147077	16	45	street light
25	21:05	430115	5149829	0	60's	Randy's Grand Slam Parking Lot, readings vary depending where
				10	90's	measurements taken in parking lot
-	21:20			220		Holiday Gas Station in Ishpeming under canopy
-	21:45			28		Holiday Inn Parking Lot Marquette
-				0		General background readings at night where no artifical light was present, both inside and outside of project area

12/4/2007

*	07:30 -12:00	430440	5148408		42.1	Minimum
					98.7	Maximum
					59.8	LEQ

* Sound Log Location near Mill entrance.



N

LEGEND

- EXISTING ELEV. CONTOUR IN FEET
- PAVED ROAD
- UNPAVED ROAD
- TRAIL
- TREE
- TREE LINE
- FENCE
- SURFACE WATER
- SWAMP/WETLAND
- STREAM/LAKE
- BUILDING
- HUMBOLDT TAILINGS DISPOSAL FACILITY
- APPROXIMATE LIMITS OF PRE-EXISTING IRON ORE TAILINGS DISPOSAL FACILITY
- KEMC PROJECT LOCATION
- 1 NOISE AND LIGHT SURVEY POINT

NOTES:

1. TOPOGRAPHIC AND PLANIMETRIC DATA SUPPLIED BY AERO-METRIC ENGINEERING, SHEBOYGAN, WISCONSIN. DATE OF PHOTOGRAPHY: APRIL 27, 2006, UNLESS OTHERWISE NOTED.
2. CONTOUR INTERVAL BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. HORIZONTAL DATUM BASED ON NAD 83/96. HORIZONTAL COORDINATES BASED ON MICHIGAN STATE PLANE.
3. SITE LOCATION: PROJECT SITE WITHIN SECTIONS 2 AND 11, T47N, R29W, HUMBOLDT TOWNSHIP, MARQUETTE COUNTY, MICHIGAN.
4. CONTOUR INTERVAL SHOWN IS 2 FOOT.

0 500' 1,000'

Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	AKM	DATE: DEC. '07
APPROVED BY:	SVDI	DATE: DEC. '07
APPROVED BY:		DATE:

Kennecott
Eagle Minerals

FIGURE 1
HUMBOLDT MILL PROJECT
NOISE AND LIGHT SURVEY

Scale: AS SHOWN	Date: DECEMBER, 2007
Prepared By: BJW1	Project No. 06W003

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12/7/2007 bjw1

Appendix H

Material Safety Data Sheets for Milling Reagents

Ciba Specialty Chemicals Corporation

Material Safety Data Sheet

OSHA / ANSI Z400.1-2004 Compliant

MSDS date: 07-Jul-2006

NFPA Rating:	**Health:** 0	**Flammability:** 1	**Instability:** 0	
HMIS Rating:	**Health:** 0	**Flammability:** 1	**Physical Hazard:** 0	**Personal Protection:** X

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name: **MAGNAFLOC 155**

Product Number: **8115810**

Chemical Family: Copolymer of sodium acrylate and acrylamide.

Manufacturer/Supplier:

Ciba Specialty Chemicals Corporation
2301 Wilroy Road
Suffolk, VA 23434
8:30am - 5pm Phone Number: 1-757-538-3700
MSDS Request Line (voicemail): 1-800-431-2360
Customer Service/Product Information 1-800-322-3885

Emergency 24-Hour Health/Environmental Phone: 1-800-873-1138

2. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

Physical Form: Granular powder
Color: White
Odor: Little or no
Health: This product has no known adverse effect on human health.
Physical Hazards: Organic powders may be capable of generating static discharges and creating explosive mixtures in air. Handle with caution., Slip hazard when wet, Refer to MSDS Section 7 for Dust Explosion information. .

OSHA Hazardous Substance: This material is classified as not hazardous under OSHA regulations.

Primary Route(s) of Entry: Ingestion, Skin, Inhalation, Eyes.

3. COMPOSITION/INFORMATION ON INGREDIENTS

NON-HAZARDOUS COMPONENTS

Components	CAS Number	Weight %
Urea	57-13-6	4-6
Water	7732-18-5	4-6
2-Propenoic acid, sodium salt, polymer with 2-propenamide	25085-02-3	88-92

4. FIRST AID MEASURES

Eyes: Flush the eye(s) with lukewarm, gently flowing water for 5-10 minutes or until the chemical is removed. Get medical attention if irritation persists.

Skin: Wash off immediately with soap and plenty of water. Get medical attention if irritation occurs. If clothing is contaminated, remove and launder before reuse.

Inhalation: Remove to fresh air, if not breathing give artificial respiration. If breathing is difficult, give oxygen and get immediate medical attention.

Ingestion: Do not induce vomiting. If vomiting occurs naturally, have casualty lean forward to reduce the risk of aspiration. Seek medical attention immediately.

5. FIRE FIGHTING MEASURES

Fire Fighting Measures: Standard procedure for chemical fires. The product becomes slippery when wet. Restrict pedestrian and vehicular traffic in areas where slip hazard may exist.

Suitable Extinguishing Media: Carbon dioxide, dry chemical or foam.

Unsuitable Extinguishing Media: If water is used, restrict pedestrian and vehicular traffic in areas where slip hazard may exist.

Fire Fighting Equipment: Wear self-contained breathing apparatus and protective suit.

Unusual hazards: Dust in sufficient concentration can result in an explosive mixture in air. Handle to minimize dusting and eliminate open flame and other sources of ignition.

Hazardous Combustion Products: Burning may produce oxides of carbon, nitrogen.

6. ACCIDENTAL RELEASE MEASURES

Cleanup Instructions: Sweep up and shovel into suitable containers for disposal. Avoid dust formation. Wear suitable protective equipment. Should not be released into the environment.

7. HANDLING AND STORAGE

Handling: As with all industrial chemicals, use good industrial practices when handling. Avoid eye, skin, and clothing contact. Do not inhale. Do not taste or swallow. Use only with adequate ventilation.

Storage: Keep containers tightly closed in a cool, well-ventilated place.

Explosion Hazards: Avoid creating dusty conditions. Risk of explosion if an air-dust mixture forms.

For Industrial Use Only

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines:

There are no OSHA or ACGIH exposure guidelines available for component(s) in this product.

Personal Protective Equipment

Eye/Face Protection:	Wear safety glasses or goggles to protect against dust particles.
Skin Protection:	Wear chemical resistant gloves and protective clothing.
Respiratory Protection:	Use NIOSH approved respirator as needed to mitigate exposure.
Engineering Controls:	Work in well ventilated areas. Do not breathe dust. Local exhaust/ventilation recommended.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical Form:	Granular powder
Color:	White
Odor:	Little or no.
Freezing/Melting Point:	Not determined
Solubility in water:	Soluble, solubility limited by viscosity
Vapor Density:	Not applicable
Vapor Pressure:	Not applicable
Density:	Not determined
Specific Gravity:	~ 0.75
pH:	5 - 7 (1 % solution)
Percent Volatile:	None expected above trace levels.
VOC:	Not determined
Partition Coefficient (Octanol/Water):	Not determined
Decomposition Temperature:	Not determined
Flammability Limits in Air:	
Upper	Not determined
Lower	Not determined
Flash point:	Not applicable
Test Method (for Flash Point):	Not applicable

10. STABILITY AND REACTIVITY

Stability:	Stable.
Conditions to Avoid:	Avoid temperature extremes. Avoid wet and humid conditions.
Incompatibility:	Strong oxidizing agents. (may degrade polymer)
Hazardous Decomposition Products:	No decomposition expected under normal storage conditions.
Possibility of Hazardous Reactions:	None expected.

11. TOXICOLOGICAL INFORMATION

Acute Oral Toxicity: Not determined.

Acute Dermal Toxicity: Not determined

Acute Inhalation Toxicity: Not determined.

Eye Irritation: Not determined.

Skin Irritation: Not determined.

Skin Sensitization: Not determined

Carcinogenicity (IARC; NTP; OSHA; ACGIH): None of the components in this product at concentrations greater than 0.1% are listed by IARC; NTP, OSHA or ACGIH as a carcinogen.

Carcinogenicity Studies: Not listed as a carcinogen by IARC, NTP, OSHA, or ACGIH.

Mutagenicity: No data for product. No effects anticipated.

Reproductive Toxicity: No data for product. No effects anticipated.

Teratogenicity: Not determined. No effects anticipated.

Neurotoxicity: Not determined

Subacute Toxicity: Not determined

Subchronic Toxicity: Not determined

Chronic toxicity: Not determined

Absorption / Distribution / Excretion / Metabolism: Not determined

Additional Information: Not determined

12. ECOLOGICAL INFORMATION

Toxicity to Fish: LC50 230 mg/L 96 hour (Rainbow trout) (under static conditions in the presence of humic acid) (based on similar product)

Toxicity to Invertebrates: EC50 > 50 mg/L 48 hour (Daphnia magna) (under static conditions in the presence of humic acid) (Highest tested concentration)
LC50 110 mg/L (48 hours) (Ceriodaphnia dubia) (under static conditions in the presence of 10 mg/L humic acid)
EC50: 3.6 mg/L 7 days (Ceriodaphnia dubia) (under static-renewel conditions in the presence of humic acid) (based on similar product)

Toxicity to Algae: Not determined

Toxicity to Sewage Bacteria: Not determined

Activated Sludge Respiration Inhibition Test: Not determined

Biochemical Oxygen Demand (BOD): Not determined

Chemical Oxygen Demand (COD): Not determined

Total Oxygen Demand (TOD): Not determined

Biodegradability: Not determined

Bioaccumulation: Not determined

Additional Environmental Data: Not determined

13. DISPOSAL CONSIDERATIONS

Waste Disposal: Dispose in accordance with local, state, provincial and federal regulations.

14. TRANSPORT INFORMATION

U.S. Department of Transportation (DOT):

Not regulated for this mode of transport.

International Maritime Dangerous Goods (IMDG):

Not regulated for this mode of transport.

International Air Transportation Authority (IATA):

Not regulated for this mode of transport.

15. REGULATORY INFORMATION

Federal Regulations

OSHA Hazardous Substance: This material is classified as not hazardous under OSHA regulations

Clean Air Act - Hazardous Air Pollutants (HAP): This product contains the following Hazardous Air Pollutants (HAP), as defined by the U.S. Clean Air Act Section 112 (40 CFR 61).

Components	CAA Section 112 Statutory Hazardous Air Pollutants
2-propenamide 79-06-1 (0-0.09999 %)	Listed.

Clean Air Act - Volatile Organic Compounds (VOC): This product contains the following SOCMI Intermediate or Final Volatile Organic Compounds (VOC), as defined by the U.S. Clean Air Act Section 111 (40 CFR 60.489).

Components	CAA Section 111 Volatile Organic Compounds
Urea 57-13-6	Listed.
2-propenamide 79-06-1	Listed.

Clean Air Act - Ozone Depleting Substances (ODS): This product neither contains, nor was manufactured with, a Class I or Class II ozone depleting substance (ODS), as defined by the U.S. Clean Air Act Section 602 (40 CFR 82, Subpt. A, App. A+B).

Clean Water Act - Priority Pollutants (PP): This product does not contain any priority pollutants listed under the U.S. Clean Water Act Section 307 (2)(1) Priority Pollutant List (40 CFR 401.15).

Resource Conservation and Recovery Act (RCRA): Not a hazardous waste under RCRA (40 CFR 261.21).

SARA Section 302 Extremely Hazardous Substances (EHS): This product contains the following component(s) regulated under Section 302 (40 CFR 355) as Extremely Hazardous Substances.

Components	Section 302 Extremely Hazardous Substances (EHS)
2-propenamide 79-06-1 (0-0.09999 %)	Listed.

SARA Section 304 CERCLA Hazardous Substances: This product contains the following component(s) regulated under Section 304 (40 CFR 302) as hazardous chemicals for emergency release notification ("CERCLA" List).

Components	Section 304 CERCLA Hazardous Substances	CERCLA Reportable Quantity
2-propenamide 79-06-1 (0-0.09999 %)	Listed.	5000 LBS

SARA Section 311/312 Hazard Communication Standard (HCS): This product is not regulated under Section 311/312 HCS (40 CFR 370).

SARA Section 313 Toxic Chemical List (TCL): This product does not contain any component(s) listed on the Section 313 Toxic Chemical List.

TSCA Section 8(b) Inventory Status: All component(s) comprising this product are either exempt or listed on the TSCA inventory.

TSCA Section 5(e) Consent Orders: This product is not subject to a Section 5(e) Consent Order.

TSCA Significant New Use Rule (SNUR): This product is not subject to a Significant New Use Rule (SNUR).

TSCA Section 5(f): This product is not subject to a Section 5(f)/6(a) rule.

TSCA Section 12(b) Export Notification: This product does not contain any component(s) that are subject to a Section 12(b) Export Notification

State Regulations

California Proposition 65: This product contains the following component(s) currently on the California list of Known Carcinogens and Reproductive Toxins.

Components	California Proposition 65
2-propenamide *79-06-1*	Carcinogenic.

Pennsylvania Right-To-Know: This product contains the following component(s) which are subject to Pennsylvania Right-to-Know disclosure requirement.

Components	CAS Number	Pennsylvania Right-to-Know
Urea	57-13-6	Not Listed.
2-Propenoic acid, sodium salt, polymer with 2-propenamide	25085-02-3	Not Listed.
Water	7732-18-5	Not Listed.
2-propenamide	79-06-1	Listed. Environmental hazard.

International Regulations

Chemical Weapons Convention (CWC): This product does not contain any component(s) listed under the Chemical Weapons Convention Schedule of Chemicals.

Domestic Substance List (DSL) Status: All components either exempt or listed on the DSL.

16. OTHER INFORMATION

Reason for revision: Toxicological update.

Disclaimer: The information contained herein is based upon data believed to be correct. However, no guarantee or warranty of any kind, expressed or implied, is made with respect to such data or information. The user is responsible for determining whether the product is suitable for its intended conditions of use.

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

MSDS Number: **C0407** * * * * * *Effective Date: **01/17/05** * * * * * *Supercedes: **08/10/04***

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

CALCIUM HYDROXIDE

1. Product Identification

Synonyms: Calcium hydrate; slaked lime
CAS No.: 1305-62-0
Molecular Weight: 74.09
Chemical Formula: Ca(OH)2
Product Codes:
J.T. Baker: 1372, 1374, 1375, 5143
Mallinckrodt: 2630, 3288, 4188, 4195, 4201, 4315, 6805, 8526

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Calcium Hydroxide	1305-62-0	99 - 100%	Yes

3. Hazards Identification

Emergency Overview

DANGER! HARMFUL IF SWALLOWED OR INHALED. CAUSES BURNS TO SKIN AND EYES. CAUSES SEVERE IRRITATION TO RESPIRATORY TRACT.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate
Flammability Rating: 0 - None
Reactivity Rating: 2 - Moderate
Contact Rating: 3 - Severe
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: Green (General Storage)

Potential Health Effects

Inhalation:
Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath. Can cause chemical bronchitis.
Ingestion:
Gastric irritant. Ingestion may be followed by severe pain, vomiting, diarrhea, and collapse. If death does not occur in 24 hours, esophageal perforation may occur, as evidenced by fall in blood pressure and severe pain. A narrowing of the esophagus may occur weeks, months, or years after ingestion, making swallowing difficult.
Skin Contact:
Corrosive. May cause severe burns and blistering, depending on duration of contact.
Eye Contact:
Corrosive. May produce severe irritation and pain. May induce ulcerations of the corneal epithelium. Can cause blindness.
Chronic Exposure:
Prolonged or repeated skin contact may produce severe irritation or dermatitis.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin problems or impaired respiratory function may be more susceptible to the effects of this substance.

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician immediately.
Ingestion:
DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Call a physician immediately.
Skin Contact:

In case of contact, wipe off excess material from skin then immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. Call a physician immediately.
Eye Contact:
Immediately flush eyes with gentle but large stream of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Call a physician immediately.

5. Fire Fighting Measures

Fire:
Not considered to be a fire hazard.
Explosion:
Not considered to be an explosion hazard.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Keep unnecessary and unprotected people away from area of spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust. Do not flush caustic residues to the sewer. Residues from spills can be diluted with water, neutralized with dilute acid such as acetic, hydrochloric or sulfuric. Absorb neutralized caustic residue on clay, vermiculite or other inert substance and package in a suitable container for disposal.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
15 mg/m3 (total dust), 5 mg/m3 (respirable fraction)
-ACGIH Threshold Limit Value (TLV):
5 mg/m3
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a full facepiece particulate respirator (NIOSH type N100 filters) may be worn for up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids. glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
White crystals or powder.
Odor:
Odorless.
Solubility:
0.185 g/100 cc water @ 0C.
Specific Gravity:
2.24
pH:
12.4 (saturated solution)
% Volatiles by volume @ 21C (70F):
0
Boiling Point:
Decomposes.
Melting Point:
580C (1076F)
Vapor Density (Air=1):
No information found.
Vapor Pressure (mm Hg):
No information found.
Evaporation Rate (BuAc=1):
No information found.

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Readily absorbs carbon dioxide from air to form calcium carbonate.
Hazardous Decomposition Products:
Caustic fumes of calcium oxide form when heated to decomposition (580C; 1076F).
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Violent reactions with maleic anhydride, nitroethane, nitromethane, nitroparaffins, nitropropane, phosphorus. As a strongly alkaline material, it is incompatible with acids.
Conditions to Avoid:
Air, dusting, and incompatibles.

11. Toxicological Information

Oral Rat LD50: 7340 mg/kg; eye rabbit, standard Draize, 10 mg, severe; investigated as a mutagen

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Calcium Hydroxide (1305-62-0)	No	No	None

12. Ecological Information

Environmental Fate:
This material is not expected to significantly bioaccumulate.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Although not a listed RCRA hazardous waste, this material may exhibit one or more characteristics of a hazardous waste and require appropriate analysis to determine specific disposal requirements. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------

Ingredient	TSCA	EC	Japan	Australia
Calcium Hydroxide (1305-62-0)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\----------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Calcium Hydroxide (1305-62-0)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Calcium Hydroxide (1305-62-0)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\----------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Calcium Hydroxide (1305-62-0)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Pure / Solid)

Australian Hazchem Code: None allocated.
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: 3 Flammability: 0 Reactivity: 0
Label Hazard Warning:
DANGER! HARMFUL IF SWALLOWED OR INHALED. CAUSES BURNS TO SKIN AND EYES. CAUSES SEVERE IRRITATION TO RESPIRATORY TRACT.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Wash thoroughly after handling.
Do not breathe dust.
Keep container closed.
Use only with adequate ventilation.
Label First Aid:
In case of contact, wipe off excess material from skin then immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. In all cases call a physician immediately.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 3.
Disclaimer:
****
Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.
****
Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

Celanese

Product name:	Methyl isobutyl carbinol
MSDS number:	63
Material number:	80063
Published date:	07/28/2005(V1)

MATERIAL SAFETY DATA SHEET

1. Product and Company Identification

Product: Methyl isobutyl carbinol
MSDS number: 63
Material number: 80063

Manufacturer name and address:

Celanese Ltd.
1601 W. LBJ Freeway
P.O. Box 819005
Dallas, TX 75381-9005
United States
Phone: 972 443 4000
Internet: www.celanesechemicals.us

Transportation emergency phone numbers:
In USA, call 800 424 9300
Outside USA, call 703 527 3887, collect calls accepted

Product Use: Intermediate for lube oil additives, especially zinc dialkyl dithiophosphates; frothing agent for ore flotation, especially copper.

2. Composition / Information on Ingredients

Component	CAS Number	Percent %	OSHA hazard category:
METHYL ISOBUTYL CARBINOL	108-11-2	99	Hazardous

3. Hazards Identification

Emergency Overview:

WARNING!
- Flammable liquid and vapor.
- May cause respiratory tract and eye irritation.
- May cause skin irritation.
- Prolonged or repeated contact may dry skin and cause irritation.
- Material creates a special hazard because it floats on water.

Transportation emergency:	800 424 9300	CHEMTREC, 24 hrs/day
	703 527 3887	Outside USA, collect calls accepted, 24 hrs/day
Product information:	800 835 5235	

Product name:	Methyl isobutyl carbinol
MSDS number:	63
Material number:	80063
Published date:	07/28/2005(V1)

Product Description

Appearance: Clear, colorless mobile liquid.
Odor: Slightly irritating, alcohol odor.

Potential health effects

Routes of exposure: Skin, eyes, inhalation, ingestion.

Immediate effects:

Skin: May cause skin irritation. Prolonged or repeated contact may dry skin and cause irritation. May be harmful if absorbed through skin. Symptoms of exposure may include: Central nervous system depression with headache, stupor, uncoordinated or strange behavior or unconsciousness. Drying, cracking or inflammation of skin.

Eyes: Exposure to vapors and liquid Causes eye irritation. Symptoms of exposure may include: Eye irritation, burning sensation, pain, watering, and/or change of vision.

Inhalation: Causes respiratory tract irritation. Harmful if inhaled. Symptoms of exposure may include: Central nervous system depression with nausea, dizziness, headache, stupor, uncoordinated or strange behavior or unconsciousness. Nasal discharge, hoarseness, coughing, chest pain and breathing difficulty.

Ingestion: May be harmful if swallowed. Symptoms of exposure may include: Nausea, vomiting, loss of appetite, gastrointestinal irritation and/or diarrhea. Central nervous system depression with nausea, headache and mental sluggishness.

Mutagenic: Does not show mutatgenic potential in most in vitro tests.

Target organ effects:
•Overexposure (prolonged or repeated exposure) may cause:
Kidney damage
Central nervous system depression
Injury to the eyes
Irritation of the respiratory tract
Irritation of the digestive tract
Drying of the skin

Medical conditions which may be aggravated by exposure: Significant exposure to this chemical may adversely affect people with acute or chronic disease of the:
Respiratory Tract
Skin
Eyes
Kidneys
Central nervous system
Digestive tract

Product name:	Methyl isobutyl carbinol
MSDS number:	63
Material number:	80063
Published date:	07/28/2005(V1)

For further information, see:
Section 4 - First Aid Measures
Section 5 - Fire Fighting Measures
Section 6 - Accidental Release Measures
Section 8 - Exposure Controls/Personal Protection
Section 9 - Physical and Chemical Properties
Section 10 - Stability and Reactivity

4. First Aid Measures

Skin: Immediately flush skin with plenty of water. Remove contaminated clothing and shoes. Call a physician if irritation develops and persists. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes. If easy to do, remove contact lenses, if worn. Get medical attention immediately.

Inhalation: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion: DO NOT induce vomiting. Get medical attention immediately. If victim is fully conscious, give a cupful of water. Never give anything by mouth to an unconscious person.

5. Fire Fighting Measures

NFPA: Health: 2 Flammability: 2 Reactivity: 0

Flammable properties

Flash point (test method): 42.4 C (108 F)

Flammable limits in air, % by volume:
Upper: 5.5 %
Lower: 1 %

Autoignition temperature: 360.3 C (680 F)

Products of combustion: Carbon Monoxide.

Extinguishing Media: Use CO_2 or dry chemical for small fires. Use aqueous film forming foam for large fires.

Transportation emergency: 800 424 9300 CHEMTREC, 24 hrs/day
703 527 3887 Outside USA, collect calls accepted, 24 hrs/day
Product information: 800 835 5235

Product name:	Methyl isobutyl carbinol
MSDS number:	63
Material number:	80063
Published date:	07/28/2005(V1)

Fire Fighting Instructions: Water spray should be used to cool fire-exposed structures and vessels. Keep personnel removed from and upwind of fire. If potential for exposure to vapors or products of combustion exists, wear full fire fighting turnout gear and NIOSH approved self-contained breathing apparatus. Oxidizing chemicals may accelerate the burning rate in a fire situation.

Fire Fighting Environmental Concerns: Thoroughly decontaminate bunker gear and other fire-fighting equipment before re-use.

6. Accidental Release Measures

Spill or Leak Instructions Eliminate ignition sources. See Section 8 for appropriate personal protective equipment. Contain spill with dikes of soil or nonflammable absorbent to minimize contaminated area. If fire potential exists, blanket spill with alcohol type aqueous film-forming foam or use water fog stream to disperse vapors. Avoid run-off into storm sewers and ditches leading to waterways. If required, notify state and local authorities. Place leaking containers in well-ventilated area. Clean up small spills by using a nonflammable absorbent or flushing sparingly with water. Contain larger spills with nonflammable diking or absorbent. Clean up by vacuuming or sweeping.

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Isolate for 800 meters or 0.5 miles in all directions if tank, rail car, or tank truck in involved in fire. Material creates a special hazard because it floats on water. Assess the spill situation, as the spill may not evolve large amounts of hazardous airborne contaminants in many outdoor spill situations. It may be advisable in some cases to simply monitor the situation until spilled product is removed.

7. Handling and Storage

Handling: Use with adequate ventilation. Keep containers closed when not in use. Always open containers slowly to allow any excess pressure to vent. Avoid breathing vapor. Avoid contact with eyes, skin or clothing. Wash thoroughly with soap and water after handling. Decontaminate soiled clothing thoroughly before re-use. Destroy contaminated leather clothing.

This product may generate a static charge. Ground/bond equipment when transferring material to prevent static accumulation. Electrical equipment and circuits in all storage and handling must conform to requirements of National Electric Code (Article 500 and 501) for hazardous location.

Storage: Keep all containers tightly closed when not in use. Store out of direct sunlight and on an impermeable floor.
Do not store with incompatible materials. See Section 10. Stability and Reactivity.

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8. Exposure Controls / Personal Protection

Engineering Controls: General or dilution ventilation is frequently insufficient as the sole means of controlling employee exposure. Local ventilation is usually preferred.

Protective Equipment A safety shower and eyebath should be readily available.

Skin protection: Wear impervious clothing and gloves to prevent contact. Butyl rubber is recommended. Other protective material may be used, depending on the situation, if adequate degradation and permeation data is available. If other chemicals are used in conjunction with this chemical, material selection should be based on protection for all chemicals present.

Eye/face protection: Wear chemical goggles when there is a reasonable chance of eye contact.

Respiratory protection: Based on workplace contaminant level and working limits of the respirator, use a respirator approved by NIOSH. The following is the minimum recommended equipment for an occupational exposure level. To estimate an occupational exposure level see Section 3, Section 8 and Section 11.

For concentrations > 1 and < 10 times the occupational exposure level: Use air-purifying respirator with full facepiece and organic vapor cartridge(s) or air-purifying full facepiece respirator with an organic vapor canister or a full facepiece powered air-purifying respirator fitted with organic vapor cartridge(s). The air purifying element must have an end of service life indicator, or a documented change out schedule must be established. Otherwise, use supplied air.

For concentrations more than 10 times the occupational exposure level and less than the lower of either 100 times the occupational exposure level or the IDLH: Use Type C full facepiece supplied-air respirator operated in positive-pressure or continuous-flow mode.

For concentrations > 100 times the occupational exposure level or greater than the IDLH level or unknown concentrations (such as in emergencies): Use self-contained breathing apparatus with full facepiece in positive-pressure mode or Type C positive-pressure full facepiece supplied-air respirator with an auxiliary positive-pressure self-contained breathing apparatus escape system.

For escape: Use self-contained breathing apparatus with full facepiece or any respirator specifically approved for escape.

Exposure guidelines

Product name:	Methyl isobutyl carbinol
MSDS number:	63
Material number:	80063
Published date:	07/28/2005(V1)

Component	CAS Number	Percent %	ACGIH TWA	ACGIH STEL	ACGIH CEILING	OSHA TWA	OSHA STEL	OSHA CEILING	Celanese WEL *	Mexico TWA	Mexico STEL	Mexico CEILING
METHYL ISOBUTYL CARBINOL	108-11-2	99	25 ppm	40 ppm	-	25 ppm	-	-	-	25 ppm	40 ppm	-

Component	CAS Number	Percent %	1990 NIOSH IDLH (Recognized by OSHA)	1994 NIOSH IDLH
METHYL ISOBUTYL CARBINOL	108-11-2	99	2000 PPM	400 ppm

Comments: Celanese has adopted the ACGIH TLVs
* Workplace Exposure Limit

9. Physical and Chemical Properties

Appearance: Clear, colorless mobile liquid.

Odor: Slightly irritating, alcohol odor.

Vapor Pressure: 4.7 mm Hg at 20 deg C

Vapor Density (Air=1 @ 20°C): 3.53

Boiling Point (760 mmHgA): 132 C (269.6 F)

Freezing Point: < -50 C (< -58 F)

Solubility in Water @ 20°C: 1.82 grams per 100 grams H2O

Specific Gravity: 0.808 at 20 deg C

Molecular Weight: 102.2

Evaporation Rate (n-Butyl acetate = 1): 0.26

10. Stability and Reactivity

Stability: Stable.

Conditions to Avoid: Avoid heat , flames, sparks, and other sources of ignition.

Incompatibility: Keep away from sulfuric and other strong inorganic acids, aluminum or lead (including equipment made of these metals), and oxidizing agents such as peroxides, nitric acid, perchloric acid or chromium trioxide.

Transportation emergency: 800 424 9300 CHEMTREC, 24 hrs/day
703 527 3887 Outside USA, collect calls accepted, 24 hrs/day

Product information: 800 835 5235

Product name:	Methyl isobutyl carbinol
MSDS number:	63
Material number:	80063
Published date:	07/28/2005(V1)

Hazardous Combustion or Decomposition Products: Thermal decomposition products may include oxides of carbon.

Hazardous Polymerization: Hazardous polymerization will not occur.

11. Toxicological Information

Component Toxicological Information

Component	METHYL ISOBUTYL CARBINOL

Acute Exposure: Excessive exposure leads to depression of the central nervous system which is generally reversible and is shown by headache, dizziness, drowsiness, loss of coordination and unconsciousness.

Oral LD50: 2.6g-kg (rats); Slightly toxic to animals. Nausea, vomiting, gastrointestinal irritation and diarrhea may occur.

Inhalation LC50: >3776 ppm (rats; vapor; 4hrs.); Slightly toxic to animals. Vapors are irritating to the respiratory tract.

Skin: Repeated or prolonged contact may cause drying of the skin dermatitis. Moderately irritating to rabbit skin. Slightly toxic (dermal LD50, rabbit:2.9g/kg).

Eyes: Liquid causes moderate to severe irritation of rabbit eyes. Vapors are irritating to the eyes.

Mutagenicity: Not mutagenic in bacterial, yeast and rat liver cell in vitro assays, including the Ames Test.

Carcinogenicity: No information.

Reproductive/Developmental Effects: No information.

Other: Methyl isobutyl carbinol has potentiated the liver toxicity of halogenated solvents (e.g., chloroform and carbon tetrachloride) in experimental animals at oral doses of 570 mg/kg or higher.

Repeated Exposure: Male and female rates exposed for 6hr/day. 5 days/wk for 6 wks to 211. 825 or 3698 mg/m^3 showed no overt signs of toxicity, effects on blood parameters or compound-related effects based on gross and microscopic examination of tissues. Increased kidney weight was observed in the males at the high dose. Effects on urine parameters were noted at all dose levels except for the low dose males. There are several other studies of limited quality and with limited details. In a 90-day inhalation study, kidney effects were reported in rats at 0.425 mg/1, but not in monkeys or dogs. The effect in rats was reversible on cessation of exposure. In mice exposed 12 times for 4 hours to vapor saturated air (approximately 20 mg/1), an anesthetic effect was reported, but no mortality. In rabbits exposed dermally 5 times over a period of 15-21 days at 2.5 g/kg, no systemic effects were observed.

12. Ecological Information

Component Ecological Information

Component	METHYL ISOBUTYL CARBINOL

Ecotoxicity: Methyl isobutyl carbinol exhibits low acute toxicity to aquatic species. The 96-hour LC50 for fish (Pimephales promelas) was greater than 92.4 ppm. There was no mortality at this level. The 24-hour LC50 value for fish (Carassius auratus) is 360 ppm. The 24-hour LC50 value for shrimp (Artemia salina) is 370 ppm. The 48-hour LC50 value for the clawed toad (Xenopus laevis) is 656 ppm. The 3-hour EC50 for inhibition of bacteria was greater than 100 ppm in the Activated Sludge Respiration Inhibition Test.

13. Disposal Considerations

Dispose of spilled material in accordance with state and local regulations for hazardous waste. Recommended methods are incineration or biological treatment at a federally or state-permitted disposal facility. Note that this information applies to the material as manufactured; processing, use, or contamination may make this information inappropriate, inaccurate, or incomplete.

Note that this handling and disposal information may also apply to empty containers, liners and rinsate. State or local regulations or restrictions are complex and may differ from federal regulations. This information is intended as an aid to proper handling and disposal; the final responsibility for handling and disposal is with the owner of the waste. See Section 9 - Physical and Chemical Properties.

EPA Hazardous Waste Code(s): D001

14. Transport Information

US Department of Transportation:

UN/NA Number:	UN 2053
Shipping name:	METHYL ISOBUTYL CARBINOL
Hazard class:	3
Packing Group:	PG III
Emergency Response Guide:	129

ICAO/IATA:

IATA UN Number:	UN 2053
Proper Shipping Name:	METHYL ISOBUTYL CARBINOL
Hazard Classification:	3
Packing group:	III
Label:	(Flammable Liquid)

IMDG:

International Marine UN Number:	UN 2053
Proper Shipping Name:	METHYL ISOBUTYL CARBINOL
Hazard Class:	3
Packing Group:	III
Flash point (test method):	42.4 C (108 F)

Transportation emergency:	800 424 9300	CHEMTREC, 24 hrs/day
	703 527 3887	Outside USA, collect calls accepted, 24 hrs/day
Product information:	800 835 5235	

Transport Canada

Trade Information
Schedule B Code (export): 2905.19.0020

15. Regulatory Information

U.S. STATE REGULATIONS
Chemicals associated with the product which are subject to the state right-to-know regulations are listed along with the applicable state(s):

METHYL ISOBUTYL CARBINOL 108-11-2

Pennsylvania	Listed
New Jersey	Listed
Illinois	Listed
Massachusetts	Listed

U.S. FEDERAL REGULATIONS

TSCA Inventory: We certify that all components are either on the TSCA inventory or qualify for an exemption.

Environmental Regulations:

SARA 311:

Acute health:	Yes
Chronic health:	No
Fire:	Yes
Sudden release of pressure:	No
Reactive:	No

INTERNATIONAL REGULATIONS

International Chemical Inventory
Listed on the chemical inventories of the following countries or qualifies for an exemption:

AUSTRALIA,CHINA,CANADA,EUROPE,KOREA,PHILIPPINES, JAPAN

Product name:	Methyl isobutyl carbinol
MSDS number:	63
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Published date:	07/28/2005(V1)

16. Other Information

Prepared by: Product Stewardship Department
Celanese Ltd.

Hazard ratings This information is intended solely for the use of individuals trained in the NFPA and/or HMIS systems.

NFPA: Health: 2 Flammability: 2 Reactivity: 0

HMIS: Health: 2 Flammability: 2 Reactivity: 0

Revisions: The following sections have been revised since the last issue of this MSDS.

Footer: Product Information number

For industrial use only. The information contained herein is accurate to the best of our knowledge. We do not suggest or guarantee that any hazards listed herein are the only ones which exist. Celanese makes no warranty of any kind, express or implied, concerning the safe use of this material in your process or in combination with other substances. Effects can be aggravated by other materials and/or this material may aggravate or add to the effects of other materials. This material may be released from gas, liquid, or solid materials made directly or indirectly from it. User has the sole responsibility to determine the suitability of the materials for any use and the manner of use contemplated. User must meet all applicable safety and health standards. Material safety data sheets are provided on the Internet by Celanese as a service to its customers. Possession of an Internet MSDS does not indicate that the possessor of the MSDS was a purchaser or user of the subject product.

MSDS Number: **S5066** * * * * * *Effective Date:* ***06/16/05*** * * * * * *Supercedes:* ***10/23/02***

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300
National Response in Canada
CANUTEC: 613-996-6666
Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

SODIUM SULFITE

1. Product Identification

Synonyms: Sodium sulfite anhydrous; disodium sulfite; sulfurous acid, disodium salt; exsiccated sodium sulfite
CAS No.: 7757-83-7
Molecular Weight: 126.04
Chemical Formula: Na2SO3
Product Codes:
J.T. Baker: 3888, 3922
Mallinckrodt: 8049, 8056, 8064

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Sodium Sulfite	7757-83-7	90 - 100%	Yes

3. Hazards Identification

Emergency Overview

WARNING! HARMFUL IF SWALLOWED. MAY CAUSE ALLERGIC REACTION AND BREATHING DIFFICULTIES. MAY CAUSE IRRITATION TO SKIN, EYES, AND RESPIRATORY TRACT.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate (Life)
Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES
Storage Color Code: Green (General Storage)

Potential Health Effects

Although only moderately toxic in large amounts, sulfites can pose risk to some asthmatics producing central nervous system depression, bronchoconstriction and anaphylaxis.

Inhalation:
Inhalation of dust may cause irritation to the mucous membranes of the upper respiratory tract. Use of bronchodilators preserved with sulfites can cause allergic reactions.
Ingestion:
May cause gastric irritation by the liberation of sulfurous acid. Large doses may result in circulatory disturbances, diarrhea, and central nervous system depression. Estimated fatal dose is 0.5 to > 5g/kg.
Skin Contact:
May cause irritation.
Eye Contact:
May cause irritation, redness and pain.
Chronic Exposure:
No information found.
Aggravation of Pre-existing Conditions:
Some individuals are said to be dangerously sensitive to minute amounts of sulfites in foods and some bronchodilator medicines preserved with sulfites. Symptoms may include broncho constriction, shock, gastrointestinal disturbances, angio edema, flushing, and tingling sensations.

4. First Aid Measures

Inhalation:

Remove to fresh air. Get medical attention for any breathing difficulty.
Ingestion:
Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Call a physician immediately.
Skin Contact:
Remove any contaminated clothing. Wash skin with soap and water for at least 15 minutes. Get medical attention if irritation develops or persists.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:
Not considered to be a fire hazard. If involved in a fire, can emit toxic fumes and irritating and corrosive gases.
Explosion:
Not considered to be an explosion hazard.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal.

7. Handling and Storage

Keep in a tightly closed container. Protect from physical damage. Store in a cool, dry, ventilated area away from sources of heat, moisture and incompatibilities. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-ACGIH Threshold Limit Value (TLV):
5mg/m3 (TWA) for sodium bisulfite & for sodium metabisulfite, A4 Not classifiable as a human carcinogen.
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a half facepiece particulate respirator (NIOSH type N95 or better filters) may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest.. A full-face piece particulate respirator (NIOSH type N100 filters) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection:
Wear protective gloves and clean body-covering clothing.
Eye Protection:
Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
White crystals.
Odor:
Odorless.
Solubility:
Soluble in ca. 3.2 parts water.
Specific Gravity:
2.6 @ 15.4C (60F)
pH:
ca. 9
% Volatiles by volume @ 21C (70F):
0
Boiling Point:
Not applicable.
Melting Point:
No information found.
Vapor Density (Air=1):
No information found.
Vapor Pressure (mm Hg):
No information found.
Evaporation Rate (BuAc=1):
No information found.

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Heat and moisture contribute to instability. May air-oxidize.
Hazardous Decomposition Products:
Burning may produce sulfur oxides.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Acids, strong oxidizers, high temperatures.
Conditions to Avoid:
Heat and moisture.

---

11. Toxicological Information

Oral mouse LD50: 820 mg/kg. Investigated as a tumorigen and mutagen.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Sodium Sulfite (7757-83-7)	No	No	3

---

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

---

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

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14. Transport Information

Not regulated.

---

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------

Ingredient	TSCA	EC	Japan	Australia
Sodium Sulfite (7757-83-7)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\----------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Sodium Sulfite (7757-83-7)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Sodium Sulfite (7757-83-7)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\----------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Sodium Sulfite (7757-83-7)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: No Fire: No Pressure: No
Reactivity: No (Pure / Solid)

Australian Hazchem Code: None allocated.
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: 2 Flammability: 0 Reactivity: 0
Label Hazard Warning:
WARNING! HARMFUL IF SWALLOWED. MAY CAUSE ALLERGIC REACTION AND BREATHING DIFFICULTIES. MAY CAUSE IRRITATION TO SKIN, EYES, AND RESPIRATORY TRACT.
Label Precautions:
Avoid breathing dust.
Avoid contact with eyes, skin and clothing.
Wash thoroughly after handling.
Keep container closed.
Use with adequate ventilation.
For Reagent and Technical Grades: Not For Food Use.For TAC Grades: Do not use in meats or in foods recognized as a source of Vitamin B-1, nor in fruits or vegetables to be served or sold raw to consumers or to be presented to consumers as fresh.
Label First Aid:
If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. If inhaled, remove to fresh air. Get medical attention for any breathing difficulty. In all cases call a physician.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 3.
Disclaimer:
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****
Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

A ALKEMIN
Alkemin,S.de R.L.de C.V.

Material Safety Data Sheet

KI - 11 Xanthate

MSDS Number: AL127 DATE: 5/2/02 7 Pages

Section 1: CHEMICAL PRODUCT and COMPANY IDENTIFICATION

1.1 Product Name ..... **KI - 11 Xanthate**
Chemical Family ..... Xanthates; carbonodithioic acid salt
Synonyms ..... Sodium isopropyl xanthate; SIPX; carbonic acid, dithio-0-isopropyl ester, sodium salt; carbonodithioic acid, 0-(1-methylethyl) ester, sodium salt.
Formula ..... C_4H_7 $NaOS_2$

1.2 Manufacturer .....ALKEMIN, S. de R.L. de C.V.
2480 W. Twin Buttes road
Sahuarita, Arizona 85629
Information .....(520) 791-2940

1.3 Emergency Contact ..... (800) 877-1737 (ALKEMIN)

(800) 424-9300 (CHEMTREC)

Section 2: COMPOSITION, INFORMATION ON INGREDIENTS

2.1 Chemical Ingredients (% by wt.)

		solid	Solution
Sodium isopropyl xanthate	CAS #:140-93-2	87%	8-28%
Water	CAS #:7732-18-5	3% Max	72-92% Max

(See Section 8 for exposure guidelines)

Section 3: HAZARDS IDENTIFICATION

NFPA:	**Health - 1**	**Flammability - 1**	**Reactivity - 1**	**(Solid)**
	Health - 2	**Flammability - 2**	**Reactivity - 1**	**(Solution)**

EMERGENCY OVERVIEW

Caution: Liquid solution is strongly alkaline. Eye contact will result in mild to severe eye irritation . Contact with the skin will result in mild to severe burns of the skin. Ingestion of product will irritate mouth, throat and gastrointestinal tract. Inhalation of product vapors, mist or dust may cause irritation of respiratory airways.

Section 3: HAZARDS IDENTIFICATION (Cont.)

3.1 POTENTIAL HEALTH EFFECTS

EYE: Contact with the eyes by product solution may cause mild to severe irritation and a burning sensation.

SKIN CONTACT: Skin contact with highly alkaline solution may result in mild to severe skin irritation.

SKIN ABSORPTION: Absorption is unlikely to occur.

INGESTION: Ingestion of product may cause mild to severe irritation of mouth, throat and gastrointestinal tract including nausea, vomiting and diarrhea. Xanthates have a low oral toxicity to humans.

INHALATION: Inhalation of product mist or dust may cause irritation of the nose, throat and respiratory tract.

CHRONIC EFFECTS/CARCINOGENICITY: Not listed as a carcinogen by NTP, IARC or OSHA. Xanthate salts may cause irritation of the respiratory tract.

Section 4: FIRST AID MEASURES

4.1 EYES: Immediately flush with large quantities of water for 15 minutes. Hold eyelids apart during irrigation to insure thorough flushing of the entire area of the eye. Obtain immediate medical attention.

4.2 SKIN: Immediately flush with large quantities of water. Remove contaminated clothing under a safety shower. Obtain medical attention if any irritation occurs.

4.3 INGESTION: If victim is conscious, have victim rinse mouth thoroughly with water. DO NOT INDUCE VOMITING. Have victim drink a glass of water. If vomiting occurs naturally, have victim lean forward to avoid aspiration. Repeat administration of water. Obtain immediate medical attention.

4.4 INHALATION: Remove victim from contaminated atmosphere. If breathing is labored, administer oxygen. If breathing has ceased, clear airway and start mouth to mouth resuscitation. If heart has stopped beating, external heart massage should be applied. Obtain medical attention.

Section 5: FIRE FIGHTING MEASURES

5.1 FLAMMABLE PROPERTIES

FLASH POINT: 125° - 126°F (52°C)	KI - 11 solution	**METHOD USED**: Closed cup
FLASH POINT: -22°F (-30°C)	Carbon disulfide	**METHOD USED:** Closed cup

5.2 FLAMMABLE LIMITS (Carbon disulfide) **LFL**: 1.3% **UFL**: 50%

5.3 EXTINGUISHING MEDIA: Carbon dioxide, dry chemical or foam

Section 5: FIRE FIGHTING MEASURES (Cont.)

5.4 FIRE & EXPLOSIVE HAZARDS: Xanthates upon aging, heating or exposure to moisture will generate carbon disulfide (CS_2) vapors and spontaneous combustion can occur. Heating of xanthate products will also form carbon disulfide vapors. Storage containers should be equipped with a forced exhaust to prevent buildup of these vapors. Storage containers should be carefully grounded.

Keep storage containers involved in a fire cooled with water spray. Heating will form CS_2 vapors.

5.5 FIRE FIGHTING EQUIPMENT: As in any fire, wear self-contained breathing apparatus, positive pressure, MSHA/NIOSH (approved or equivalent) and full protective gear.

Section 6: ACCIDENTAL RELEASE MEASURES

6.1 Small releases: The product is readily soluble in water but should not be flushed down drains or used to help clean up spills (evolution of CS2 vapors). Sweep up small spills of solid product. Confine and absorb small liquid releases on sand earth or other inert absorbent. Pick up contaminated soil in labeled containers for disposal in chemical waste landfills.

6.2 Large releases: Confine area to qualified personnel. Extinguish or remove all ignition sources. Shut off release if safe to do so. Dike spill area to prevent runoff into sewers, drains or surface waterways (potential aquatic toxicity). Recover as much of the solution as possible. Treat remaining material as a small release.

Section 7: HANDLING and STORAGE

7.1 Handling: Avoid contact with eyes. Use only in a well ventilated area. Wash thoroughly after handling. Avoid prolonged or repeated breathing of vapors or dust. Avoid prolonged or repeated contact with the skin. Ground drums and bond transfer containers (grounding clips must contact bare metal). (See Section 5, for fire dangers) Use caution opening containers with xanthates of unknown age (CS_2 vapor accumulation).

7.2 Storage: Store in cool, dry, well ventilated areas. Do not store combustibles in the area of storage vessels. Keep away from any sources of heat or flame. Store tote and smaller containers out of direct sunlight at moderate temperatures. Storage containers should be properly grounded. (See Section 10.4 for materials of construction)

Section 8: EXPOSURE CONTROLS, PERSONAL PROTECTION

8.1 RESPIRATORY PROTECTION: None generally required. If conditions exist where dust or mist may be generated, a NIOSH/MSHA approved mist respirator should be worn. If CS_2 vapors are present an appropriate respirator according to the concentration should be used.

8.2 SKIN PROTECTION: Neoprene rubber gloves, apron and boots (as appropriate) should be worn to prevent repeated or prolonged contact with the liquid. Wash any contaminated clothing prior to reuse.

Section 8: EXPOSURE CONTROLS, PERSONAL PROTECTION (Cont.)

8.3 EYE PROTECTION: Chemical goggles and preferably a full face shield.

Maintain an eyewash/safety shower in immediate work areas.

8.4 EXPOSURE GUIDELINES:

	OSHA		ACGIH	
	TWA	STEL	TLV	STEL
Carbon disulfide	20 ppm	30 (ceiling)	10 ppm	NA

8.5 ENGINEERING CONTROLS: Engineering control methods to reduce hazardous vapor exposure are preferred. Methods include mechanical ventilation (dilution and local exhaust) and process control.

Section 9: PHYSICAL and CHEMICAL PROPERTIES

	Solid	Solution
9.1 APPEARANCE:	Light green to beige pellets	Dark orange to amber liquid.
9.2 ODOR:	No noticeable odor	strong organic odor
9.3 BOILING POINT:	Not Applicable	233° F (112° C)
9.4 VAPOR PRESSURE:	Not Applicable	Not determined
9.5 VAPOR DENSITY:	Not Applicable	Not determined
9.6 SOLUBILITY IN WATER:	Complete	Complete
9.7 SPECIFIC GRAVITY:	1.08	1.00 - 1.14 (8.33 - 9.5 lbs/gal)
9.8 FREEZING POINT:	Not Applicable	Not determined
9.9 pH:	Not applicable	10 - 12.5
9.10 VOLATILE:	Not applicable	Not determined

Section 10: STABILITY and REACTIVITY

10.1 STABILITY: This is a stable material

10.2 HAZARDOUS POLYMERIZATION: Will not occur

10.3 HAZARDOUS DECOMPOSITION PRODUCTS: Carbon disulfide, trithiocarbonate, isopropyl alcohol.

10.4 INCOMPATIBILITY: Strong oxidizers can cause fire or explosions. Acids will accelerate the hydrolysis of xanthates. Xanthates are not compatible with copper, or its alloys (i.e. bronze, brass, etc.). These materials should not be used in handling systems or storage containers. (SEE Section 7.2, Storage)

Section 11: TOXICOLOGICAL INFORMATION

11.1 ORAL: Parenteral-mouse LD_{LO}: 600 mg/kg

11.2 DERMAL: Data not available

11.3 INHALATION: Data not available

11.4 CHRONIC/CARCINOGENICITY: No evidence available

11.5 TERATOLOGY: Data not available

11.6 REPRODUCTION: Data not available

11.7 MUTAGENICITY: Data not available

Section 12: ECOLOGICAL INFORMATION

Rainbow trout: FW: 96 hr: LC_{50}: 18-20 mg/L
Rainbow trout: toxicity range: 100-180 mg/L
Rainbow trout: lethality: 180 mg/L

Section 13: DISPOSAL CONSIDERATIONS

Solid xanthates do not meet the criteria for a hazardous waste as specified in 40 CFR 261. KI-11 solutions may have a pH of 12.5, which meets the criteria for a DOO2, corrosive waste and a flash point of 125°F which meets the criteria of a D001 characteristic waste. Consult state and local regulations for different or more restrictive disposal regulations.

Section 14: TRANSPORT INFORMATION

	Solid	Solution
14.1 DOT Shipping Name:	Self heating, solid, organic, n.o.s.	Corrosive liquids, flammable, n.o.s.
14.2 DOT Hazard Class:	4.2	8
14.3 UN/NA Number:	UN3088	UN 2920
14.4 Packing Group:	III	II
14.5 DOT Placard:	Spontaneously combustible	Corrosive
14.6 DOT Label(s):	Spontaneously combustible	Corrosive, flammable

Section 14: TRANSPORT INFORMATION, Cont.

14.7 IMO Shipping Name:	Self heating, solid, organic, n.o.s.	Corrosive liquids, flammable, n.o.s.
14.8 Reportable Quantity:	NA	NA
14.9 RR STCC Number:	NA	NA

Section 15: REGULATORY INFORMATION

15.1 OSHA: This product is listed as a hazardous material under criteria of the Federal OSHA Hazard Communication Standard, 29 CFR 1910.1200.

15.2 **SARA TITLE III**

a. **EHS** (Extremely Hazardous Substance) List: No

b. Section 311/312, (Tier I,II) Categories:

Immediate (acute)	Yes
Fire	Yes
Sudden release	No
Reactivity	Yes
Delayed (chronic)	No

c. Section 313 (Toxic Release Reporting-Form R): No

Chemical Name	CAS Number	Concentration
NA		

d. **TPQ** (Threshold Planning Quantity): No

15.3 CERCLA/SUPERFUND:

RQ (Reportable Quantity) No

15.4 TSCA (Toxic Substance Control Act) Inventory List: Yes

15.5 RCRA (Resource Conservation and Recovery Act) Status: D001, D002,(solution)

15.6 WHMIS (Canada) Hazard Classification: B6 (solid) E, B3 (solution)

15.6A. Canadian DSL/NDSL No

15.7 DOT Hazardous Material: (See Section 14) Yes

15.8 CAA Hazardous Air Pollutant (HAP) No

15.9 European EINECS/ELINCS No. 205-443-5

Section 16: OTHER INFORMATION

REVISIONS: The entire MSDS was reformatted to comply to ANSI Standard Z400.1-1993, by Technical Services-Tessenderlo Kerley, Inc.

Revised 5/2/02. Revised Section 8.3, Eye Protection

THE INFORMATION PUBLISHED IN THIS MATERIAL SAFETY DATA SHEET HAS BEEN COMPILED FROM OUR EXPERIENCE AND OSHA, ANSI, NFPA, DOT, ERG, AND CHRIS. IT IS THE USER'S RESPONSIBILITY TO DETERMINE THE SUITABILITY OF THIS INFORMATION FOR THE ADOPTION OF NECESSARY SAFETY PRECAUTIONS. WE RESERVE THE RIGHT TO REVISE MATERIAL SAFETY DATA SHEETS PERIODICALLY AS NEW INFORMATION BECOMES AVAILABLE.

SODIUM CARBONATE ANHYDROUS

MSDS Number: S3242 — *Effective Date: 06/30/98*

1. Product Identification

Synonyms: Carbonic acid, disodium salt; disodium carbonate; soda ash
CAS No.: 497-19-8
Molecular Weight: 105.99
Chemical Formula: Na_2CO_3
Product Codes:
J.T. Baker: 3602, 3604, 3605, 4502, 4923, 5198, 5834
Mallinckrodt: 1338, 7468, 7521, 7527, 7528, 7698

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Sodium Carbonate	497-19-8	99 - 100%	Yes

3. Hazards Identification

Emergency Overview

DANGER! MAY CAUSE EYE BURNS. HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN AND RESPIRATORY TRACT.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 1 - Slight
Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES
Storage Color Code: Orange (General Storage)

Potential Health Effects

Inhalation:
Inhalation of dust may cause irritation to the respiratory tract. Symptoms from excessive inhalation of dust may include coughing and difficult breathing. Excessive contact is known to cause damage to the nasal septum.
Ingestion:
Sodium carbonate is only slightly toxic, but large doses may be corrosive to the gastro-intestinal tract where symptoms may include severe abdominal pain, vomiting, diarrhea, collapse and death.
Skin Contact:
Excessive contact may cause irritation with blistering and redness. Solutions may cause severe irritation or burns.
Eye Contact:
Contact may be corrosive to eyes and cause conjuctival edema and corneal destruction. Risk of serious injury increases if eyes are kept tightly closed. Other symptoms may appear from absorption of sodium carbonate into the bloodstream via the eyes.
Chronic Exposure:
Prolonged or repeated skin exposure may cause sensitization.
Aggravation of Pre-existing Conditions:
No information found.

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
Ingestion:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
Immediately flush skin with plenty of soap and water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical

attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

Note to Physician:
Consider endoscopy in all suspected cases of sodium carbonate poisoning. Perform blood analysis to determine if dehydration, acidosis, or other electrolyte imbalances occurred.

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5. Fire Fighting Measures

Fire:
Not considered to be a fire hazard.
Explosion:
Not considered an explosion hazard, but sodium carbonate may explode when applied to red-hot aluminum.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire.
Special Information:
Use protective clothing and breathing equipment appropriate for the surrounding fire.

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6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal.

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7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

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8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
None established.
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
For conditions of use where exposure to the dust or mist is apparent, a half-face dust/mist respirator may be worn. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection:
Wear protective gloves and clean body-covering clothing.
Eye Protection:
Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

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9. Physical and Chemical Properties

Appearance:
White powder or granules.
Odor:
Odorless.
Solubility:
45.5 g/100 ml water @ 100C (212F)
Specific Gravity:
2.53
pH:
11.6 Aqueous solution
% Volatiles by volume @ 21C (70F):
0

Boiling Point:
Decomposes.
Melting Point:
851C (1564F)
Vapor Density (Air=1):
No information found.
Vapor Pressure (mm Hg):
No information found.
Evaporation Rate (BuAc=1):
No information found.

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Hygroscopic. Readily absorbs moisture from the air. Solutions are strong bases.
Hazardous Decomposition Products:
Oxides of carbon and sodium oxide.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Fluorine, aluminum, phosphorous pentoxide, sulfuric acid, zinc, lithium, moisture, calcium hydroxide and 2,4,6-trinitrotoluene.
Reacts violently with acids to form carbon dioxide.
Conditions to Avoid:
Moisture, heat, dusting and incompatibles.

11. Toxicological Information

For Sodium Carbonate:
Oral rat LD50: 4090 mg/kg; inhalation rat LC50: 2300 mg/m3/2H; irritation eye rabbit: 50 mg severe; investigated as a mutagen, reproductive effector.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Sodium Carbonate (497-19-8)	No	No	None

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------

Ingredient	TSCA	EC	Japan	Australia
Sodium Carbonate (497-19-8)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\----------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Sodium Carbonate (497-19-8)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Sodium Carbonate (497-19-8)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\----------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Sodium Carbonate (497-19-8)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: No Fire: No Pressure: No
Reactivity: No (Pure / Solid)

Australian Hazchem Code: No information found.
Poison Schedule: S5
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: **2** Flammability: **0** Reactivity: **0**
Label Hazard Warning:
DANGER! MAY CAUSE EYE BURNS. HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN AND RESPIRATORY TRACT.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Avoid breathing dust.
Keep container closed.
Use with adequate ventilation.
Wash thoroughly after handling.
Label First Aid:
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. Get medical attention for any breathing difficulty. In all cases, get medical attention.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 3, 8, 16.
Disclaimer:
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