Application

Kennecott
Eagle Minerals

Humboldt Mill

Mining Permit Application
Volume IIA

Environmental Impact Assessment
Appendix B-1 (1 of 5)

Project I.D.: 06W003

Kennecott Eagle Minerals Company
Ishpeming, Michigan

December 2008

Foth

Appendix B

Humboldt Mill Hydrology and Mill Investigation Studies

B-1

Humboldt Mill Hydrogeological Report

Report

Kennecott
Eagle Minerals

Humboldt Mill
Hydrogeological Report

Project I.D.: 06W003

Kennecott Eagle Minerals Company
Marquette, Michigan

October 2007

Foth

Humboldt Mill

Hydrogeological Report

Project ID: 06W003

Prepared for

Kennecott Eagle Minerals Company

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Prepared by

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Humboldt Mill
Hydrogeological Report

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Ag	silver
AgCl	silver chloride
AST	Aboveground storage tank
ASTM	American Society for Testing and Materials
BEA	Baseline Environmental Assessment
bgs	Below Ground Surface
CCI	Cleveland Cliffs, Inc.
cfs	cubic feet per second
cm^2	Square Centimeters
COC	Chain-of-Custody
DCC	R 299.5746 Direct Contact Criteria
DO	dissolved oxygen
DWC	R 299.5744 Residential Groundwater Drinking Water Criteria
DWPC	R 299.5746 Soil Drinking Water Protection Criteria
EIA	Environmental Impact Assessment
EPA	United States Environmental Protection Agency
EQL	Estimated Quantitation Limit
ESA	Environmental Site Assessment
ft	feet
FOIA	Freedom of Information Act
Foth	Foth Infrastructure & Environment, LLC
GPS	Global Positioning System
GSIC	Groundwater Surface Water Interface Criteria
GSIPC	Groundwater Surface Water Interface Protection Criteria
HSA	Hollow Stem Auger
HTDF	Humboldt Tailings Disposal Facility
KEMC	Kennecott Eagle Minerals Company
MDEQ	Michigan Department of Environmental Quality
m^3	cubic meters
MPC	Minerals Processing Corporation
MSL	Mean Sea Level
NJC	North Jackson Company
NPDES	National Pollutant Discharge Elimination System
NREPA	National Resources and Environmental Protection Act, 1994 PA 451, as Amended
ORP	Oxidation Reduction Potential
PAH	Polynuclear aromatic hydrocarbons
pH	- Log [H+]
PCB	Polychlorinated biphenyl
ppm	parts per million
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RTK	Real time kinematics

SCA	Sundberg, Carlson and Associates, Inc.
SPT	Standard Penetration Test
SPLP	Synthetic Precipitation Leaching Procedure
TCLP	Toxicity Characteristic Leaching Profile
TES	Traverse Engineering Services
US	United States
USGS	United States Geologic Survey
UST	Underground Storage Tank
VOC	Volatile Organic Compound

1 Introduction

Kennecott Eagle Minerals Company (KEMC) is preparing to use the former Humboldt Mine and Humboldt Mill (Mill) for processing ore from the Eagle Mine and disposing the tailings into the existing Humboldt Tailings Disposal Facility (HTDF). On behalf of KEMC, Foth Infrastructure & Environment, LLC (Foth) has conducted a series of environmental investigations at the site between March 2006 and August 2007. The former Humboldt Mine and Mill, located at 4567 County Road 601, Marquette County, Michigan and adjacent property was operated by the Cleveland Cliffs, Inc. (CCI) iron mining operations between 1954 and 1973. Taconite pellet production continued at the facility until 1979 with taconite from the nearby Republic Mine. Callahan Mining Corporation processed gold ore from the Ropes Mine at the former Humboldt Mill from 1984 through 1989 and deposited mill tailings and processed pyrite concentrate into the HTDF throughout the period. Historical environmental investigations have been researched, evaluated and included in this report to present an environmental history of more than twenty years for this site. This report will describe the historic and current environmental conditions of the site divided into two general areas. The area acquired or to be acquired by KEMC will be referred to as the Project Site. The Mill refers to the southern portion of the Project Site, including the mill buildings and the surrounding area. The northern portion of the Project Site, referred to as the HTDF area, includes the HTDF and the immediate, surrounding area.

The Project Site is located at 4567 County Road 601 in Humboldt Township, Marquette County, Michigan, about 24 miles west of the City of Marquette (Figure 1-1). Major highways leading to the 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 is from County Road 601, which intersects State Highway 95.

The terrain of western Marquette County can be characterized as low areas, comprised of lakes, streams, wetlands and isolated sand plains, separated by rugged, bedrock-supported ridges (Figure 1-2). Regional surface water drainage in the area is controlled by topography and bedrock outcroppings. In the area of the Mill surface water drains into small creeks and rivers that flow through the wetlands. Surface water drainage is generally to the south entering the Escanaba River or Black River. The Black River is a tributary of the Escanaba River. Figure 1-3 displays the regional drainage system and watersheds. The Middle Branch of the Escanaba River drains the northern half of the Project Site that includes the existing HTDF, then turns to the southeast flowing to Lake Michigan. Approximately 1.5 mile southwest of the site, Mud Lake empties into what is referred to in this report as the West Branch of the Black River, which flows through Iron Ore Tailings Basin West before turning south to enter the Main Branch of the Black River, south of the Project Site. The iron tailings ponds situated southeast of the Mill do not currently have a surface outflow. However, if the surface elevations of those ponds were higher, both would drain to Lake Lory. The outlet of Lake Lory drains into the Black River, which flows to the southwest, then to the southeast before it empties into the Middle Branch of the Escanaba River.

Isolated, flooded wetlands can be found on the ridge in the northern portion of the Project Site, east of the former pellet plant, and south of the mill buildings. The flooded wetland south of the Mill flows to the west in what appears to be a man-made ditch, eventually flowing into the West Branch of the Black River. The Mill is located in a relatively low area bordered on the north by a steep ridge with many bedrock outcrops.

The hydrogeological investigation of the Project Site and surrounding area was completed per American Society for Testing and Materials (ASTM) standards.

1.1 Purpose and Scope of the Hydrogeological Report

The purpose of this report is to assess the baseline hydrogeologic conditions of the Project Site and surrounding area, prior to construction and operation of the proposed facility. This report documents baseline conditions in and around the Project Site, based on investigations beginning in 1984 through August 2007. These investigations encompass field and laboratory analysis of soils, groundwater, surface water and other media on the Project Site and the surrounding area.

In addition to the documentation of baseline hydrogeologic conditions, the findings of these investigations have revealed specific areas where elevated concentrations of naturally occurring metals can be found and historic industrial impacts have occurred. This report will show that the degree of environmental impact of some of these areas has attenuated over time. Other areas continue to exhibit soil, groundwater or surface water characteristics typical of historic industrial mining activities. This report presents baseline hydrogeologic data for the Project Site and surrounding area and detailed information related to specific areas outlined below. As such, the scope of this report includes the following:

- Research and review of historic environmental investigations at the Project Site,
- Compilation and assessment of geologic, hydrogeologic and environmental data from the historic reports,
- Geologic and hydrogeologic investigation of the areas with historic mining related impacts,
- Geologic and hydrogeologic investigation of the Project Site and surrounding area,
- Collection and analysis of soil samples from selected locations via soil borings,
- Collection and analysis of groundwater samples from monitoring wells,
- Collection of surface water and sediment samples, at and surrounding the Project Site,

1.2 Areas of Investigation

A planimetric map of the Project Site and existing topographic conditions and structures is shown in Figure 1-4. Given the aerial extent of the Project Site, historic and existing environmental impacts and areas of investigation have been grouped into areas of investigation, as displayed on Figure 1-5. Sections 1.2.1 through 1.2.8 summarize these areas of investigation.

1.2.1 Office/Maintenance Building

The office/maintenance building includes office space, a laboratory and the vehicle maintenance shop. Gasoline and diesel fuel were stored in underground storage tanks (USTs) near the northeast corner of this building and vehicle maintenance took place in the western half of the building.

1.2.2 Fuel Oil AST

During the site inspection, Foth investigators observed a sandy area, with sparse vegetation, surrounded by a rectangular berm, to the east of the pellet plant. Review of the historic aerial photographs of the Project Site revealed a large aboveground storage tank (AST) situated adjacent to the east side of the former taconite pellet plant.

1.2.3 Pyrite Stockpile Area

This area is located immediately south of the mill buildings. It was used for storage of process materials.

Pyritic gold ore, gold-bearing pyrite concentrate, and pyrite leach residue were stockpiled south of the mill building and office/maintenance areas. Previous environmental investigations (Sundberg, Carlson and Associates {SCA}, 1996) identified this area as a source of metal concentrations in groundwater. Past surface water samples obtained from this area also contained elevated metal concentrations.

1.2.4 Buried Pyrite and Truck Scale Area

Pyritic flotation concentrate was buried in a trench, north of the main access road to the Mill. It was noted during site visits that yellow-orange staining of the paved roadway adjacent to the pyrite trench has occurred. Some of the vegetation on the other side of the roadway appears to be stressed. Historic samples of soil collected from this location identified elevated concentrations of several metals. Elevated concentrations of metals at the truck scale area were also noted in historic soil samples.

1.2.5 Septic Drainfield and Stormwater Outfall

Based on historical records and interviews with the current property owner, the floor drains were connected to the sanitary sewer which discharged into a drain field south of the Mill. During the field inspection, a storm water or process water outfall was identified which formerly discharged into a wetland adjacent to the septic field. It is unknown whether this discharge point originated from stormwater runoff in the vicinity of the Mill, the office and maintenance shop or both.

1.2.6 Iron Ore Tailings Basins

Two large iron ore tailings storage facilities are located approximately 1,400 feet (ft) southeast of the mill buildings. These facilities may be characterized as monofills of relatively inert material, the actual environmental impact to the groundwater and surface water was a topic of this investigation.

1.2.7 Humboldt Tailings Disposal Facility

Processed material from the milling of gold ore from the Ropes Mine was deposited in the HTDF from 1985 through 1989. The HTDF was created when iron ore extraction from the Humboldt open pit mine ceased and the pit was allowed to fill with water. Historic environmental investigations from 1984 through the present have shown that high concentrations of various metals and other compounds can be found in groundwater and surface water.

1.2.8 Regional Surface Water

Documentation of current conditions of regional surface resources is a requirement in the preparation of an Environmental Impact Assessment (EIA) as outlined in R 425.202. Lakes, ponds, wetlands, streams and man-made drainages were investigated and the findings are included in this document.

2 Regional Setting

2.1 Topography

The Project Site is located in the Humboldt Township, in western Marquette County (Figure 1-2). The area is characterized by rugged bedrock ridges, separated by sand plains, wetlands and lakes. The highest elevation in the vicinity can be found on the ridge in the north half of Section 11, T47N, R29W, approximately 1760 ft above mean sea level (MSL). The lowest elevation, approximately 1539 ft above MSL, occurs at the HTDF, which bisects the ridge in the north half of Section 11. Most of the land around the mill buildings has been raised up to the existing grade, to produce a generally flat, south sloping surface, approximately 1600 ft above MSL (Figure 2-1).

To the northwest of the mill buildings is a large, water–filled former open pit iron mine used for storage of Ropes Mine tailings, known as the HTDF. Southeast of the HTDF lies a small mined out iron ore pit, that may be water-filled during the spring and extended wet periods, but is otherwise dry. Lean iron ore and development rock taken from the Humboldt Mine is stored in two separate locations, forming flat-topped hills that rise up to 150 ft above the existing terrain. One is located adjacent to the northwest edge of the HTDF and the other is located southwest of the HTDF (Figure 2-1). Tailings produced from the processing of iron ore have been deposited in topographic depressions to the east and west of the Mill, forming broad, south sloping plains. The tailings basins southeast of the mill buildings are surrounded by man-made stone berms, constructed between isolated upland areas.

2.2 Geology

The Project Site is located in the western half of the Upper Peninsula dominated by Precambrian Rocks covered by a variable thickness of unconsolidated glacial sediments. The former Humboldt Mine is located in the Marquette Range, a mining district more than 25 miles long. Iron ore has been mined in this district for more than 160 years. In addition to iron, there are more than 20 known metal occurrences north of the Marquette Range, in an area known as the Northern Complex.

Lead, zinc and silver veins are most common. There are also many gold occurrences in the Northern Complex, some of which have been mind in the past. Other trace metals commonly occur with these deposits and they may be locally abundant, including antimony, boron, copper, molybdenum, silver and nickel.

The geology of the former Humboldt Mine and area of the Mill, shown in Figure 2-2, was mapped in detail by the United States Geological Survey (U.S.G.S.) in 1975 as part of the Republic Quadrangle (Cannon, 1975). Bedrock in this area consists of Archean granitic gneiss in fault contact with younger, Lower Proterozoic sediments intruded by diabase dikes and sills that have been folded and metamorphosed. The metamorphosed sedimentary and intrusive rocks form the highest ridges. The rocks include quartzite, iron formation, minor slate and the intruded diabase, that are complexly folded, but generally form an anticline which plunges to the west and hosts the iron ore deposit that was mined from the Humboldt Pit that forms the HTDF.

The stratigraphy in the vicinity of the Humboldt Pit consists of the Negaunee Iron formation divided into a thin, upper hematite-rich oxide facies and a lower, thicker cherty silicate iron formation. Both units are generally evenly bedded, recrystallized and may display a strong

foliation. The iron formation is unconformably overlain by the Goodrich quartzite, which, in the HTDF consists predominantly of thick lenses of basal conglomerate. Clasts in the conglomerate range from angular to sub rounded iron formation and other sedimentary rocks, along with well rounded pebbles and cobbles of vein quartz. The matrix is completely silicified and is dominated by fine grained quartz with accessory muscovite, hematite and magnetite with little or no feldspar. Both have been intruded by a medium to coarse grained diabase that generally forms concordant masses. All of these rocks were then folded and metamorphosed, and contacts between the intrusive rocks and iron formation were commonly sheared. This folded sequence forms a prominent east-west ridge through the northern portion of the Project Site that rises more than 200 ft above the lowlands to the north and south and generally forms an anticline that plunges to the west.

The deformation and foliation of these rocks has served to produce a weakly jointed bedrock surface. Sheared and recrystallized contacts at depth would likely limit joint propagation. Typically, recrystallized formations without a well developed joint network would be very poor groundwater producers.

The bedrock is overlain by a complex sequence of unconsolidated glacial and post glacial material that is generally thinner over the bedrock ridges and thicker in the adjacent valleys. Differential erosion at the contact between the iron formation and quartzite produced a narrow pass that cut across the prominent east-west trending ridge. At the end of the last glaciation, this ridge acted as a dam, inhibiting the flow of glacial meltwater southward. The pass localized a post-glacial stream channel that enhanced this valley and deposited wedges of alluvial sediments at the north and south ends of the valley. Till and outwash are the most common unconsolidated formations. Peat and lacustrine deposits underlie in the area of the Mill. Both are generally thinner over the ridge and thicker where it occurs in the valleys.

Figure 2-3 shows a generalized geologic cross section of the Project Site. The former Humboldt Mine was developed in a post-glacial stream channel that cut through the bedrock ridge. Previous subsurface environmental investigations (SCA, 1992, 1996) have documented the presence of a buried swamp, or wetland in the area south of the mill buildings. According to these reports, this area was backfilled to facilitate construction of the Mill.

Iron mining at the former Humboldt Mine created a pit approximately 350 ft deep. While the mine was operating, stormwater and groundwater that entered the pit was removed by pumping. After mining ceased, groundwater and surface water was allowed to fill the pit. The open pit created a local cone of depression in the water table both north and south of the pit, and groundwater and surface water was allowed to fill the pit. Once the pit had filled to a static level, this new local watershed discharged to the north. Surface recharge is predominantly from the east and west flanks of the pit, while groundwater recharge is from the unconsolidated aquifer south of the pit, which formerly had flowed to the south. Flow out of the HTDF drains to the north and enters the Middle Branch of the Escanaba River. A rock and earthen berm was constructed on the north end of the HTDF by CCI to regulate flow out of the flooded mine pit before it was used as a tailings disposal facility. TES (1984) indicated two culverts were constructed to regulate the flow out of the pit.

The findings of this hydrogeological investigation indicate a complex assemblage of glacial till, glacial outwash and at least one peat horizon overlying bedrock. Precambrian bedrock is exposed

in several areas on the Project Site, including the ridge immediately north of the Mill, 150 ft south of the Mill/Office building, and west of Iron Ore Tailings Basin South. Depth to groundwater varies from less than 10 ft below ground surface (bgs) east of the mill building, to greater than 30 ft bgs near the HTDF. Groundwater flow across the area of the Mill is to the west and southwest, where it is captured by the wetland ponds in that area and eventually enters the Black River. However, groundwater at the western side of the area of the Mill is captured by the HTDF and flows into the HTDF. Water in the HTDF discharges through the subsurface and surface seeps at the northern face of the HTDF, an area that drains to the Middle Branch Escanaba River.

The relationship among the unconsolidated formations is complicated by the extensive back filling of low areas prior to and during construction of the former 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 fill low-lying areas, and waste rock taken out of the former Humboldt Mine. In many cases, it is difficult to distinguish sand, gravel and rock that have been used as fill from similar material that is found in place.

Undisturbed soils surrounding the vicinity are identified as the Rubicon sand. The soils are deep, well drained to excessively drained sands and gravels. The soils have very high to high hydraulic conductivity and low water holding capacity.

2.3 Hydrology

2.3.1 Groundwater

Groundwater in this area primarily occurs in the unconsolidated deposits overlying the bedrock. The bedrock formations in this area consist of igneous intrusive rocks and metamorphosed and recrystallized sedimentary rocks, and typically have very low incipient permeability. In general groundwater in consolidated formations in this area occurs along isolated fractures, joints and openings along bedding planes. Groundwater flow rates vary widely depending on the hydraulic conductivity of the hosting material and can occur under water table or artesian conditions. In the unconsolidated formations, although artesian conditions may occur locally, due to stratified glacial drift with low permeability horizons, the upper surface of the groundwater in this area is generally unconfined and is subject to atmospheric pressure. Groundwater is recharged from precipitation and drainage from higher elevations, which in this area are generally bedrock ridges that contain only a thin veneer of unconsolidated material, whereby runoff drains down to the glacial drift-filled valleys.

The HTDF was developed in a narrow valley, floored by iron-rich rocks, that cuts through a ridge of silicified, dense, recrystallized sedimentary and mafic intrusive rocks. The east and west sides of the HTDF are essentially poorly fractured bedrock overlain by a thin, patchy till, and provides very little observed subsurface inflow into the pit. The predominant groundwater flow into the pit is from the south, through more than forty feet of sand and gravel outwash.

Groundwater flows out of the north end of the HTDF, through a similar thickness of outwash and enters a wetland, before discharging to the Middle Branch of the Escanaba River

2.3.2 Surface Waters

Western Marquette County is drained by a network of small to medium sized streams which generally flow to the southeast, eventually emptying into Lake Michigan. The primary streams in

this area are the Middle Branch of the Escanaba River and the Black River. Large lakes are uncommon, but smaller lakes are abundant, connected by the stream network. The larger lakes in the area include Lake Michigamme, Lake Lory and the Greenwood Reservoir.

Prior to construction of the former Humboldt Mine the ridge in the northern portion of the Project Site divided sub-watersheds of the Escanaba River. Precipitation falling on the north side of the ridge migrated northward by overland flow or in the subsurface toward the Middle Branch Escanaba River. To the south of the ridge, precipitation migrated southward toward the West Branch of the Black River, ultimately flowing into the Middle Branch Escanaba River south of the Greenwood Reservoir.

Many isolated ponds and small lakes, without interconnecting streams occur in this area. Some occur on the bedrock ridges and are merely catch basins for precipitation that may completely evaporate during prolonged dry periods. Other ponds, generally in unconsolidated material at lower elevations are likely connected to the water table, but have no discernible surface flow.

Figure 1-3 displays the regional watershed and sub watersheds in the vicinity of the Project Site. Surface drainage into the HTDF is limited to a small bedrock highland watershed shown in Figure 2-4. Local relief in the vicinity of the pit is approximately 200 ft

Surface drainage around the Mill is predominantly controlled by man-made features such as drainage trenches, constructed to minimize the time storm water runoff is on site and its contact with historic pyritic material. Stormwater runoff generally moves from north to south across the Mill, entering a tributary of the Black River.

3 Historical Investigations

3.1 Overview of Past Work

Environmental investigations have been conducted at the Mill over a period of more than 23 years. Those investigations have evaluated conditions of the soil, groundwater and surface water at this location. The historic investigations begin with the initial permitting of the Ropes Mine tailings disposal in the HTDF in 1984 and extend through sampling and analysis of surface water samples at the HTDF outfall in 2001. Documentation of these investigations has been acquired predominantly from the current owner of the Mill. Other documents have been acquired from Couer d'Alene Mining Company, the parent company of Callahan Mining Corporation, with supplementary, miscellaneous documents acquired through a Freedom of Information Act (FOIA) request of the Michigan Department of Environmental Quality (MDEQ). These investigations and related documents are summarized below.

Traverse Engineering Services, P.C., 1984, Humboldt Pit Hydrogeological Report.

- Traverse Engineering Services (TES) was retained by Callahan Mining Corporation to evaluate the hydrogeological environment in the vicinity of the Humboldt Pit. Callahan Mining Corporation was proposing to use the pit, a former open pit iron mine that had closed and was allowed to fill with water, for subaqueous disposal of pyrite-rich mill tailings that would be processed at the adjacent Mill. The findings of this report would be used to support permit approval for the HTDF. The report presented findings of a water balance assessment based on precipitation, surface runoff and subsurface groundwater flow measurements, baseline surface water and groundwater quality analyses, and a seismic refraction survey to determine the thickness of the unconsolidated formations and the depth to bedrock. Water quality analysis of the flooded mine pit was also completed. In addition to these studies, a biological assessment was conducted, which included thermal and water quality profiles, fish population and benthic organism studies.

MDEQ FOIA Request, 2007, Miscellaneous data tables documenting water quality and field parameters of the HTDF, the HTDF outfall and surface water locations north of the HTDF, 1990 through 1995.

- This request has produced documents from the MDEQ files that present summarized results from the collection of field parameter data and water quality analysis required for Callahan Mining Corporation's NPDES permit, following the conclusion of tailings disposal in the HTDF. Written reports that reference these documents were not included. Based on the presentation of these results, Callahan Mining Corporation was able to demonstrate that the concentrations of contaminants of concern in the surface effluent leaving the HTDF had decreased to the level that the NPDES permit was no longer required. MDEQ agreed and eliminated the NPDES permit, replacing it with a Stormwater Permit requirement that remains in effect.

Sundberg, Carlson and Associate, Inc., 1992, Ropes Mill Facility - Preliminary Hydrogeological Investigation.

- SCA was retained by Callahan Mining Corporation to conduct and document a tank closure assessment at the Mill in 1990.

Montgomery Watson, 1993 Humboldt Mill Tailings Pond Sediments Characterization and Evaluation of Metal Leachate Potential.

- This addendum to an earlier memorandum characterizes the pyritic tailings in the HTDF by conducting metals concentration analysis on sediment samples that were completely digested by nitric acid. The report concludes that an insignificant amount of the total metals in the tailings have leached into water, and that due to only mildly leaching conditions, it is unlikely that the total metals will leach to water in the HTDF. This report also provides historical data on flow out of the HTDF during previous operations.

Montgomery Watson, 1995 Comparison of total phosphorous and algal enumeration after phosphorous application to the Humboldt pit.

- This letter presents the comparison of total phosphorous and algal enumeration after phosphorous application to the HTDF. They support the discussion with analyses of phosphorous, temp, nitrogen, nickel, copper, and algae counts over a period from 1993 through 1995. The letter concludes that although nickel concentrations generally decrease over this period, the decrease may not be due to algal complexing. This report also provides historical profile measurements of nickel within the HTDF.

*Callahan Mining Corporation, 19*95*, Ropes Closure Document*.

- Callahan Mining Corporation requests case closure of the Mill, based on documentation of the completion of physical reclamation activities, completion of required actions under an Administrative Consent Order, and achievement of water quality effluent standards for the HTDF.

Callahan Mining Corporation, 1996, Characterization and Remedial Alternatives for Groundwater - Humboldt Mill Facilities.

- Callahan Mining Corporation summarized the environmental investigations that had been completed to date. At that time, 16 monitoring wells had been installed near the Mill. Possible contaminant sources included an unknown upgradient source, floor drains, USTs, former stockpile areas and fill material. The report concluded that an unknown upgradient source is the most probable cause of continued metals contamination in groundwater at the site. The report was not specific as to the nature of this source.

Sundberg, Carlson and Associate, Inc., 1996 Baseline Environmental Assessment - Volumes 1 – 3.

- This report was prepared for Minerals Processing Corporation (MPC) and evaluated mitigation and cost alternatives. MPC purchased a portion of the Mill in 1995. MPC evaluated the environmental condition of the property by conducting a Phase I ESA, an environmental investigation and producing the three volume Baseline Environmental Assessment (BEA) report in order to limit MPC's liability for past environmental impacts. Several environmental investigations were conducted to produce the BEA, including soil, groundwater and surface water investigations on and around the area of the Mill. These

investigations expanded on the previously conducted studies. The BEA identified a number of environmental concerns.

Sundberg, Carlson and Associate, Inc., 1996, Phase I - Environmental Site Assessment - Former Ropes Milling Plant Property (Attachment A to BEA, included in Vol 1 of 3).

- This report documented the findings of a Phase I Environmental Site Assessment (ESA).

Sundberg, Carlson and Associate, Inc., 1996, Baseline Environmental Assessment - Vol 2 of 3 - Investigative Report (Attachment B to BEA).

- This report provided documentation of a soil and groundwater investigation, surface water analysis and polychlorinated biphenyl (PCB) sampling in the mill.

Sundberg, Carlson and Associate, Inc., 1996, Baseline Environmental Assessment - Vol 3 of 3 - Historical Environmental Documentation (Attachment C to BEA).

- This report provides a collection of historical environmental documents including correspondence between Callahan Mining Corporation and the MDEQ, hazardous waste disposal manifests, the Pollution Incident Prevention Plan prepared by Callahan Mining Corporation in 1984, and miscellaneous documents for the Mill.

Sundberg, Carlson and Associate, Inc., 1996, Leaking Underground Storage Tank - Closure Report.

- SCA presented documentation supporting case closure of the leaking UST site at the mill, based on identifying groundwater on site as "groundwater not in an aquifer."

Titan Environmental Corporation, 1997, Ropes Mill Site Closure - Phase II-DRAFT.

- Titan Environmental Corporation identified seven tasks and the associated recommendations to achieve closure. These tasks included: development of closure standards, classification of groundwater, water table mapping, organic plume mapping, UST verification sampling, determining pyrite concentrate volumes and a pyrite landfill design assessment.

Maxim Technologies, Inc., 1999, Qualifications of the Humboldt Mill Site, Michigan, for Closure Under Part 201.

- This report documents the presence of three contaminant sources at the Mill and indicates that releases from the three sources may have commingled. The report states that Michigan regulations, as defined in Part 201 of National Resources and Environmental Protection Act (NREPA), permit an owner/operator to close a facility with multi-source contaminants under Part 201, if certain criteria are met. The report concludes that the criteria have been met and that Part 201 rules should govern site closure.

Maxim Technologies, Inc., 2000, *Remedial Action Plan for Closure of the Humboldt Mill Site Michigan Under Part 201*

- This report presents the final Remedial Action Plan intended to meet the part 201 requirements. The plan includes recommendations for monitoring groundwater quality and flow conditions, closure in place of the existing hydrocarbon plume, modeling to predict degradation and attenuation rates, consolidation and capping of residual pyrite and implementation of institutional controls to eliminate potential exposure pathways.

Laboratory analytical results from these historical data sources have been compiled in separate tables by sample matrix and can be found in Appendix A. Laboratory analytical reports and other data sources are also included in Appendix A. Sections 3.2 and 3.3 will summarize the historical data for each medium.

3.1.1 Use of Historical Data

Data, including complete or partial lab reports and data summary tables, were compiled from the sources discussed above. These data, were evaluated and divided into 3 tiers based on completeness and data confidence.

The three tiers were defined as follows:

- Tier 1 – Includes data with lab reports, accompanying chain-of-custody (COC) documents, lab quality control samples and any summary tables of these data.

- Tier 2 – Includes data with partial lab reports without accompanying COC documents and lab quality control samples.

- Tier 3 – Includes report summary tables with no supporting lab documentation.

Summary tables of the historical soil, groundwater and surface water data are provided in Appendices A-1 through A-3. The supporting Tier 1, Tier 2 and Tier 3 data reports are provided in Appendices A-4 through A-6. Historical documents prepared by TES (1984) and Montgomery Watson (1993 and 1995) as obtained from MDEQ records are provided in Appendix B.

The discussion of historical investigations will be divided into two sections; the first section will describe investigations in the vicinity of the area of the Mill and the second section will describe investigations in the HTDF

3.2 Humboldt Mill

3.2.1 Summary of Soil Studies

The earliest documented soil investigation is related to the UST closure assessment conducted in 1990 by SCA (SCA, 1992). Later studies investigated a wider area, based on the earlier results, and were expanded to include investigation of the impact of industrial activity to support the preparation of a BEA (SCA, 1996) after MPC purchased the property in 1995. Historical soil sampling locations are shown in Figure 3-1. The analytical results were compared to R 299.5746, the generic residential soil clean-up criteria (Appendix A-1). The most conservative environmental protection criteria is the drinking water protection criteria (DWPC). Soil samples that exceed the DWPC can be found in Table 3-1. Maps showing these exceedances, are provided

in Figures 3-2 through 3-14. Groundwater Surface Water Interface Protection Criteria (GSIPC) are evaluated in Section 5 based on more recent data.

Available historical boring logs can be found in Appendix A-7. Sections 3.2.1.1 through 3.2.1.3 discuss the occurrence of volatile organic compounds (VOCs), polynuclear aromatic hydrocarbons (PAH), inorganics and metals in soil that exceed the DWPC.

3.2.1.1 Volatile Organic Compounds and Polynuclear Hydrocarbons

VOCs and PAHs were detected in concentrations that exceed the DWPC at one location in the vicinity of the vehicle maintenance area near the northwest corner of the mill/office building. This sample (PL-4) was collected along the piping run on the north side of the building. No other VOC exceedances were detected.

Maintenance Shop Area

Parameter	Units	Sample PL-4	Drinking Water Protection Criteria
1,2,4-Trimethylbenzene	ug/kg	56000	2100
Anthracene	ug/kg	100000	41000
Phenanthrene	ug/kg	110000	56000

3.2.1.2 Inorganics

Cyanide

Cyanide was detected above the DWPC at two locations in the vicinity of the former pyrite stockpile area located south of the mill. Samples were collected for laboratory analysis from three locations in this area: TP-34, TP-17 and a stockpile near TP-14. The sample from TP-17 stockpile exceeded the DWPC. The results are summarized below:

Former Stockpile Area

Parameter	Units	Stockpile	Sample TP-17	Drinking Water Protection Criteria
Cyanide	ug/kg	10.5	6.6	4.0

The pyrite stockpile area was investigated by a series of test pits (TP-1 through TP-35) arranged in a grid pattern to assess the distribution and thickness of the remaining pyritic material stored to the south of the mill. This investigation, conducted in 1995 (SCA, 1996) identified a single, thin pyrite layer on the east end of the stockpile area, covered by a thin veneer of soil. Test pits on the western portion of the stockpile area identified multiple pyrite horizons that were likely formed by several grading events. The findings of this investigation estimated up to 4,000 cubic yards of non-pyritic fill material mixed with approximately 1,500 cubic yards of pyritic leach material. Two samples were collected for laboratory analysis. The results of the toxicity characteristic leaching profile (TCLP) analysis indicated that the pyritic material was not likely to leach hazardous concentrations of metals, but the pH of the leachate was acidic. In addition, the concentration of nickel and manganese in groundwater in this area did exceed the residential drinking water standard. These metals are known to be present in the pyritic material.

3.2.1.3 Metals

The limits of the buried pyrite trench area was investigated through physical description of a series of soil borings (T1 – T4 and T10 – T23) in 1995 (SCA 1996). The borings were authorized by MPC to estimate the volume of buried pyritic material. Antimony, arsenic, chromium, iron, manganese, nickel and silver were detected in concentrations that exceeded the DWPC in samples collected in the buried pyrite trench area during characterization of that area in 1998 (Maxim Technologies, 2000). The results are summarized below:

Parameter	Units	Concentration Ranges	Drinking Water Protection Criteria
Antimony[1]	mg/kg	4.3 – 30.7	4.3
Arsenic[1]	mg/kg	156 - 563	4.6
Chromium[1]	mg/kg	171 - 1220	30
Iron[1]	mg/kg	98800 - 203000	6
Manganese[1]	mg/kg	58.4 - 1030	1
Nickel[1]	mg/kg	330 - 780	100
Silver[1]	mg/kg	16.1 - 904	4.5

[1]See Table 3-1 for sample numbers

Magnesium was also detected in concentrations that exceeded the DWPC at several locations in the buried pyrite trench area during the 1998 soil sampling event. Lead is also noted because it exceeded the Direct Contact Criteria (DCC) which is lower than the DWPC. The results are summarized below:

Parameter	Units	Sample Number					Drinking Water Protection Criteria
		SB-1”	SB-10”	SB-5”	SB-6”	SB-9	
Lead	mg/kg	530	525	625	510	525	700*
Magnesium	mg/kg	22	104	12600	11500	13400	8,000

*DCC 400 mg/kg.

Arsenic, iron, manganese and nickel were also detected in concentrations that exceed the DWPC in a sample collected at the former scale area. There is very little documentation on the history or mitigation of metals in soil in this area. The results from the one sample collected at the former scale area are summarized below:

Parameter	Units	Scale #1	Drinking Water Protection Criteria
Arsenic	mg/kg	8	4.6
Iron	mg/kg	46000	6
Manganese	mg/kg	900	1
Nickel	mg/kg	140	100

The TCLP results from the soil sample at the former scale area contained detectable concentrations of arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, nickel, silver and zinc but did not exceed TCLP criteria. According to a report prepared by Maxim Technologies, (2000) "most" of the pyritic soil in the vicinity of the former truck scales were excavated in 1998 and disposed in a local municipal landfill. There are no records documenting this event.

3.2.2 Summary of Groundwater Studies

Historical groundwater monitoring well sampling locations are shown in Figure 3-15. The analytical results were tabulated and compared to the R 299.5744 Residential Drinking Water Criteria (DWC) (Appendix A-2). Historical groundwater results that exceed the R 299.5744 DWC can be found in Table 3-2. Maps showing these exceedances by parameter are provided in Figures 3-16 through 3-32. Groundwater Surface Water Interface Criteria (GSIC) are evaluated in Section 5 based on more recent data.

Appendices A-4, A-5 and A-6 provide the available laboratory analytical reports and other data sources. Available monitoring well construction forms and water well records can be found in Appendix A-7. The following sections discuss the occurrence of VOCs, inorganics, and metals in groundwater that exceed the DWC.

3.2.2.1 Volatile Organic Compounds and Polynuclear Aromatic Hydrocarbons

Nine monitoring wells (MW-1 through MW-7, MW-9 and MW-10) were initially constructed in 1991 and 1992 to delineate the suspected VOC plume in the vicinity of the shop/office (SCA, 1992). In general, these wells identified very little impact of the petroleum release in groundwater, with the exception of the groundwater in MW-5. The data suggested that VOCs detected at MW-5 originated from the gasoline UST and extended to the southwest. Benzene, ethylbenzene and xylenes persisted at MW-5 at concentrations that exceeded the DWC. These same VOCs were not detected in groundwater samples collected from any other monitoring well during this period.

Eight additional wells were constructed between 1992 and 1996 in part to further delineate the known VOC plume to the south and west of the vehicle maintenance area in the shop/office building (MW-104 through MW-106). Laboratory analysis of groundwater samples collected from MW-104, in the vicinity of the known VOC plume, indicated benzene and xylene exceeded the DWC. The exceedances are summarized in Table 3-2 and on Figures 3-16 through 3-22. Over the period from 1995 through 1999, the PAHs 2-methyl naphthalene, acenaphthylene, naphthalene and phenanthrene also exceeded the DWC.

3.2.2.2 Inorganics

Ammonia and sulfate were only detected at concentrations exceeding the DWC in the October 1999 sampling event. These conditions occurred at wells located within or near the former pyrite stockpile and are summarized below and on Figures 3-23 and 3-24.

Parameter	Units	MW-11	MW-102	MW-103	MW-107	MW-4	MW-7	Drinking Water Criteria
Ammonia	mg/L	12.6	3.7	1.4	3.5	2.8	2.5	10
Sulfate	mg/L	25	6940	260	660	1550	1070	250

3.2.2.3 Metals

The groundwater investigation assessing the impact of dissolved metals that may have originated from pyrite-bearing stockpiles and other mining related activities on the property began in 1992 with monitoring wells MW-11 and MW-12. Concentrations of arsenic, iron, lead and manganese in groundwater generally exceeded the DWC through 1999. Metals analysis of groundwater was expanded in 1995. Monitoring wells MW-101 through MW-103 were constructed to further assess the presence of metals in groundwater related to the storage of pyritic leach residue stockpiled south of the mill. Concentrations of arsenic, cadmium, iron, lead, manganese and nickel exceeded the DWC in the sampling event conducted in the fall of 1995 and in the subsequent sampling event in June 1996. Dissolved metals in groundwater were next analyzed in October, 1999 when chromium and sodium were added to the parameter list. Chromium exceeded the DWC at MW-102. Sodium exceeded the DWC at MW-11. These data are spatially presented on Figures 3-25 through 3-32.

3.2.3 Surface Water Studies

Historic surface water investigations at the Mill were limited and focused specifically on isolated surface depressions near the pyrite stockpiles that temporarily held precipitation or snow melt prior to evaporating or running offsite. Five surface water samples were collected in November, 1995 and are summarized in Appendix A-3. Historical surface water monitoring locations are shown in Figures 3-33 through 3-36. One surface water site that was inspected, but not sampled (SW-3), is also shown. All historical surface water results that exceed Rule 57 criteria can be found in Table 3-3. Maps showing these exceedances by parameter are provided in Figures 3-33 through 3-36.

3.3 Humboldt Tailings Disposal Facility

3.3.1 Summary of Soil Studies

Historical soil studies in the vicinity of the HTDF include the assessment of the unconsolidated formations overlying bedrock, particularly to the north and south of the former iron mine. The bedrock surface was also mapped by means of a shallow seismic survey. Soil borings were logged prior to the construction of monitoring wells north and south of the pit in order to evaluate the unconsolidated aquifer, and provide additional information regarding the depth to bedrock (Appendix B-1).

Surface mapping supported by the seismic survey and the soil boring program identified a relatively narrow bedrock trough, or valley on both the north and south ends of the former iron mine. The east and west flanks of the pit were prominent bedrock ridges covered with a thin, discontinuous veneer of unconsolidated material.

3.3.2 Summary of Groundwater Studies

Groundwater studies in the vicinity of the HTDF were conducted in the fall of 1984 prior to using the former iron mine pit for Ropes Mine tailings disposal. The investigation was conducted by TES, on behalf of Callahan Mining Corporation. Monitoring wells were constructed in the unconsolidated formations in order to define the aquifer characteristics and baseline groundwater quality.

One of the findings of this investigation by Callahan Mining Corporation, which was accepted by the Department of Natural Resources and later by the MDEQ was that very little groundwater entered or left the pit through the east and west walls of the HTDF. In fact, based on the aquifer testing done at this time, it was found that groundwater enters the HTDF through the unconsolidated formations in a buried bedrock valley near the south end. Water leaves the pit through a buried bedrock valley filled with similar material on the north end of the HTDF.

Historical groundwater monitoring well sampling locations are shown in Figure 3-37. The analytical results were tabulated and compared to the R 299.5744 DWC (Appendix A-2). Historical groundwater results that exceed the R 299.5744 DWC can be found in Table 3-4. These results indicate that concentrations of iron, lead, nickel and silver were present in concentrations exceeding the DWC in groundwater entering the HTDF before the disposal of Ropes Mine tailings. Iron, lead and silver were also present in concentrations exceeding the DWC in groundwater leaving the HTDF before the disposal of Rope Mine tailings. Maps showing these data by parameter are provided in Figures 3-38 through 3-41. GSIC are evaluated in Section 5.

Appendices A-4, A-5 and A-6 provide the available laboratory analytical reports and other data sources. Available monitoring well construction forms and water well records can be found in Appendix A-7. Groundwater samples were analyzed for a selected set of organic compounds, inorganic compounds, and metals. None of the organic or inorganic parameters exceeded the DWC.

3.3.3 Summary of Surface Water Studies

Historic surface water investigations in the vicinity of the HTDF were focused specifically on the flooded Humboldt Mine pit prior to use as the HTDF and later after the Ropes Mine tailings disposal had concluded. Both the HTDF and the watershed to the north were studied. Prior to use as the HTDF, water quality samples were collected at two depths from two locations in the proposed HTDF (Pit Station #1 & #2) and two locations in the wetland to the north (Weir #1 & #2), representing the effluent discharge. In addition, field parameters were measured at the surface and five depths at one location within the proposed HTDF (Location A). The analytical surface water results are provided in Appendix A-3. Historical surface water results in the vicinity of the HTDF that exceed Rule 57 criteria can be found in Table 3-5. Historical surface water monitoring locations in the vicinity of the HTDF are shown in Figures 3-42. Maps showing these exceedances by parameter are provided in Figures 3-43 through 3-49. Appendix A-4 through A-6 provides the available laboratory analytical reports and other data sources.

Prior to Ropes tailings disposal, the water within the pit exceeded the Rule 57 surface water criteria for copper, lead, nickel and silver, while the discharge exceeded the Rule 57 criteria for copper, nickel, and silver. Within the proposed HTDF, copper concentrations ranged from 40 to 80 ug/L, the nickel concentration reached 140 ug/L in one event, silver reached 1.5 ug/L in one

event and lead exceeded 80 ug/L in one event. Discharge concentrations for copper, nickel and silver were generally the same order of magnitude. Lead was not detected above Rule 57 criteria in any of the discharge results.

Following the conclusion of tailings disposal, water quality sampling was conducted at selected depths within the HTDF, at the outfall, and two other downstream locations prior to entering the Middle Branch of the Escanaba River (WLR-001 and confluence). Discharge water quality sampling was a requirement of the National Pollutant Discharge Elimination System (NPDES) permit until all contaminants of concern decreased below permitted concentrations. Additional water quality profile data collected within the HTDF included analyses of phosphorous, temperature, nitrogen, nickel, copper, and algae counts over a period 1993 through 1995, (Montgomery Watson ,1995).

The discharge concentrations of the contaminants of concern, documented by Callahan Mining Corporation and confirmed by MDEQ staff, decreased over the period from 1991 through 1997, so that by August, 1995 nickel was the only remaining contaminant of concern. A letter from the MDEQ in 1996 stated "*The NPDES permit could be terminated any time after the pit discharge nickel concentration has been less than 190 ug/l as a monthly average for 12 consecutive months*". This milestone was reached in June 1997 and the NPDES permit was terminated before the end of that year. Correspondence indicating the MDEQ accepted this data as evidence that their prescribed water quality standards had been met is presented in Appendix A-8. Historical data on HTDF effluent chemistry obtained from MDEQ records search is provided in the historical database in Appendix A-3.

4 Methods of Investigation

This section describes the methods of investigation to further assess the state of soils groundwater and surface water conditions at the Mill and HTDF.

4.1 Mill Area Soil Investigations

A soil investigation was completed in the fall of 2006 in order to further assess the environmental condition of the soils and Quaternary deposits in the vicinity of the Mill and to supplement historical data collected during previous hydrogeologic studies.

4.1.1 Methodology

In the fall of 2006, soil borings were completed. The soil boring locations are shown on Figure 4-1. The soil borings, were located to define subsurface conditions at specific locations and characterize the subsurface conditions in the areas of investigation.

4.1.1.1 Drilling Methods

Forty-two soil borings were drilled using hollow stem auger (HSA) methods, eighteen soil borings were drilled using sonic drilling methods. Soil boring details are summarized in Table 4-1. The sample depths and sampling program for each boring is listed in Table 4-2. Complete boring logs, boring abandonment forms, and well construction reports can be found in Appendix C. The procedures and requirements for soil borings were as follows:

- A minimum of one soil boring per acre and/or a soil boring spacing of about 200 ft in the vicinity of the iron ore tailings basins immediately east of the mill was completed over the approximate western half of the basin.

- Soil borings were completed using HSA techniques (ASTM 5784), and sonic boring methods were used when HSA proved to be ineffective or impractical.

- Continuous split spoon samples (ASTM D1586) were collected from the ground surface to a depth of 25 ft below grade, in the vicinity of the mill, where refusal did not occur. Continuous sampling was required to define the thickness and classification of topsoil, any fill materials, peat, glacial till or other soils encountered.

- Except for borings at SB-637 and SB-644 which were sampled continuously, split spoon samples were taken at 5 foot intervals in the iron ore tailings basins and at depths greater than 30 ft in all soil borings.

- The entire recovery of each split spoon sample was retained for review after the field work was completed and intervals were selected for soil laboratory testing. Geotechnical testing work was completed by Miller Engineer's and Scientists (Sheboygan, WI) and analytical lab work was completed by Pace Analytical Laboratories (Green Bay, WI).

- A description of each soil sample recovered in the boring log was completed in accordance with ASTM D2488 and ASTM D5434.

- Attempts were made to recover relatively undisturbed samples of cohesive soil and peat using three inch Shelby Tubes (ASTM D1587). However, no cohesive soil was encountered and intervals of peat that were encountered were not recovered due to the compaction of that material by the overlying fill material.

- Soil borings not completed as groundwater monitoring wells were abandoned in accordance with MDEQ Well Construction Code Standards by the drilling contractor immediately after drilling. Monitoring well construction logs are provided in Appendix C-1. Soil boring abandonment forms documenting the abandonment techniques and materials used are provided in Appendix C-2.

- A geologist, hydrogeologist or qualified soil technician from Foth prepared soil boring logs, documented well construction and obtained and containerized retained soil samples.

4.1.1.2 Deviations from Drilling Program

Deviations from the planned drilling included minor changes to the proposed boring and well locations, based on overhead or subsurface conditions.

- A proposed soil boring that was to be converted into a monitoring well in the paved area on the south side of the mill office (to replace historical monitoring well MW-4), and a soil boring south of the maintenance area were not drilled to comply with the KEMC safety requirement to not operate a drill within 100 ft of an overhead power line. The monitoring well was moved to KMW-2 and the boring was moved to KSB-7. That limitation also eliminated a proposed well between the buried pyrite and KMW-9.

- Proposed soil boring KSB-16 was not drilled due to extremely difficult drilling conditions in the vicinity of the buried pyrite. Much of that area was a former waste rock pile for the early Humboldt Mining operations. In later years this area was used as an access roadway for mining and milling vehicles. The subsurface can be characterized as compacted boulders of very hard, lean iron formation and quartzite with a sand to silty sand matrix. KMW-5, KMW-6 and KMW-6A were drilled in this area. Each monitoring well took more than ten hours to drill an average depth of 50 ft. The subsurface conditions were very hard on the drilling equipment; parts were broken and some drilling rods were lost and then retrieved in the hole for KMW-6A.

- KSB-18 was added to further characterize the subsurface beneath the buried pyrite stockpile area and to determine if peat was present at depth. KSB-19 was added to evaluate the subsurface beneath the former fuel oil AST used to operate the former pellet plant.

- SB-622 and SB-619 each encountered auger refusal at a shallow depth using the HSA drill. The borings were redrilled with the mini-sonic drill in order to assess the subsurface to a greater depth. SB-45, -46, and -47 all encountered auger refusal at shallow depths, due to their location on the rock berm enclosing the iron ore tailings storage facility. They were not redrilled due to their distance from the mill.

- One hand auger sediment sample (HA-1) was collected in the pond on the east side of the former fuel oil AST.

- Two hand auger soil samples were collected in the vicinity of the stormwater discharge point and the septic drainfield. Heavy tree cover and steep terrain precluded the use of either HSA or the mini sonic. Soil sample HA-2 was collected approximately ten feet south of the stormwater outfall, at a depth of one to two feet below grade. Soil sample HA-3 was collected approximately 150 ft southwest (downgradient) of the drainfield. Rocky subsurface conditions prevented a soil sample from being collected within the drainfield.

- Additional samples from the buried pyrite area were collected with a hand auger. These samples are labeled on Figure 4-1 as HA-1BP, HA-2BP and HA-33P. These samples were analyzed for total metals and TCLP and synthetic precipitation leaching procedure (SPLP).

4.2 Groundwater Investigation

The most recent groundwater investigation was initiated in 2006 to characterize the environmental condition of the groundwater in the vicinity of the Mill and outlying areas and to supplement historical data collected during previous investigations. Additional groundwater monitoring wells and piezometers were completed to accomplish this task. In addition, groundwater monitoring in the vicinity of the HTDF was completed in June 2007. Monitoring in this area was accomplished with previously existing monitoring wells. Groundwater monitoring in the vicinity of the HTDF is discussed, after the groundwater monitoring in the area of the Mill. The locations of all the monitoring wells and piezometers on the subject site are provided on Figure 4-1.

4.2.1 Methodology

In the Fall of 2006, 17 monitoring wells and 3 piezometers were completed in the area of the Mill . The groundwater monitoring wells and piezometers were located to define subsurface conditions at specific locations and characterize the subsurface conditions in the areas of investigation.

4.2.1.1 Drilling Methods

Two monitoring wells, and one piezometer and were drilled using HSA methods, while fifteen monitoring wells, and two piezometers were drilled using sonic drilling methods. A detailed summary of the drilling program and well construction is provided as Table 4-1. The groundwater sampling program is listed in Table 4-3. The procedures and requirements for monitoring well installation were as follows:

- Monitoring wells were completed using HSA (HSA) techniques (ASTM 5784), and sonic drilling methods were used when HSA proved to be ineffective or impractical.

- Geotechnical lab work was completed by Miller Engineer's and Scientists (Sheboygan, WI) and analytical lab work was completed by Pace Analytical (Green Bay, WI). Geotechnical testing reports are provided in Appendix C-3.

4.2.1.2 Deviations from Drilling Program

Deviations from the plan included minor changes to the proposed boring and well locations, based on overhead or subsurface conditions.

- The boring planned for the former scale area was not constructed, due to extremely difficult drilling conditions encountered in the construction of nearby wells KMW-5 and

KMW-6, and lack of specific information regarding the location of the scale area excavation.

- Initial construction of KMW-6 resulted in a dry well, which was properly abandoned. KMW-6A was redrilled five feet south of KMW-6.

- A proposed soil boring that was to be converted into a monitoring well in the paved area on the south side of the Mill office (to replace historic well MW-4) was not drilled in order to comply with the KEMC safety requirement to not operate a drill within 100 ft of an overhead power line. The monitoring well was moved to KMW-2. That limitation also eliminated a proposed monitoring well between the buried pyrite and KMW-9.

- KMW-4 was designed to be a water table monitoring well and piezometer well nest. However, bedrock was encountered at a shallow depth, which would not have provided sufficient separation for installation of a piezometer. As such a piezometer was not constructed at this location.

- MW-605 and P-605 were moved to the north following the marking of the natural gas line on the first day of drilling.

Monitoring wells were installed based on the following criteria:

- Four groundwater monitoring wells, three paired with a piezometer to form a well nest, were constructed in the western half of the iron ore tailings basin east of the mill.

- Groundwater monitoring wells were not installed in drill holes advanced to a depth greater then the desired well depth. A separate boring was blind drilled at locations where the desired well depth was shallower then the boring depth required.

- Groundwater monitoring wells were constructed approximately eight feet into the water table.

- Samples for water used for drilling the wells or piezometers was obtained and analyzed. Samples were taken from the driller's water tank. The results of this sampling are summarized in Table 4-4.

- If possible, piezometers were constructed approximately 10 ft away from the water table monitoring well and approximately 25 ft below the bottom of the adjacent water table monitoring well.

- Wells were constructed with threaded schedule 40 PVC pipe with "O" ring seals if the well depth was less than 50 ft.

- Wells were constructed with threaded schedule 80 PVC pipe with "O" ring seals for well depths greater than 50 ft.

- Groundwater monitoring wells intersecting the water table were constructed with 10 foot factory slotted, 10 slot screens.

- Piezometers were constructed with 5 foot factory slotted, 10 slot screens.

- Lockable, steel protective pipes with keyed alike locks were installed over each well and piezometer. Older wells with no locks or damaged surface protection were retrofitted.

- Wells were developed approximately one week to 10 days after construction. Well development was completed by the drilling contractor and the data was recorded. Well development logs are provided in Appendix C-2.

- Slug tests were completed on individual monitoring wells by North Jackson Company (NJC). The data were analyzed via methodology described by Bouwer and Rice (1989) and are summarized in Appendix C-4.

- All drilling locations were surveyed upon completion. Survey data was collected in United States (U. S.) State Plane 1983, Michigan North, 2111 coordinate system.

4.2.1.3 Mill Area Groundwater Monitoring Well Development and Sampling

Groundwater monitoring of historic wells were conducted by NJC in June and July 2006 at the site by sampling monitoring wells constructed prior to 2000. All of the existing wells were developed prior to sampling in June 2006. The monitoring wells and piezometers in the area of the Mill were constructed in September and October 2006 as part of the comprehensive subsurface investigation. All of the wells and piezometers constructed in 2006, along with the historic wells were sampled in four events: June 2006, November 2006, March 2007 and June 2007, to assess the water quality and the characteristics of the aquifer.

In addition to groundwater monitoring at monitoring well and piezometer locations, water elevations were read at seven staff gauges placed in areas that appear to have standing water for most of the year (HMS -001 through -007) in order to evaluate the relationship between the groundwater and local surface water expressions. Sample locations are shown on Figure 4-1.

Prior to sampling, each well was measured for depth to static water level and purged using low-flow sampling methods in accordance with MDEQ low-flow sampling methods. Pre-sampling purging was considered complete when at least three casing volumes were evacuated from the well and three consecutive field measurements (collected at least one-half a casing volume apart) did not change by more than the following:

- Conductivity +/- 10%
- pH +/- 10%
- Temperature +/- 10%

In order to minimize sampling time and decontamination procedures, dedicated purge pumps were installed in each well. Purge water from the wells was containerized for proper disposal pending review of the analytical results. Field sampling at each site included field measurement of depth to water (prior to purging), temperature, dissolved oxygen (DO), specific conductance, redox, turbidity, and pH. The volume of purged water was recorded.

Field parameters and samples for laboratory analysis were collected by NJC. Samples were placed into clean containers of appropriate size and type specified for the analysis. Water samples from each well and piezometer were collected and analyzed for all parameters listed in Tables 4-5 and 4-6. Analysis of the parameters in Table 4-7 only applied to wells: MW-601, MW-101, MW-102, MW-11, MW-103, KMW-2, MW-9, MW-6, MW-5, PW-4, MW-104, KMW-1, PW-1, KMW-4, and KMW-6A. All samples were sent to Pace Analytical Laboratory (Green Bay, WI).

KEMC's existing Quality Assurance/Quality Control (QA/QC) program (NJC, 2004) was maintained during all sample collection and analysis procedures. All non-dedicated sampling equipment (including sampling pumps) was decontaminated between wells and before each sample.

Calibration of all field equipment was completed per the existing QA/QC program (NJC, 2004). Field calibration requirements were in compliance with the technical procedure describing the instruments' use and/or with the manufacturer's instructions issued with the equipment.

To assess the precision of field measurements, duplicate field measurements were obtained at a frequency of 1 in 10 measurements or 1 set per day, whichever was greater. Duplicate field measurements were made using a fresh portion of sample relative to the original measurement and after rinsing the meter using the same procedures used between wells.

To assess the precision of field sampling procedures and variability of the sample source, field replicates were collected at a frequency of 1 in 10 samples. Each field replicate was collected after performing the decontamination and purging routines used for normal sample collection. One set of atmosphere blanks was collected each day for VOC, PAH and metals analysis.

4.2.1.4 HTDF Groundwater Monitoring Well Development and Sampling

Groundwater monitoring of historic wells near the HTDF was conducted by NJC in June 2007. The wells were inspected and developed in May 2007, prior to sampling in June 2007. These wells were sampled, along with the wells in the Mill area, during the June 2007 sampling event to assess the water quality and the characteristics of the aquifer in the vicinity of the HTDF.

In addition to groundwater monitoring at monitoring well locations, water elevations were read at five staff gauges placed in and around the HTDF and one piezometer in an isolated wetland situated on the ridge to the east of the HTDF. The staff gauge and piezometer locations were selected in order to evaluate the relationship between the groundwater and local surface water features. The sample locations are shown on Figure 4-1.

The field investigation collected the data required to define the following:

- Elevation of the water table relative to the HTDF and area of the Mill;
- Elevation of the surrounding surface water relative to the HTDF;
- The relationship between the elevation of the HTDF and the elevation of groundwater and surface water around the HTDF;
- Surface and subsurface flow characteristics into and out of the HTDF;

- Surface water quality in the HTDF;
- Surface and subsurface water quality in the surrounding HTDF watershed and the regional watershed;
- Horizontal and vertical flow direction and gradients of the quaternary aquifer;
- Seasonal variations in groundwater depths;
- Site specific geology for cross sections and groundwater maps in the vicinity of the HTDF.

4.3 Surface Water Investigations

A topographic and field review of the Mill was conducted and information from that review indicated that several surface water monitoring locations were necessary to adequately document regional baseline water quality conditions and existing conditions in the vicinity of the Mill and HTDF. The data collection program was designed to characterize surface water quality beyond the direct impact of historic activities.

Regional locations selected for sampling include the stream reaches and lakes/ponds illustrated on Figure 4-2. The lake/pond sites include two sites on Lake Lory (LKL-001 and LKL-002), one on the water-filled HTDF (HMP-001), two iron ore tailings ponds east of the Mill (HTP-001 and HTP-002), one wetland/pond south of the Mill (WLD-001) and two small ponds east of the HTDF and northeast of the Mill (WLD-002 and WLD-003).

Stream sampling sites include reaches of the Middle Branch of the Escanaba River (MER-001 through MER-003), outflow of the flooded HTDF (HMP-002), outflow from the wetland south of the Mill (WLD-001 NW and WLD-001 SE), outflow from Lake Lory (EBR-001), an iron ore tailings pond southwest of the Mill (WBR-002), a tributary of the Black River referred to in this report as the West Branch of the Black River (WBR-003), outflow from Mud Lake west of an iron ore tailings pond (WBR-001) and the main branch of the Black River system (MBR-001) south of the mill. The sample sites were located in the field using hand-held GPS equipment. At each stream site an appropriate reach of the stream was identified and marked for future reference.

Additional sites in the HTDF area, included the wetland northeast of the HTDF (HMP-004), a beaver pond southeast of the HTDF (HMP-005), an isolated wetland pond on the ridge northeast of the HTDF (HMP-006) and a wetland pond south of the HTDF and the abandoned railroad grade south County Road 601 (HMP-007). Two additional sites on the north side of the HTDF (HMP-008 and HMP-009) are staff gauge locations for the HTDF and the HTDF outflow location, respectively. These sites are displayed on Figure 4-1.

4.3.1 Stream Field Procedures

Surface water samples were collected quarterly at the sample sites by NJC beginning in August 2006. Field parameters and flow measurements have been collected on a monthly schedule through August 2007. Samples were sent to Pace Analytical Laboratory (Green Bay, WI) and analyzed for the parameters listed in Table 4-8. In addition to the surface water sampling, sediment samples were collected from the sample sites during the first sampling event and

analyzed for the parameters listed in Table 4-9. In the streams the sediment sample was collected from the slowest portion of the stream.

At each stream sampling site, a cross stream transect was constructed following standard field procedures. Water depth along the transect was measured to establish the cross-sectional area and streambed morphology. Stream velocity measurements using a flow meter were collected along each transect, following standard field procedures. The stream velocity information along with the stream cross sectional area was used to calculate stream discharge at each site

At lake/pond sites the field measurements were collected with depth to provide a depth profile for each of the field parameters. Measurements were collected at one meter (3 ft) intervals to the bottom of the lake/pond.

Sampling conformed to the existing KEMC Quality Assurance Project Plan (QAPP) (NJC, 2004). The sampling team donned new, clean powderless latex gloves at each site, prior to sampling. For stream sample sites the technician stood downstream of the sample site and slowly submerged the laboratory supplied container into the main flow of the stream (thalweg) at a shallow angle, allowing the container to fill while minimizing agitation and aeration of the sample. The filled containers were capped, labeled, noted on the COC, and placed in a cooler on ice. The lake/pond sample sites were sampled from a boat using a Niskin sampling bottle or equivalent. At each lake/pond sample site, two samples were collected. One sample was collected from a depth approximately midway between the thermocline/chemocline and the water surface, identified with a suffix E. The second sample was collected between the thermocline/chemocline and the bottom, identified with a suffix H. The thermocline/chemocline was determined from the profile of field parameters. If the thermocline/chemocline was not detected, the lake/pond sample was collected at 20 per cent of the total water column.

The field quality assurance protocols included the collection of a “blind” replicate sample and a field blank with each quarterly sampling event. All samples collected for laboratory analysis were handled under strict COC procedures. In addition, laboratory quality control procedures included analysis of a matrix spike and matrix spike duplicate to assess analyte recovery, laboratory control samples and laboratory fortified blank for ongoing precision assessment, and instrument blank and method preparation blank to assess laboratory analytical instrument baseline drift.

4.3.2 HTDF Area Field Procedures

Several different sampling events were conducted in the HTDF to evaluate its physical and chemical characteristics. Prior to conducting water quality assessments on the HTDF, Foth conducted a bathymetry survey to define the current limits of the facility since the conclusion of tailings deposition in 1989.

Investigation of the HTDF area consisted of conducting a bathymetry survey, followed by collection of field parameter data and the collection of samples for water quality analysis at several locations. Data and sample collection at these locations were designed to provide a profile of geochemical results from the surface to the bottom of the HTDF. The perimeter of the HTDF was inspected for evidence of environmental impact and to asses the physical conditions within this subwatershed, including mapping the surficial and exposed bedrock geology and assessing the potential for surface water drainage into the HTDF.

The bathymetric survey of the HTDF was completed between May 1 to May 4, 2007. Survey setup along with grid lines and survey extents was done on May 1, 2007. On May 2, 2007 the horizontal and vertical control on site was check into. The real time kinematic (RTK) Global Positioning System (GPS) units used for the survey were Trimble 5700 series with a Trimble TSCe data collector (accuracy +/- 0.10 ft vertical, and 0.03 horizontal).

The bathymetric survey data was collected into a raw data file to be post processed in the office. Data was collected on lines approximately 50' apart parallel to the long axis of the HTDF, and 100' apart parallel to the short axis of the HTDF. In addition a single line of data was collected following the perimeter of the pit. This system of survey was selected to optimize efficiency and accuracy.

HYPACK® high speed multibeam data acquisition software, with RTK imaging, was used to coordinate the RTK GPS with a Knudsen BP 320 echo sounder (depth resolution, 1/100' for water to 100 ft deep, 1/10' for water over 100 ft deep). Overall accuracy, with consideration of RTK and echo sounder limitations, along with an allowance for boat movement due to wind and waves, is +/-0.25' horizontal and vertical.

Based on the findings of the bathymetry survey, seven sites (HPL-001 through -007 as displayed on Figure 4-1) were selected to assess horizontal and vertical variation of the physical parameters, pH, temperature, specific conductivity and dissolved oxygen (DO). On May 23, 2007, field readings were taken every three feet from the surface to the bottom of the HTDF at these seven sites.

On May 30 and 31, 2007, two of the seven sites on the HTDF were chosen to collect water quality samples at five discrete depths, based on the detailed profile measurements collected previously. Field parameters were collected along with the water quality samples and sediment samples were collected at both locations.

On July 12, 2007, surface water samples were collected from HPL-003 at 140 ft and 175 ft below the surface of the HTDF for nitrate/nitrite analysis and standard field parameters. Field tests for ferrous iron and total iron were conducted at the surface and at depths of 3 ft, 15 ft, 60 ft, 80 ft, 20 ft, 150 ft and 175 ft. Diurnal DO profiles were collected from the surface to a depth of 51 ft in order to assess the biological contribution to the observed DO content in the HTDF. In addition to organic carbon measurements at a variety of depths, a complete field parameter profile, including oxidation reduction potential (ORP) was collected at this location from the surface to the bottom of the HTDF at three foot intervals.

5 Results of Hydrogeological Investigation

By design, the performance and documentation of this investigation has been divided into two distinct but adjacent areas: the Mill, comprising the area surrounding the mill buildings, and the HTDF, comprising the flooded, former Humboldt Mine which was used for tailings disposal by Callahan Mining Corporation and the immediate surroundings. The geology and the hydrogeology of the entire Project Site is discussed in Section 5.1. The analytical results of the soil investigation of the area of the Mill will be discussed in Section 5.2. The analytical results of the groundwater investigation of the area of the Mill and the HTDF area will be discussed in Section 5.3. The analytical results of the surface water investigation for the regional area and the results of the surface water investigation for the HTDF will be discussed in Section 5.4. Section 5.4 also discusses the comparison of sediment and groundwater results to the GSIPC and Groundwater Surface Water Interaction Criteria (GSIC), respectively and analytical results of regional sediments collected from surface water sites and results for the HTDF area. Section 5.5 discusses the results of the investigation of mill buildings and stockpiles.

5.1 Geology and Hydrogeology

This section discusses the geology and hydrogeology of the Project Site. The geology is presented in Section 5.1.1, the groundwater hydrology in Section 5.1.2 and the regional surface water hydrology in Section 5.1.3.

5.1.1 Geology

The existing surficial geology is predominantly sand, gravel and rock fill, and iron ore tailings, overlying and adjacent to deposits of native sand and gravel. Isolated, low-relief bedrock exposures can be seen south of the mill buildings, but the ridge north of the mill buildings is predominantly bedrock-supported with a variable but generally thin veneer of glacial till and minor outwash sand (Figure 5-1). The depth to bedrock in the area ranges from greater than 50 ft below grade, to zero feet, where it is exposed at the surface. Without exception, the subsurface investigation in the area of the Mill intersected disturbed soils on the surface in all of the soil borings (Appendix C-1). Fine to coarse sand, gravel, cobbles, boulders and waste rock from the Humboldt Iron mine was used to fill a wetland south of the ridge for construction of the former Humboldt Mine offices and mill facilities.

The subsurface geology of the area of the Mill is shown in cross sections in Figures 5-2 through 5-15. Structural fill was placed over much of the area south of the mill buildings in previously low-lying wetland areas. This material consists of coarse sand and gravel, cobbles and boulders extracted from borrow pits in the vicinity of MW-605, a previously existing hill between MW-605 and the gas main pressure relief station, and broken rock (low-grade iron ore) taken from the Humboldt mine during construction. Standard penetration tests (SPT) in this area returned high blow counts ranging from 20 to 50+, indicating very dense subsurface conditions, due to the abundance and significant thickness of cobble and boulder fill. Conventional HSA drilling was conducted with extreme difficulty in this area. In fact, in the area immediately west of Iron Ore Tailings Basin North and South, eleven borings could not be completed with HSA due to the rocky subsurface conditions. These borings were completed with a sonic drill, without SPT. However, detailed borehole logging confirmed the presence of more than ten feet of coarse fill material in most of these borings. The remaining borings intersected coarse gravel with cobbles and sand that may be fill or may be native material.

Twenty seven soil borings intersected the eastern tailings basins and identified a wedge of iron ore tailings more than 50 ft thick overlying in situ peat, sand and gravel outwash and till. The iron ore tailings are contained primarily by a former wetland with a constructed berm stretching between previously existing hills of sand, gravel and bedrock. The tailings occur as a wedge, or delta, with a thickness ranging from at least 50 ft in the northern area, to approximately 20 ft thick in the southernmost area tested. The tailings may be thicker or thinner to the north or south, respectively, away from the drilling conducted in the tailings basin.

A seismic refraction survey conducted in 1984 provides indirect subsurface information that buried bedrock valleys exist both north and south of the HTDF (Figure 5-16). Direct subsurface information for this area is based on eleven monitoring wells constructed between 1984 and 1992. Three of the wells are located to the south of the HTDF and eight wells are distributed in an east west arc to the north of the HTDF. Based on the well construction logs, these valleys have been filled with outwash composed of fine to medium-grained sand with variable amounts of clay and gravel (Figure 5-17). The bedrock formations in this area hold little water (Stuart, et. al 1954) and are typically not water bearing.

The former Humboldt Mine was developed in a narrow valley, floored by iron-rich rocks, that cuts through a ridge of silicified, dense, recrystallized sedimentary and mafic intrusive rocks. The east and west sides of the pit are poorly fractured bedrock overlain by a thin, patchy till, and provides very little observed subsurface inflow in to the pit. The subsurface geology in the area of the HTDF is shown in Figures 5-17 through 5-19.

Foth conducted a bathymetric survey of the HTDF in May 2007 (Figure 5-20). The HTDF covers an area of 269,400 m2 (67 Ac) at a normal elevation of 468.8 m (1538 ft), with a total volume of 7,997,216 m^3. Depths in the main HTDF area are over 20 m (66 ft) for roughly two-thirds of the main HTDF surface area, and are 58.5 m (192 ft) at the deepest point. Depths in the northern HTDF area are limited to less than 20 m, and less than 7 m at the confluence with the main HTDF area.

Prior to construction of the Mill in 1954, this area was a wooded wetland divided by isolated upland areas and low bedrock exposures (Figure 5-21). In order to construct the mill, the wetlands were filled with the unconsolidated material from the intervening uplands and development rock taken out of the former Humboldt Mine. Soil samples collected during the recent investigation contained wood fragments on top of the peat horizon with multiple growth rings. SPT of the tailings generally returned very low blow counts indicating a relative density ranging from very loose to medium dense. The relative density increased at depths. However, it was observed that hydrostatic pressure forced the saturated tailings into the hollow stem, influencing the SPT results.

5.1.1.1 Mill Geotechnical Results

Twenty-eight geotechnical samples were collected and analyzed from twenty-four soil boring locations in September 2006. Results from the geotechnical testing are summarized in the boring logs in Appendix C-1. Drillers logs, well development records and boring abandonment logs are included in Appendix C-2. Information on grain size analyses for select soil borings are included in Appendix C-3. Soil samples were analyzed for selected geotechnical testing to more accurately describe the soil types within the existing tailings basin, to ensure accuracy of the field logs, and for collection of engineering data.

Based on the results of the geotechnical testing, the tailings within the tailings pond are predominantly brown sandy silt and silty sand.

Geotechnical samples were not collected from the area of the HTDF. However, the historic subsurface investigation at the HTDF identified fill and native soils similar to the area around the mill, suggesting these soils would have similar physical characteristics (Appendix B).

5.1.2 Groundwater Hydrology

In addition to historic data presented in Section 3, groundwater and surface water elevations were collected during five groundwater sampling events between June 2006 and June 2007. Contoured groundwater elevations for the June 2007 event are shown on Figure 5-22. The highest groundwater elevation is found near the eastern end of the Project Site (MW-602, elevation 1604.31 ft MSL), the northern-most portion of the iron ore tailings basin. The lowest groundwater elevation was recorded in the wetland north of the HTDF (HW-6, elevation 1533.39 ft MSL). The depth to groundwater varies from less than 10 ft bgs east of the mill building, to greater than 38 ft bgs near the south end of the HTDF (PW-2, 38.24 ft bgs). Groundwater flow across the southern portion the Mill is to the west and southwest, where it is captured by the wetland ponds in that area and eventually enters the Black River.

To the west of the Mill, the slope of the water table changes from southerly toward the West Branch of the Black River to northerly into the HTDF. Although groundwater south of the ridge generally flows south, the pit is draining groundwater from south of the HTDF. Given the lack of significant groundwater within the bedrock flanking the HTDF, the predominant groundwater flow into the pit is from the south, through more than forty feet of sand and gravel outwash. The deformation and foliation of the bedrock surrounding the HTDF has served to produce a weakly jointed bedrock surface. Sheared and recrystallized contacts at depth would likely limit joint propagation. In addition, due to the interlocking recrystallized texture, storage will be limited to the joint network. Recrystallized formations without a well developed joint network are typically poor groundwater producers.

It is important to recognize that almost all of the potential groundwater flowing into the HTDF at its southern end is from outside the drainage basin of the HTDF, as the perimeter of the drainage basin falls very close to the perimeter of the pit in this location. Therefore, this input is distinct from, and in addition to, the rain input in the drainage basin. Thus, the site survey and the recent groundwater monitoring strongly indicate that groundwater from a small area south of the HTDF flows into the southern end of the HTDF

Water flows out of the north end of the HTDF through approximately forty feet of outwash and enters a wetland, before discharging to the Middle Branch of the Escanaba River. Groundwater in the vicinity of the HTDF is recharged from the infiltration of precipitation on the small area to the south and south west of the HTDF.

Groundwater in the southern portion of the Project Site is recharged from precipitation and runoff from the bedrock ridge to the north. Groundwater discharges predominantly towards Lake Lory and the Black River.

5.1.3 Regional Surface Water Hydrology

The Project Site is situated near the drainage divide between sub-watersheds of the Escanaba River, which flows southeast into Lake Michigan. Prior to construction of the former Humboldt Iron Mine, the divide followed the prominent east-west ridge in the northern portion of the Project Site. After mining had ceased, groundwater entered the HTDF from both the north and south ends. After the pit filled with water, it discharged to the north, into the Middle Branch of the Escanaba River. Therefore the watershed divide effectively migrated south to the southern edge of the HTDF.

A detailed site survey of HTDF conducted in April, 2007 by a Foth geologist concluded that only minor seasonally ephemeral flows leave the HTDF by seepage through an earthen dam on the north side of the HTDF. The berm was constructed by CCI to regulate flow out of the pit. While this field investigation showed no evidence of perennial overland flow, historical documents indicate that two culverts transmit water from the HTDF into the wetland to the north (TES, 1984). TES estimated flow through the culvert(s) to be 75-100 gpm (375-545 m^3/d). TES reported a visible discharge from the pit in the form of seepage through the embankment. Visual inspection suggested that a substantial portion of the discharge occurs through the coarse materials near the surface, estimated to be 100-150 gpm (545-818 m^3/d). While this flow is not measurable at this location, flow measurements at weirs constructed near Highway 41 were conducted to document surface flow out of the flooded mine pit. Moreover, the MDEQ accepted these measurements as part of the NPDES to represent surface discharge from the pit even though observed surface flow was not measurable at the berm.

The Middle Branch of the Escanaba River drains the area to the north of the bedrock ridge crossing the Project Area. Flow rates at the eastern-most recording location (MER-003) range from a low of 4.6 cubic feet per second (cfs) (August 2, 2007) to a high of 218 cfs (April 3, 2007).

Surface water in the area of the Mill is limited to small, isolated wetland ponds located to the east and south of the mill buildings, including ponds situated at the south and eastern ends of the iron ore tailings basins. There are no perennial surface water streams in the Project Site. Drainage in the area of the Mill is predominantly controlled by man-made features such as drainage trenches, constructed to minimize the time storm water runoff is on site and its contact with pyritic material that may contribute contaminants to the water. In the southern portion of the Project Site, surface water generally moves from north to south across the site, entering the West Branch of the Black River or Lake Lory and the East Branch of the Black River.

Over the past year, flow rates on the East Branch of the Black River (EBR-001) flowing out of Lake Lory have been negligible, except for September and October, 2006 when the flow rates were <2 cfs and <3 cfs, respectively. The greatest flow rate recorded at this location was 8.3 cfs during the April 2, 2007 sampling event. Flow rates have consistently been below 1 cfs on the southern-most recording location on the West Branch of the Black River (WBR-003), except for the May 2, 2007 event (1.1 cfs). The highest flow rate at this location was 7.6 cfs, during the April 2, 2007 sampling event.

5.2 Mill Area Soil Analytical Results

Results from the 2006 soil sampling were compared to R 299.5746, Generic Soil Clean-Up Criteria for Residential and Commercial I Categories. The DWPC are generally the most

conservative criteria. DCC were used in specific areas, where applicable. GSIPC are examined later in this document in the context of examining recent groundwater quality data and stream sediment quality data. TCLP and SPLP concentrations were exceeded in several samples. Exceedances of these criteria were evaluated and are presented in Table 5-1 and summarized by occurrence below. Complete, tabulated analytical results for soil samples can be found in Appendix D-1. Figures showing the locations of these exceedances by parameter are presented in Figures 5-23 through 5-46. Appendix D-2 provides the full laboratory analytical reports. The following sections discuss the occurrence of VOCs, inorganics and metals in soil that exceed these criteria.

5.2.1 Volatile Organic Compounds and Polynuclear Aromatic Hydrocarbons

VOCs were detected in concentrations that exceed DWPC in two separate areas on the Project Site. These areas include: the storm water outfall and the vehicle maintenance shop area. These data are visually presented on Figures 5-23 through 5-26. PAHs were detected in several soil samples but at concentrations below DWPC. The distribution of these PAHs (naphthalene, anthracene and phenanthrene) occurrences at the site are shown on Figures 5-27 through 5-29.

Several VOC parameters were detected in soils that exceed the DWPC at the storm water outfall (HA-2). Laboratory results at these two locations are summarized below:

Storm Water Outfall

Parameter	Units	HA-2	HA-2 (DUP)	HA-3	Drinking Water Protection Criteria
1,2,4-Trimethylbenzene	ug/kg	35000	15000	<23	2100
1,3,5-Trimethylbenzene	ug/kg	27000	11000	<11	1800
n-Propylbenzene	ug/kg	2500	1000	<12	1600
s-Butylbenzene	ug/kg	2300	880	<9.7	1600

One VOC parameter was detected in soil in the vicinity of the maintenance building that exceeded the DWPC. Three other compounds showed elevated concentrations, but were below the DWPC. Laboratory results at this location are summarized below:

Maintenance Shop Area

Parameter	Units	KSB 4-4	Drinking Water Protection Criteria
1,2,4-Trimethylbenzene	ug/kg	5600	2100
1,3,5-Trimethylbenzene	ug/kg	1600	1800
n-Propylbenzene	ug/kg	660	1600
s-Butylbenzene	ug/kg	520	1600

These results are consistent with the historical soil data discussed in Section 3. While exceedances were not detected in soil samples collected in the past, elevated detection limits for the VOC parameters that were analyzed, suggested elevated concentrations of VOCs were historically present in the soil in this area.

5.2.2 Inorganics

Cyanide

Cyanide was detected above the DWPC at two out of 87 locations tested in the Fall of 2006. One location is in the area of the buried pyrite and the other location is near the eastern side of the pyrite stockpile area. Results are summarized in Table 5-1. The soil exceedance results at the two locations (Figure 5-30) are summarized below:

Parameter	Units	KSB-16	KSB-18	KSB-18 (dup)	Drinking Water Protection Criteria
Cyanide	mg/kg	37	14	12	4

There is very limited historical data for cyanide as described in Section 3. The widespread testing for cyanide completed in this investigation indicates the presence of cyanide at this site is quite limited.

5.2.3 Metals

Data summarizing metal content in soils is provided in Figures 5-31 through 5-46 and Table 5-1. Aluminum, cobalt, iron, manganese, antimony, arsenic, boron, lithium, magnesium, molybdenum, nickel, selenium, silver, and thallium were detected on site in 2006 at concentrations that exceed the DWPC. The exceedances of DWPC for boron, magnesium, nickel, selenium, silver and thallium were spatially limited. Lead exceeded the DCC at one location at the buried pyrite. Soil samples collected in the area of the Mill exceeded acceptable SPLP concentrations for barium, cadmium, chromium and lead (KMW-2, KSB-7, KSB-15, KSB- 16, KSB-18, KSB-19, SB-618 and SB-634). SPLP concentrations were also exceeded for lead in the buried pyrite trench area (KMW-6, KMW-6A). The following section summarizes these findings.

Aluminum, Cobalt, Iron and Manganese

Aluminum, cobalt, iron, and manganese were present in every soil sample collected on site in 2006 at concentrations that exceed the DWPC. There is no historical data for aluminum or cobalt in other areas across the site and very little historical data for iron and manganese. Historical data for iron and manganese were also above the DWPC. Results are summarized in Table 5-1 and Figure 5-31 through 5-34. Soil exceedances are summarized below by concentration ranges for these metals.

Parameter	Units	2006 Concentration Ranges	Drinking Water Protection Criteria
Aluminum	mg/kg	1100 - 21000	1
Cobalt	mg/kg	1.8 - 260	0.8
Iron	mg/kg	7690 - 200000	6
Manganese	mg/kg	33 - 7830	1

Antimony

Antimony was detected above the DWPC at one-third (22 out of 83) of the locations tested in the Fall of 2006. Antimony exceedances occurred throughout most of the Mill, in the area of the buried pyrite, around the maintenance shop, in the area of the pyrite stockpile and in the western

central part of the iron ore tailings basin south. Results are summarized in Table 5-1 and Figure 5-35.

Arsenic
Arsenic was detected above the DWPC at one-third (24 out of 83) of the locations tested in the Fall of 2006. Arsenic exceedances predominantly occurred in the area of the buried pyrite across the Mill and with limited occurrences in the iron ore tailings basin. These data are consistent with historical data for arsenic in soil discussed in Section 3. Results are summarized in Table 5-1 and Figure 5-36.

Boron
Boron was detected above the DWPC at 4 locations tested in November of 2006. All four exceedances were around the maintenance shop. Results are summarized in Table 5-1 and Figure 5-37. Soil exceedances are summarized below:

Parameter	Units	KSB-1	KSB-3	KSB-4	KSB-7	Drinking Water Protection Criteria
Boron	mg/kg	12	12	13	13.1	10

Lithium
Lithium was detected above the DWPC at 63 out of 83 locations tested in the Fall of 2006. Lithium exceedances occurred throughout most of the Humboldt Mill, in the area of the buried pyrite, around the maintenance shop and other mill buildings, in the area of the pyrite stockpile and in the iron ore tailings basin south. Results are summarized in Table 5-1 and Figure 5-38.

Magnesium
Magnesium was detected above the DWPC at 5 out of 83 locations tested in the Fall of 2006 in the area of the buried pyrite, around the maintenance building, and near the pyrite AST. Results are summarized in Table 5-1 and Figure 5-39. Soil exceedances are summarized below:

Parameter	Units	KSB-1	KSB-3	KSB-4	KSB-14	KSB-16	Drinking Water Protection Criteria
Magnesium	mg/kg	13000	13000	14000	12700	10000	8000

These data are consistent with the historical data discussed in Section 3.

Molybdenum
Molybdenum was detected above the DWPC at 15 out of 83 locations tested in the Fall of 2006. Molybdenum exceedances occurred throughout most of the Humboldt Mill, in the area of the buried pyrite, near the maintenance shop, near the pyrite AST, in the area of the pyrite stockpile, and in three locations in the iron ore tailings basin south. Results are summarized in Table 5-1. and Figure 5-40.

Other Metals in Soil
In addition to the primary metals discussed above; nickel, selenium, silver, and thallium were detected above the DWPC at a few locations. Lead exceeded the DCC at KMW-6/6A. Results

are summarized in Table 5-1 and Figure 5-41 through 5-45. Zinc (Figure 5-46) was not detected in any soil samples at concentrations that exceed the DWPC. Soil exceedances and results at these locations are summarized below:

Parameter	Units	KSB-5	KSB-7	KSB-8	KSB-13	KSB-16	KMW-6	KMW-6A	Drinking Water Protection Criteria
Lead	mg/kg	9.2	9.4	110	282	330	889	12000	400[1]
Nickel	mg/kg	22	104	66	223	740	29.5	14	100
Selenium	mg/kg	3.2	0.35 J	0.95	3	6.2	<0.27U	0.3	4
Silver	mg/kg	1.4	0.23	9.3	17	36	0.25	0.037B	4.5
Thallium	mg/kg	3.3	0.3	0.0027 B	0.0046J	0.0069B	<0.054U	0.011B	2.3

[1]DCC

Exceedances of nickel, lead and silver occurred primarily in the area of the buried pyrite trench. Additionally, there was one exceedance of nickel and silver at KSB-8 near the pyrite AST. Exceedances of selenium occurred only in the area of the buried pyrite. The one exceedance of thallium is near the maintenance shop.

Buried Pyrite Area Sampling Results

The buried pyrite area is located west of the mill buildings (Figure 1-5). 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.

The collected samples were identified in the field as HA-1, HA-2 and HA-3 and are labeled on Figure 4-1 and in Appendix D-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. 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.

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. 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. Arsenic and chromium appear to exceed state DCC for generic soil cleanup levels for all three samples and nickel and silver exceed DWC 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 D-1. A copy of the laboratory report and COC form is provided in Appendix D-2 (also see Figures 5-36 and 5-41 through 5-44).

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). 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.

5.3 Groundwater Analytical Results

The groundwater sampling reports are provided in Appendix E. The field reports are presented in Appendix E-1. A table summarizing the groundwater analytical results relative to DWC is presented in Appendix E-2. The laboratory reports are provided in Appendix E-3.

5.3.1 Mill Area

Results from all events were compared to the R 299.5744 Groundwater Residential & Commercial Clean-Up Criteria. DWC are generally the most conservative groundwater clean-up levels. Exceedances of these criteria were evaluated and are presented in Table 5-2 and summarized below. GSIC are addressed later in this document in Section 5.4.3. Figures showing the locations of these exceedances by parameter are presented in Figures 5-47 through 5-64.

The following sections discuss the occurrence of VOCs, inorganics, and metals that are above the DWC in the area of the Mill. Results from November 2006 are shown with additional comments regarding results from other events.

5.3.1.1 Volatile Organic Compounds and Polynuclear Aromatic Hydrocarbons

Benzene, ethylbenzene, and xylenes were detected in groundwater monitoring wells MW-101, MW-104, and MW-5 located in the area of the maintenance shop waste oil UST (Figures 5-47 through 5-49) in June or November 2006. Results at these two locations are summarized below:

Parameter	Units	MW-104	MW-5	Drinking Water Criteria
Benzene	ug/L	0.65J	10	5
Ethylbenzene	ug/L	3.2	90	74
Xylenes	ug/L	27	1400	280

Note: Results from November 2006 are presented in the above table.
J = Result is between the method detection limit and the reporting limit.

MW-5 is the only monitoring well with VOCs detected at or above the DWC. In well MW-104 detections of ethylbenzene and xylenes were below the standard and benzene was detected at a level below the method detection limit. This is consistent with VOC data from groundwater sampling events in June 2006, March 2007, and June 2007. PCBs were detected at concentrations that exceed the DWC at KMW-1 in March 2007.

These results are also consistent with the historical groundwater data discussed in Section 3. Contaminant concentrations have decreased over time in both monitoring wells indicating that natural attenuation of the VOCs is occurring. In the past, contaminant concentrations in MW-104 exceeded the DWC. The recent 2006 data show the levels of VOCs in MW-104 have decreased to below the DWC. No other VOCs were detected during the November 2006 sampling event.

5.3.1.2 Inorganics

Inorganic data is summarized in Table 5-2 and Appendix E-2.

Nitrogen/Ammonia

Nitrogen/Ammonia was detected below the DWC in a majority of the groundwater monitoring wells. However, ammonia was detected above the DWC in groundwater in only two monitoring wells, MW-5 located in the vicinity of the maintenance building waste oil release and MW-11 located in the pyrite stockpile area (Figure 5-50). Results at these two locations are summarized below:

Parameter	Units	MW-5	MW-11	Drinking Water Criteria
Nitrogen/Ammonia	mg/L	19	22	10

Note: Results from November 2006 are presented in the above table.

These data are consistent with nitrogen, ammonia data from groundwater sampling events in June 2006, March 2007, and June 2007. Exceedances for all groundwater sampling events are summarized in Table 5-2.

These results are also consistent with historical data for MW-11 discussed in Section 3. Nitrogen/Ammonia was not detected historically at MW-5. Contaminant concentrations have decreased in MW-11 but have increased at MW-5 relative to historical data.

Sulfate

Sulfate was detected below the DWC in most of the monitoring well locations but was detected above the DWC at KMW-6A, KMW-9P, KMW-7 located in the area of the buried pyrite, and MW-102 located in the area of the pyrite AST (Figure 5-51). Results at these four locations are summarized below:

Parameter	Units	KMW-6A	KMW-7	KMW-9P	MW-102	Drinking Water Criteria
Sulfate	mg/L	360	750	850	13,000	250

Note: Results from November 2006 are presented in the above table.

These data are consistent with sulfate data from these wells during groundwater sampling events in June 2006, March 2007, and June 2007. In addition to the monitoring wells listed above, exceedances of sulfate also occurred in MW-103, MW-11, MW-6, and MW-7 in June 2006 and MW-11 in March 2007.

Historically sulfate has been detected above the DWC in the pyrite stockpile area, in the area of the maintenance shop, and near the pyrite AST as discussed in Section 3. There is no historical sulfate data in the area of the buried pyrite.

5.3.1.3 Metals

Groundwater quality data for metals in the area if the Mill is summarized in Table 5-2 and Appendix E-2 and is presented graphically on Figures 5-52 through 5-64.

Iron and Manganese
Iron and manganese occur in groundwater at every monitoring well location across the site (Figures 5-52 and 5-53). Iron occurs above the DWC in all monitoring wells except one, MW-605. Manganese is present above the standard in all monitoring wells surrounding the area of the Mill. This is consistent with historical data from the area.

Aluminum
Aluminum occurs in groundwater at concentrations that are above the DWC in the area of the maintenance shop, in the pyrite stockpile area, in the area of the pyrite AST, and in the area of the fuel oil AST. Results at these locations are summarized below and in Figure 5-54:

Parameter	Units	KMW-1	MW-5	MW-11	MW-102	MW-104	MW-601	PW-1	PW-4	Drinking Water Criteria
Aluminum	ug/L	62	360	430	400,000	80	58	130	230	50

Note: Results from November 2006 are presented in the above table.

These data are consistent with aluminum data from these wells during groundwater sampling events in June 2006, March 2007, and June 2007. In addition to the monitoring wells listed above, exceedances of aluminum also occurred in MW-6 and MW-8 in June 2006 and in KMW-10, KMW-2. KMW-3, KMW-4, KMW-5, KMW-6A, KMW-7, KMW-9, KMW-9P, MW-101, MW-604, P-604, and PW-2 in June 2007.

No historical data exists for aluminum.

Arsenic
Arsenic is present in groundwater at concentrations above the DWC at KMW-6A located in the area of the buried pyrite trench; MW-5, MW-104, and PW-4 in the area of the maintenance building; MW-9 and KMW-2 in the area of the office and diesel and gas USTs; MW-11, MW-12, MW-101 and MW-103 in the pyrite stockpile area; MW-601 near the fuel oil AST and MW-102 near the pyrite AST. Exceedance results at these locations are summarized below and on Figure 5-55:

Parameter	Units	KMW-2	KMW-6A	MW-5	MW-9	MW-11	MW-12	Drinking Water Criteria
Arsenic	ug/L	24	12	160	29	18	10	10

Parameter	Units	MW-101	MW-102	MW-103	MW-104	MW-601	PW-4	Drinking Water Criteria
Arsenic	ug/L	31	5,600	14	28	26	93	10

Note: Results from November 2006 are presented in the above table.

These data are consistent with arsenic data obtained from these wells during groundwater sampling events in June 2006, March 2007, and June 2007. In addition to the monitoring wells listed above, exceedances of arsenic also occurred in KMW-1 and KMW-3 in March 2007 and KMW-3 and PW-2 in June 2007.

The November 2006 occurrences of arsenic in groundwater are generally consistent with the historical occurrence of arsenic discussed in Section 3.

Cobalt

Cobalt is present in groundwater at concentrations above the DWC in monitoring wells KMW-5 and KMW-7 in the area of the buried pyrite and in well MW-102 located near the pyrite AST. Results at these three locations are summarized below and on Figure 5-56.

Parameter	Units	KMW-5	KMW-7	MW-102	Drinking Water Criteria
Cobalt	ug/L	67	120	6,400	40

Note: Results from November 2006 are presented in the above table.

These data are consistent with cobalt data obtained from these wells during groundwater sampling events in June 2006, March 2007, and June 2007. In addition to the monitoring wells listed above, exceedances of cobalt also occurred in MW-7 in June 2006 and PW-2 in June 2007.

Vanadium

Vanadium is present in groundwater at concentrations that exceed the DWC at KMW-7 located south of the buried pyrite trench; MW-5, MW-104, PW-1, and PW-4 in the area of the maintenance shop; MW-102 near the pyrite AST, MW-11 in the pyrite stockpile area and MW-601 in the area of the fuel oil AST. Results at these locations are summarized below and on Figure 5-57

Parameter	Units	KMW-7	MW-5	MW-11	MW-102	Groundwater-Drinking Water Criteria
Vanadium	ug/L	4.8	21	16	220	4.5

Parameter	Units	MW-104	MW-601	PW-1	PW-4	Groundwater-Drinking Water Criteria
Vanadium	ug/L	4.6	5	5.2	11	4.5

Note: Results from November 2006 are presented in the above table.

These data are consistent with vanadium data obtained from these wells during groundwater sampling events in June 2006, March 2007, and June 2007. In addition to the monitoring wells listed above, exceedances of vanadium also occurred in KMW-1 in March 2007 and KMW-1, KMW-5, KMW-6A, PW-2 in June 2007.

No historical data exists for vanadium.

Other Metals in Groundwater

In addition to the metals listed above the following metals occur in groundwater at concentrations that exceed the DWC only at monitoring well MW-102, located near the pyrite AST (see Figures 5-58 through 5-64):

Parameter	Units	MW-102	Drinking Water Standard
Beryllium	ug/L	29	4
Cadmium	ug/L	49	5
Chromium	ug/L	8000	100
Copper	ug/L	10000	1000
Lithium	ug/L	450	170
Nickel	ug/L	14000	100
Zinc	ug/L	5800	2400

Note: Results from November 2006 are presented in the above table.

These data are consistent with other metal data from this well obtained during groundwater sampling events in June 2006, March 2007 and June 2007. In addition to MW-102, exceedances of beryllium occurred in MW-103, MW-12, MW-101 in June 2006 and MW-11 in June 2007. No exceedances of beryllium occurred in March 2007. In addition to MW-102, exceedances of nickel occurred in MW-7 in June 2006, MW-603 in March 2007, and KMW-7 and PW-2 in June 2007.

No historical data exists for beryllium or lithium. The other data are consistent with historical groundwater data discussed in Section 3.

5.3.2 HTDF Area

Results from the June 2007 groundwater sampling around the HTDF were compared to the R 299.5744 DWC. Exceedances of these criteria were evaluated and are presented in Table 5-2 and are summarized below. GSIC are addressed later in this document in Section 5.4.3. Figures showing the locations of these exceedances by parameter are presented in Figures 5-65 through 5-69.

The groundwater sampling reports are provided in Appendix E. The field reports are presented in Appendix E-1. A table summarizing the groundwater analytical results relative to DWC is presented in Appendix E-2. The laboratory reports are provided in Appendix E-3. The following sections discuss the occurrence of VOCs, inorganics, and metals that are above the DWC.

5.3.2.1 Volatile Organic Compounds

Wells surrounding the HTDF were analyzed for VOCs. There were no exceedances or detections in these wells.

5.3.2.2 Metals

Groundwater quality data for metals is summarized in Table 5-2 and Appendix E-2 and is presented graphically on Figures 5-65 through 5-69. Five metals exceeded the DWC – aluminum, antimony, iron, lead and manganese.

Aluminum
Aluminum occurs in groundwater at concentrations that are above the DWC in HW-3. Results at these locations are summarized below and on Figure 5-65:

Parameter	Units	HW-3	Drinking Water Criteria
Aluminum	ug/L	150	50

Note: Results from June 2007 are presented in the above table.

Antimony
Antimony occurs in groundwater at concentrations that are above the DWC in HW-1A, HW-2, HW-5A, and HYG-1. Results at these locations are summarized below and on Figure 5-66:

Parameter	Units	HW-1A	HW-2	HW-5A	HYG-1	Drinking Water Criteria
Antimony	ug/L	6.8	6.1	9.3	9.6	6

Note: Results from June 2007 are presented in the above table.

Iron
Iron occurs in groundwater at every monitoring well location surrounding the HTDF (Figure 5-67) and occurs above the DWC in all monitoring wells except one, HYG-1. This is consistent with historical iron data from the area except historically HW-2 was below the standard.

Lead
Lead occurs in groundwater at concentrations that are above the DWC in HW-4. The result is summarized below and on Figure 5-68:

Parameter	Units	HW-4	Drinking Water Criteria
Lead	ug/L	15	4

Note: Results from June 2007 are presented in the above table.

Manganese
Manganese occurs in groundwater at every monitoring well location surrounding the HTDF. As displayed in Figure 5-69, manganese is present above the DWC standard in monitoring wells HW-1, HW-2, HW-3, HW-4, HW-5, HW-6, surrounding the HTDF.

5.4 Surface Water Investigation Results

5.4.1 Regional Area

Surface water samples were collected at the regional surface water sample location in August 2006, October 2006, February 2007, and April/May 2007 using the procedure described in Section 4. Results from these sampling events were compared to the lowest value of the Rule 57 Water Quality Criteria. Exceedances of these criteria were evaluated and are presented in Table 5-3 and summarized below.

The surface water sampling reports and results are provided in Appendix F. The field reports are presented in Appendix F-1. A summary table containing all of the surface water analytical results is presented in Appendix F-2. A table containing the sediment analytical results from samples

collected at surface water sample locations are presented in Appendix F-3. The analytical laboratory reports are provided in Appendix F-4.

Figures 5-70 through 5-75 display regional surface water quality data for August and October 2006. Manganese was detected above the final chronic value set forth in R 323.1057 at Lake Lory in August 2006. Mercury was detected above the wildlife value in Lake Lory, the Black River and the Middle Branch of the Escanaba River in August 2006 and at only two locations in October 2006. Nickel exceeded the final chronic value only at station HMP-001H in August 2006. The suffix "E" indicates the sample was collected above the thermocline, whereas the suffix "H" indicates the sample was collected below the thermocline. Silver exceeded the final chronic value only at HTP-002 in August 2006. Zinc exceeded the aquatic maximum value at WBR-001 in October 2006.

5.4.2 HTDF Area

Several surface water sampling events were conducted in and around the HTDF during the spring and early summer of 2007. To more adequately define the thermal and chemical structure of the HTDF, Foth conducted water quality profile measurements with three-foot resolution at seven locations in the facility. Five sample locations are roughly equally spaced along a line parallel to the long axis of the HTDF (HPL-001 through HPL-005), with two more locations (HPL-006 and HPL-007) located on either side of HPL-003 (see Figure 5-2 for locations). The profiling includes measurements of temperature, as well as DO, pH, and specific conductance. All chemical constituent profiles are shown on Figure 5-76.

5.4.2.1 HTDF Field Parameters May 2007

Temperature—Temperature measurements are presented as depth profiles in Figure 5-76A. Temperature measurements vary somewhat in the surface water at each station, but all stations show a constant low temperature in deep water. A well-developed thermocline is clearly present at each station, and the shape of the thermocline does not vary among stations. Temperature stratification begins sharply at approximately 20 ft below the surface and is complete by the 50 foot depth.

Dissolved Oxygen—As shown in Figure 5-76B, DO concentrations vary little among stations (mostly due to instrument noise) but change dramatically over the depth of the water column. The HTDF exhibits a very pronounced oxygen chemocline, with maximum concentration holding steady over the uppermost 80 ft of water, and then disappearing almost completely between 80 and 120 ft deep. The chemocline divides the HTDF into two distinct compartments: a well-oxygenated upper compartment and an anoxic lower compartment.

pH—Hydrogen ion concentration (pH) does not change greatly in the HTDF, remaining relatively constant both laterally and vertically, as seen in Figure 5-76C. Vertical variation is greater than lateral variation, and there is a distinct vertical structure: maximum pH at the water surface, minimum values at approximately 100 ft deep, and intermediate pH values in the deep water.

Specific Conductance—Specific conductance (Figure 5-76D) provides a general measurement of the concentration of dissolved ions in water. Values of this parameter very little among sampling locations, but the HTDF may be divided into two distinct vertical compartments based on specific conductance measurements. While not as extreme as temperature and oxygen, specific

conductance (and thus, dissolved ions) changes rapidly from lower values in the upper waters to higher values in the bottom waters, with the change occurring at about 100 ft deep.

The various elements of the vertical structure present in the HTDF water column, suggested by the individual field parameter depth profiles, are more apparent when all four profiles are displayed in a single figure. Because units and scaling differ among the profiles, each profile is plotted in Figure 5-76E relative to its maximum value. Thus, the temperature falls to about 40% (value of 0.4) of its maximum value deep in the HTDF, relative to its maximum surface temperature.

Based on the above assessment, the HTDF consists of five contiguous compartments, with the boundaries of each compartment defined by the vertical structure of the individual field parameters, as well as the water surface and HTDF sediment floor. The compartments are:

- surface water 0-6 ft
- above the thermocline 6-24 ft
- below the thermocline, and above the chemocline 24-96 ft
- below the chemocline 96-144 ft
- deep water 144-192 ft

Finally, it is important to note that three field parameters change abruptly at about 95 ft deep. This depth is at the mid-point of the major change in DO concentration and specific conductance, and the minimum pH occurs here. This result strongly suggests that the chemistry is very different in the top and bottom waters of the HTDF.

5.4.2.2 Seasonal Persistence of HTDF Thermocline

Temperature field measurements shown above (from May, 2007), as well as more data from August and October, 2006, indicate the presence of a thermocline in the HTDF during these times of the year. As surface water temperatures cool in the late autumn, water temperatures (and densities) will momentarily become the same between top and bottom water, until surface water cools below 4° C and again becomes less dense than bottom water. During this time, the HTDF could theoretically mix completely. However, momentary loss of temperature (density) stratification alone may not bring about complete mixing; sufficient turbulence must also be present.

Thermal stability of a body of water may be quantified by the densimetric Froude number (Tchobanoglous and Schroeder, 1987), a dimensionless ratio comparing inertial and gravitational forces acting on the body of water:

$$N_{DF} = \frac{Q/(b \times d)}{\sqrt{(\Delta\rho/\rho) \times g \times d}} \qquad (1)$$

where

N_{DF} = Densimetric Froude Number
Q = Volume flow
b = Average width
d = Average depth
$\Delta\rho$ = Top and bottom water density difference

ρ = Depth-average water density
g = Gravity constant

Values of N_{DF} greater than one indicate that turbulent mixing prevents thermal stratification, while values less than one indicate that thermal stratification will remain despite small levels of mixing.

Representative values used to calculate N_{DF} for the HTDF were obtained from recently acquired data, as presented above. Direct measurement of aerial photography was used to estimate the length to width ratio for the facility (3.33:1). This ratio was then used with the known surface area to determine the average width of the facility.

From equation 1, the HTDF has a $N_{DF} = 0.0000054$ and is very strongly stratified. Moreover, because of the very small flow out of the facility compared to the cross-sectional area, the difference in density between the upper and lower zones must be less than about 10^{-14} before the Froude number approaches unity. This suggests that it is unlikely that the HTDF will mix completely, although mixing probably increases as surface water temperatures pass through times of maximum density.

5.4.2.3 Dissolved Oxygen and Primary Productivity

Graph A in Figure 5-77 displays measurements of DO measured in the HTDF during July, 2007. The values are displayed as a depth profile and are very similar to those shown in Figure 5-76B, based on sampling done in May 2007. Oxygen was measured using different methodology in May and July. May measurements were made using a colorimetric method, whereas measurements in July used an electronic probe with approximately ten times the resolution of the colorimetric method. Despite this difference, the two profiles are essentially identical, with the exception of the top of the profiles. While both profiles show DO values of about 8 mg/L from the surface to a depth of about twenty feet, the July measurements capture an increase in DO that occurs between twenty feet and about forty feet. At this depth, oxygen reaches a maximum of about 10.5 mg/L. The increase is due to the greater solubility of oxygen in cold water, and the oxygen trend mirrors the water temperature profile shown in Graph B, Figure 5-77.

The oxygen chemocline observed in the May profile is clearly present in the July profile. The loss of oxygen occurs at the same depths in both profiles, with anoxic water below 100 ft in both cases. Thus, oxygen dynamics are very stable and show no seasonality between spring and summer.

Also shown in Graph A in Figure 5-77 is a depth profile of measurements of DO collected in 1984 in the Humboldt Pit (now known as the HTDF) (TES, 1984). In 1984, before Ropes mine tailings were placed, the pit was about 300 ft deep, and the historical measurements show that the entire water column was oxygenated, with DO concentrations at the bottom equal to about 75% of surface values.

Comparison of the historical and contemporary oxygen profiles shows that, in the surface waters of the HTDF, little has changed with oxygen dynamics over about twenty three years. The profiles show very similar surface concentrations, and each profile captures the increased oxygen due to decreasing water temperature.

However, below about 75 ft the two profiles are very different. In 1984, the entire pit was oxygenated, whereas currently the HTDF is anoxic below about 100 ft. Given that atmospheric

oxygen levels and rates of oxygen diffusion through water have not changed over the past twenty years, the difference in bottom water oxygen over this time is most likely due to an increase in oxygen demand, that is, an increase in chemical reductants, in the bottom of the HTDF during this time.

An increase in reductants at the bottom of a body of water most often occurs as a result of increased primary productivity in the surface waters. Also, an increase in input of allochthonous carbon might occur. In either case, more organic (reduced) carbon would reach the sediments, leading to an increase in oxygen consumption, and oxygen depletion in bottom waters.

Aerial photography shows that land usage has not changed greatly around the HTDF in the last several decades, so allochthonous carbon loading to the HTDF has likely been relatively constant during this time. Also, dissolved organic carbon levels are typical of a system with low primary productivity. The extent of primary production may also be assessed by examining DO.

A diurnal DO profile survey was conducted in July, 2007 to determine the biologic contribution of DO in the water column. The two sets of DO measurements are shown in Graph B, Figure 5-77. These measurements were taken on the same July day as the measurements shown in Graph A, but at different times. The first set shown in Graph B was obtained at about 5:00 AM, while the second set was measured at about 4:00 PM. As explained above, photosynthesizing algal cells would release a pulse of oxygen during the day and consume oxygen at night, resulting in very different DO levels early and late in the day. The fact that the oxygen profiles in Graph B are almost identical strongly indicates that photosynthesis, and therefore, primary production, is essentially not occurring in the HTDF.

Organic carbon measurements were obtained as a part of the May, 2007 field sampling (Foth, 2007). Samples were analyzed both for total and dissolved organic carbon (MDL 1.4 mg/L, EQL 2.0 mg/L for both sample types). In total, twenty samples were analyzed for organic carbon (two sampling stations, dissolved and total samples, at five depths). Of these, four were less than the MDL, seven were less than the EQL and two were equal to the EQL. The seven quantified samples have an average value of 2.39 mg/L and a standard deviation of 0.28 mg/L. The measurements did not agree well between the two stations and no consistent trends were observed with depth or type of sample. These data are provided in the data summary in Appendix F.

Dissolved organic carbon is much more prevalent than particulate organic carbon in surface bodies of water, often accounting for more than 90% of total organic carbon. Total organic carbon ranges between about 0.7 mg/L (ground water) and 33 mg/L (bog water), with oligotrophic waters averaging 2.2 mg/L and eutrophic waters at about 12 mg/L (Wetzel, 2001). Based on total organic carbon, the HTDF would be classified as, at most, an oligotrophic system. This may be misleading, however, as the number of values below the 2.0 mg/L Estimated Quantitation Limit (EQL) and the lack of structure suggest that even less organic carbon is autochthonous than in an oligotrophic system. It is likely that the small amount of organic carbon present in the HTDF is predominantly allochthonous.

Measurements of organic carbon and DO show no evidence of high levels of organic carbon production in the water column of the HTDF, and so, little organic carbon is expected in the sediments. The depletion of oxygen in the bottom waters must then be due, at least in part, to the presence of other reductants capable of consuming oxygen.

The change in oxygen dynamics between 1984 and present, visible in Graph A, Figure 5-77, and the fact that the Ropes tailings were placed during this interval suggests that the tails are helping to maintain anoxic conditions in the HTDF. In this scenario, oxygen continually diffuses into the waters of the HTDF, past depths where primary production would otherwise begin to consume it. At deeper depths, oxygen encounters in situ reductants, including small amounts of predominantly allochthonous organic carbon, and is at least partially consumed by these reductants. Any oxygen that remains at deeper depths eventually reacts with reduced sulfur from mine tailings. Thus, the large mass of sulfidic mine tailings is self-stabilizing, in that variations in amounts of other reductants, principally organic carbon, cannot lead to a build up of oxygen near the tailings.

The chemistry of the HTDF was further investigated by measuring the ORP, or redox potential in July, 2007. Measurements were taken at three foot intervals using a platinum electrode and a silver/silver chloride (Ag/AgCl) reference electrode. Actual environmental systems (bodies of water) are complex, contain many chemical species and several redox couples. Because of this, redox profiles should be interpreted with caution and cannot be expected to predict individual chemistries. However, field measurements are very useful in understanding relative conditions within a body of water, and may provide chemical information when compared to literature values of redox potentials. As with most bodies of water, the redox profile for the HTDF displays a reduction gradient with increasing water depth; waters are most oxidizing at the surface and are most reducing in the bottom waters. The profile is erratic in the oxygenated top waters, but much more stable in the anoxic bottom waters. These data are provided in the data summary in Appendix F.

5.4.2.4 HTDF Chemocline

On May 30 and 31, 2007, NJC collected field parameter measurements and water quality samples to quantify the chemical concentrations of many dissolved constituents in the HTDF (Appendix F-2). While this documentation is a necessary part of the permit application process, the measurements and analytical results are fundamental inputs for any model describing the evolution of the HTDF as new mine tailings are added to the facility. Field measurements of ferric and ferrous iron were collected on July 12, 2007 to determine the insitu concentrations in the HTDF. However, the detection limit of the field test was not sensitive enough to quantify the actual concentrations. Laboratory analysis of ferrous iron indicated concentrations below the MDL of 26 ug/L.

Water samples were collected from five depths defined by the vertical structure of the HTDF, as discussed above. These depths are 3, 15, 60, 120, and 175 ft deep. Sampling at each depth was done at two of those locations (HPL-003 and HPL-004) to assess horizontal variability in the HTDF. The data from a given depth varied little between these two locations, and results presented here are from HPL-003, located in the center of the HTDF.

All water samples were analyzed for the surface water quality parameter list in Table 4-8. Twenty-two parameters (including related parameters such as turbidity and alkalinity) were successfully quantified at all five depths at each sampling station. In addition, ammonia was quantified at the two deepest depths (120 and 175 ft). To facilitate comparisons among the chemicals, and to examine the vertical structure displayed by each chemical (if any), data presented here are in the form of depth profiles for each chemical. Representative results for four metals found in the HTDF are shown in Figure 5-76F through 5-76I.

The constituents measured in HTDF water vary in concentration over five orders of magnitude. Despite this range, three general patterns with respect to depth are observed in the data. Some constituents, for example nickel, are present at low concentrations in surface water, but increase to high levels with increasing depth; other constituents, like copper, increase from intermediate to high values with increasing depth; finally, another set of constituents, represented here by calcium, are nearly constant with depth.

The shape of the iron profile is unique and points to the importance of iron in the HTDF as a mediator of surface concentrations of a number of metals. The mechanism involves the reduction-oxidation coupling of Fe^{+2} and Fe^{+3} below and above the oxygen chemocline, and formation of iron precipitates in the upper regions of the HTDF.

The patterns present in the individual depth profiles are compared in Figure 5-76J by plotting all profiles together using relative values, as done above with field parameters. Three of these field parameters are also included in Figure 5-76J.

Several general observations are presented here. Almost all of the chemical constituents in the HTDF are present at highest concentration at the very bottom of the HTDF. This result strongly suggests that the sediments (old tailings) are the predominant source of these constituents. As noted above, almost all of these chemicals then decrease to a varying degree at shallower depths. The greatest decrease occurs for nickel, manganese, molybdenum, cobalt, and antimony; all of these fall to less than 20% of their maximum concentrations. Potassium, sodium, chloride, copper, and boron also decrease, but by only about one-half their maximum levels. Finally, magnesium and calcium change very little with depth, suggesting that the rock that forms the HTDF is the source of these cations. The rock forming the HTDF is predominantly iron, so the fact that iron does not behave like calcium and magnesium strongly suggests that iron participates in reactions within the HTDF, and, as discussed above, it is likely that the decrease in other metal concentrations is due to iron chemistry in the HTDF.

5.4.2.5 Surface Water Quality within HTDF Watershed

Surface water samples were collected from the HTDF and surrounding area during May and June. Results from this sampling event were compared to the lowest value of the Rule 57 Water Quality Criteria. Exceedances of these criteria were evaluated and are presented in Table 5-3 and summarized below.

All of the surface water sampling reports and results are provided in Appendix F. The field reports are presented in Appendix F-1. A summary table containing all of the surface water analytical results is presented in Appendix F-2. Figures showing the locations of the surface water exceedances by parameter are presented in Figures 5-78 through 5-82 for the June 2007 sampling event.

5.4.3 Groundwater Surface Water Interface

The GSIPC were evaluated relative to sediment quality samples collected in August 2006 and May 2007 and the GSIC were evaluated relative to groundwater quality data collected in June 2006, November 2006, February 2007, and March 2007.

5.4.3.1 Groundwater Surface Water Interface Protection Criteria

During the August 2006 surface water sampling event, grab samples of sediment were collected at regional the surface water sample stations. In June 2007, grab sample were collected at the surface water sample stations around the HTDF. These results were compared to R 299.5746 GSIPC. A summary of the data is provided as Table 5-4 and figures showing the locations of exceedances are presented as Figure 5-83 to 5-99.

Arsenic, cobalt, lithium, mercury, molybdenum, selenium, and silver were detected at regional sampling locations above the GSIPC in August. Cobalt and lithium were detected above the criteria at a majority of the sample locations. Arsenic, mercury, molybdenum, selenium and silver were detected above the GSIPC at some of the regional locations in August 2006.

Cobalt, copper, lithium, manganese, mercury, molybdenum, nickel, selenium, silver, and zinc were detected above the GSIPC at sampling stations within the HTDF watershed in June 2007. Lithium and manganese exceeded the GSIPC at all locations. Copper and cobalt exceeded the GSIPC at a majority of the locations. Nickel and selenium exceeded the GSIPC half the locations. Silver and zinc exceeded the GSIPC at two locations. Mercury exceeded the GSIPC at one location.

5.4.3.2 Groundwater Surface Water Interface Criteria

Table 5-5 summarizes 2006 and 2007 groundwater quality relative to GSIC. The table shows that a number of metals at a variety of wells exceed the GSIC.

6 Conclusions

The Project Site is located in a geologic region that has produced vast quantities of iron ore and some gold. The abundance of metals and associated compounds in the surface environment has produced high background concentrations in soil. Erosion and glacial action over geologic time have broken down the minerals and redistributed the primary components. The result is elevated concentrations of a variety of compounds in soil, groundwater and surface water throughout the region. Mining and processing activities have enhanced these concentrations in some areas, and have effectively reduced them in others.

The Mill is a former iron ore processing facility, adjacent to an iron mine, and many of the metals identified at the site during this investigation were primary constituents of metallic mineral deposits both here and throughout the area. In addition to iron, manganese and aluminum which are common constituents of iron ore deposits, cobalt and lithium can be found in nearly every soil sample. Arsenic, antimony and molybdenum are also common across the area. Although there is no published mineral record for the former Humboldt Mine, it is generally accepted among local geologists that the geochemistry of the former Humboldt Mine and the neighboring Champion Mine is unique to the Marquette Range. The elevated concentration of these metals likely represents an elevated background for this area and, with the exception of antimony and arsenic, will not be considered further.

Gold ore from the Ropes Mine, near Ishpeming was processed at the Mill from 1985 through 1989. This activity brought another suite of metals and other potentially hazardous substances to the Project Site, although the possible area of impact would be smaller than that covered by the earlier iron ore processing. Antimony and arsenic found in the buried pyrite trench suggest they were a component of the gold mining process.

In general the soil investigation identified isolated areas in the vicinity of the office and maintenance building and mill building, the fuel oil AST, the septic drain field and stormwater outfall, the buried pyrite and isolated areas in the vicinity of the pyrite stockpile that have elevated concentrations of metals that exceed Part 201 criteria. The groundwater investigation has shown that contaminants of concern are isolated and limited to the area around the Mill and to a lesser extent, in the vicinity of the buried pyrite. However, it should be noted that in many cases, contaminant concentrations in soil and groundwater barely exceed their respective criteria.

With the exception of the HTDF, surface water is not abundant in the area of the Mill. In the area of the Mill surface water runoff generally follows man-made ditches that drain into a natural drainage with associated wetlands that have been modified by the construction of the Humboldt Mill. The ditches were constructed by Callahan Mining Corporation and CCI to mitigate the impact of stormwater runoff. Historic exceedances of contaminants of concern have not been duplicated because water is only found in those locations during spring runoff and heavy precipitation events. It should be noted that most of the perceived source material for contaminated runoff, the pyritic stockpile, has been removed from the original location south of the mill.

The findings of this investigation are provided in Sections 6.1 through 6.8.

6.1 Office/Maintenance Building

Based on the historic investigations conducted in the office diesel and gas USTs area and data obtained from this investigation, the leaking UST site has been remediated.

6.2 Fuel Oil AST

Soil samples from beneath the former AST location showed no petroleum compound concentrations that exceed DWPC. A groundwater sample collected near the AST showed no petroleum compound concentrations that exceed DWC.

6.3 Pyrite Stockpile Area

- Soil samples collected in this area show isolated impacts of cyanide, arsenic, silver and antimony are still present.

- With the exception of ubiquitously occurring metals and arsenic, high concentrations of dissolved metals are not common in groundwater samples beneath this area or in the downgradient direction which suggests that the remaining, limited source material is not providing a significant source to be transported to the groundwater.

- The limited surface water samples collected in this area do not indicate any significant impact from contaminants of concern other than high background metals.

6.4 Buried Pyrite and Truck Scale Area

- Soil samples collected in this area indicate that high concentrations of virtually all metals analyzed are still present above DWPC. Groundwater samples collected to the north and south of this area indicate high concentrations of sulfate, indicating the degradation of the primary pyrite. Arsenic, vanadium and cobalt were detected above DWC.

- Yellow-orange staining of the paved roadway adjacent to the pyrite trench has occurred. Some of the vegetation on the other side of the roadway appears to be stressed. High concentrations of sulfate in groundwater south of this staining suggests that high-sulfur surface water runoff from the buried pyrite trench area is migrating to the south and impacting both vegetation and groundwater.

- Elevated metals concentrations that exceed the DWPC were also noted in historic soil samples in the vicinity of the former truck scale area. According to Maxim Technologies (2000), the soil at the scale area was excavated and disposed at a local landfill, but no documentation was presented to support this action. It should be noted that no DWC exceedances were detected in the downgradient monitoring well, indicating any remaining metals in the soil at the scale area are not contributing to groundwater impacts.

6.5 Septic Drainfield and Stormwater Outfall

During the field inspection, a storm water or process water outfall was identified which formerly discharged into a wetland adjacent to the septic field. Based on laboratory analysis, soil samples collected in this area contain several petroleum related compounds that exceed DWPC.

6.6 Iron Ore Tailings Basins

Two large iron ore tailings storage facilities are located approximately 1,400 ft southeast of the area of the Mill. Laboratory analysis of the tailings indicted high concentrations of iron, manganese, aluminum, cobalt and lithium in samples above the DWPC. These metals are believed to represent the primary metal assemblage in the iron ore from the Humboldt mine. Antimony, arsenic, molybdenum were also detected in a number of tailings samples that exceed DWPC. Laboratory analysis of groundwater in the iron ore tailings facility did not detect any exceedances of DWC other than for iron and manganese, indicating the metals in the tailings are not leaching to groundwater in significant quantities. Note that these tailings basins are not included in the Project Site.

6.7 Iron Ore Concentrate

There are two piles of iron ore concentrate located south of the mill building. Taconite pellets form a consistent cover over much of the area of the Mill.

6.8 HTDF Area

The HTDF was originally a geologic formation of quartz-rich rocks high concentrations of iron, manganese, and locally sulfide veins that commonly contain copper, zinc, arsenic and lead. The deposit was mined beginning early in the twentieth century through 1968. Following the conclusion of mining, pumps used to keep the mine dry were shut off. Between 1968 and 1984, precipitation and ground water filled the pit to a generally static level.

Hydrologic studies done in 1984 revealed high concentrations of iron, lead and silver in groundwater in the unconsolidated aquifer bounding the pit on the north and south. Bedrock cliffs that form the east and west sides of the pit consist of complexly folded, and recrystallized stratified rocks that are poorly fractured and produce very little groundwater. Within the flooded mine pit, surface water concentrations of copper, lead, nickel and silver exceeded the Rule 57 criteria. Effluent discharged from the pit exceeded the Rule 57 criteria for copper, nickel and silver.

Callahan Mining Corporation processed Ropes Mine gold ore and deposited the mill tailings and some of the pyritic leach residue in the HTDF from 1985 through 1989. The ore was processed at the Humboldt Mill adjacent to the former iron mine. Hydrologic studies conducted after the tailings disposal activities were completed, indicated that iron and manganese concentrations in groundwater continued to exceed the DWC, but lead concentrations had decreased to below the DWC. In surface water, nickel, copper and cyanide exceeded Rule 57 criteria.

Environmental monitoring of surface water and groundwater between 1989 and the present has shown that of the historic parameters analyzed, iron, manganese and lead continue to exceed the DWC. The concentrations of all of the contaminants of concern at the time decreased to below regulatory limits by the end of 1997, when the MDEQ deactivated the NPDES permit for the HTDF. Recent laboratory analysis of a wider range of parameters has shown that aluminum and antimony also exceed the DWC. In surface water, copper, lead, manganese, mercury and nickel exceeded Rule 57 criteria. Due to the observed distribution of mercury concentrations in surface water, generally away from the Humboldt Mill and the HTDF, an atmospheric source is likely.

The other metals that exceed the Rule 57 criteria due to a combined effect of locally derived, natural occurrence of metals and later processing and disposal on site.

7 References

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Tables

Table 3-1

Mill Area Historical Soil Results -Exceedances

Event Date	Parameter	Units	Data Level	PL-1	PL-10	PL-11	PL-12	PL-2	PL-3	PL-4	PL-5	PL-6	PL-7	PL-8	PL-9	SB-1 SW	SB-1"	SB-10"	SB-2"	SB-2EW	SB-3"	SB-3WW	SB-4"	SB-4NW
10/24/1995	**PCBs**																							
	Physical Property																							
	Cyanide, total	mg/kg	Tier 2																					
	VOC-PAH																							
11/7/1995	**Metal**																							
	Arsenic	mg/kg	Tier 1																					
	Chromium	mg/kg	Tier 3																					
	Iron	mg/kg	Tier 1																					
	Iron	mg/kg	Tier 3																					
	Manganese	mg/kg	Tier 1																					
	Nickel	mg/kg	Tier 1																					
7/28/1998	**Metal**																							
	Antimony	mg/kg	Tier 3														**9**	**21**	4		**4.3**		**6.1**	
	Arsenic	mg/kg	Tier 3														**519**	**435**	**214**		**156**		**287**	
	Chromium	mg/kg	Tier 3														**346**	**1220**	**298**		**210**		**171**	
	Iron	mg/kg	Tier 3														**181000**	**178000**	**128000**		**98800**		**133000**	
	Lead	mg/kg	Tier 3	5.45	3.16	8.44	6.87	1.65	60.9	3.01	15.2	108	3.71	3.46	2.99		**530**	**525**	330		242		296	
	Magnesium	mg/kg	Tier 3														**9190**	**10000**	5800		5040		6210	
	Manganese	mg/kg	Tier 3														**142**	**1030**	**87.5**		**114**		**92**	
	Nickel	mg/kg	Tier 3														**780**	**745**	**345**		**330**		**535**	
	Silver	mg/kg	Tier 3														**41.9**	**904**	**26.7**		**16.1**		**29.2**	
	VOC																							
	1,2,4-Trimethylbenzene	ug/Kg	Tier 3	<51 U	<55 U	<53 U	<53 U	1800	<54 U	**5600**	<53 U	<57 U	<58 U	<56 U	<58 U									
	VOC-PAH																							
	Anthracene	ug/kg	Tier 3	<200 U	<220 U	<210 U	<210 U	14000	<220 U	**100000**	<210 U	<230 U	<230 U	<230 U	<230 U	<210 U				<210 U		<210 U		<210 U
	Phenanthrene	ug/kg	Tier 3	390	<220 U	<210 U	<210 U	19000	830	**110000**	<210 U	320	<230 U	260	<230 U	<210 U				<210 U		<210 U		<210 U

Prepared by: SVF
Checked by: CED1

Table 3-1

Mill Area Historical Soil Results -Exceedances

Event Date	Parameter	Units	Data Level	SB-5"	SB-5WF	SB-6"	SB-6EF	SB-7"	SB-8"	SB-9"	Scale #1	Stockpile	TP-17	TP-34	Drinking Water Protection[1]	Drinking Water Protection Code
10/24/1995	**PCBs**															
	Physical Property															
	Cyanide, total	mg/kg	Tier 2									**10.5**	**6.6**	0.9	4	
	VOC-PAH															
11/7/1995	**Metal**															
	Arsenic	mg/kg	Tier 1								**8**				4.6	
	Chromium	mg/kg	Tier 3								**100**				30	D
	Iron	mg/kg	Tier 1								**46000**				6	
	Iron	mg/kg	Tier 3								**46000**				6	
	Manganese	mg/kg	Tier 1								**900**				1	
	Nickel	mg/kg	Tier 1								**140**				100	
7/28/1998	**Metal**															
	Antimony	mg/kg	Tier 3	**16.1**		**13.2**		**11.1**	**8.7**	**30.7**					4.3	M
	Arsenic	mg/kg	Tier 3	**443**		**339**		**540**	**340**	**563**					4.6	
	Chromium	mg/kg	Tier 3	**402**		**396**		**173**	**245**	**337**					30	D
	Iron	mg/kg	Tier 3	**175000**		**174000**		**154000**	**143000**	**203000**					6	
	Lead	mg/kg	Tier 3	**625**		**510**		391	390	**525**					400	
	Magnesium	mg/kg	Tier 3	**12600**		**11500**		4220	5270	**13400**					8000	
	Manganese	mg/kg	Tier 3	**155**		**145**		**58.4**	**93.9**	**194**					1	
	Nickel	mg/kg	Tier 3	**366**		**695**		**735**	**570**	**443**					100	
	Silver	mg/kg	Tier 3	**42.5**		**34.8**		**35.9**	**35.6**	**46.6**					4.5	
	VOC															
	1,2,4-Trimethylbenzene	ug/Kg	Tier 3												2100	
	VOC-PAH															
	Anthracene	ug/kg	Tier 3		<210 U		<210 U								41000	
	Phenanthrene	ug/kg	Tier 3		<210 U		<210 U								56000	

Notes:

[1] = Analytical results were compared to drinking water protection criteria. Exceedances are highlighted. Value cited for lead is Direct Contact Criteria.

D = Calculated criterion is below the analytical target detection limit, therefore, the criterion defaults to the target detection limit

M = Calculated criterion is below the analytical target detection limit, therefore, the criterion defaults to the target detection limit

U = All - The analyte was not detected at or above the reporting limit.

< = All - The analyte was not detected at or above the reporting limit.

mg/kg = millograms/killogram

PAH = Polynuclear Aromatic Hydrocarbon

ug/kg = micrograms/kilogram

VOC = Volatile Organic Compound

PCB - polychlorinated byphenyl

Table 3-2

Mill Area Historical Groundwater Results - Exceedances

Event Date	Parameter	Units	DataLevel	MW-1	MW-10	MW-101	MW-102	MW-103	MW-104	MW-105	MW-106	MW-107	MW-11	MW-12	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-9	Residential Commercial I Drinking Water Criteria[1]	Residential Commercial Code
8/6/1991																							
	VOC																						
	Benzene	ug/L	Tier 1															**20**				5	A
	Ethylbenzene	ug/L	Tier 1															**120**				74	E
	Xylenes	ug/L	Tier 1															**1800**				280	E
1/13/1992	**VOC**																						
	Xylenes	ug/L	Tier 1	<1 U											<1 U	<1 U	<1 U	**320**	<1 U	<1 U	<1 U	280	E
8/18/1992	**Metal**																						
	Arsenic	ug/L	Tier 3										**37**	9			**83**					10	
	Iron	ug/L	Tier 3										**300000**	**7000**			**170000**					300	E
	Lead	ug/L	Tier 3										**120**	<30 U			<30 U					4	L
	Manganese	ug/L	Tier 3										**13000**	**1900**			**62000**					50	E
	Nickel	ug/L	Tier 3										70	10			**940**					100	A
12/17/1992	**Metal**																						
	Arsenic	ug/L	Tier 3										**16**	**12**			**120**					10	
	Iron	ug/L	Tier 3										**240000**	**16000**			**170000**					300	E
	Lead	ug/L	Tier 3										**50**	**30**			<30 U					4	L
	Manganese	ug/L	Tier 3										**9700**	**1100**			**49000**					50	E
	Nickel	ug/L	Tier 3										20	<10 U			**790**					100	A
12/28/1992	**Metal**																						
	Iron	ug/L	Tier 3										**230000**	**5100**			**120000**					300	E
	Manganese	ug/L	Tier 3										**10000**	**1000**			**47000**					50	E
	Nickel	ug/L	Tier 3										20	10			**780**					100	A
8/10/1993	**Metal**																						
	Arsenic	ug/L	Tier 3										**10**	**14**			**180**					10	
	Iron	ug/L	Tier 3										**11000**	**200000**			**240000**					300	E
	Nickel	ug/L	Tier 3										<10 U	<10 U			**2200**					100	A
1/20/1994	**VOC**																						
	Ethylbenzene	ug/L	Tier 3	<1 U	<1 U										<1 U	<1 U	<1 U	**93**		<1 U	<1 U	74	E
	Xylenes	ug/L	Tier 3	<3 U	<3 U										<3 U	<3 U	<3 U	**1700**		<3 U	<3 U	280	E
2/2/1994	**Metal**																						
	Arsenic	ug/L	Tier 3										**30**	**400**			**66**					10	
	Iron	ug/L	Tier 3										**260000**	**37000**			**170000**					300	E
	Lead	ug/L	Tier 3										**50**	<30 U			<30 U					4	L
	Nickel	ug/L	Tier 3										<20 U	<20 U			**1300**					100	A
6/2/1994																							
	VOC																						
	Benzene	ug/L	Tier 3	<1 U	<1 U											<1 U	<1 U	**24**	<1 U	<1 U	<1 U	5	A
	Ethylbenzene	ug/L	Tier 3	<1 U	<1 U											<1 U	<1 U	**120**	<1 U	<1 U	<1 U	74	E
9/14/1994																							
	VOC																						
	Benzene	ug/L	Tier 3	<1 U	<1 U										<1 U	<1 U	<1 U	**20**		<1 U	<1 U	5	A
	Ethylbenzene	ug/L	Tier 3	<1 U	<1 U										<1 U	<1 U	<1 U	**130**		<1 U	<1 U	74	E
	Xylenes	ug/L	Tier 3	<3 U	<3 U										<3 U	<3 U	<3 U	**2000**		<3 U	<3 U	280	E
12/7/1994																							
	VOC																						
	Benzene	ug/L	Tier 3	IS	<1 U										<1 U	<1 U	<1 U	**19**		<1 U	<1 U	5	A
	Ethylbenzene	ug/L	Tier 3	IS	<1 U										<1 U	<1 U	<1 U	**94**		<1 U	<1 U	74	E
	Xylenes	ug/L	Tier 3	IS	<3 U										<3 U	<3 U	<3 U	**1600**		<3 U	<3 U	280	E
3/31/1995																							
	VOC																						
	Benzene	ug/L	Tier 3	<1 U	<1 U										<1 U	<1 U	<1 U	**24**			<1 U	5	A
	Ethylbenzene	ug/L	Tier 3	<1 U	<1 U										<1 U	<1 U	<1 U	**130**			<1 U	74	E
	Xylenes	ug/L	Tier 3	<3 U	<3 U										<3 U	<3 U	<3 U	**1900**			<3 U	280	E
6/2/1995																							
	Metal																						
	Arsenic	ug/L	Tier 3	7.2	4.8								6.4	6.9	5.3	4.8	**18**	**74**	dry	7.7	<2 U	10	
	Cadmium	ug/L	Tier 3	<5 U	<5 U								<5 U	<5 U	<5 U	<5 U	**26**	**5**	dry	**42**	<5 U	5	A
	Iron	ug/L	Tier 3	**21000**	**18000**								**140000**	**7400**	**1600**	**450**	**250000**	**200000**	dry	**170000**	120	300	E
	Lead	ug/L	Tier 3	**23**	<1 U								3.4	<1 U	<1 U	1.2	<1 U	1.2	dry	<2 U	<1 U	4	L
	Manganese	ug/L	Tier 3	**9400**	**23000**								**7800**	**1000**	**6000**	**1900**	**64000**	**6100**	dry	**76000**	**210**	50	E
	Nickel	ug/L	Tier 3	**210**	30								<10 U	<10 U	60	90	**2200**	30	dry	**3900**	20	100	A
6/13/1995																							
	VOC																						
	Benzene	ug/L	Tier 2	<5 U	<5 U										<5 U	<5 U	<5 U	**13**	<5 U	<5 U	<5 U	5	A
	Xylenes	ug/L	Tier 2	<3 U	<3 U										<3 U	<3 U	<3 U	**1100**	<3 U	<3 U	<3 U	280	E

Prepared by: SVF
Checked by: JSL

Table 3-2
Mill Area Historical Groundwater Results - Exceedances

Event Date	Parameter	Units	DataLevel	MW-1	MW-10	MW-101	MW-102	MW-103	MW-104	MW-105	MW-106	MW-107	MW-11	MW-12	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-9	Residential Commercial I Drinking Water Criteria[1]	Residential Commercial Code
9/18/1995	**Metal**																						
	Arsenic	ug/L	Tier 3	<2 U	3.6								6.8	6.4	2	dry	**46**	**94**	dry	2	<2 U	10	
	Cadmium	ug/L	Tier 3	<0.5 U	2.5								**16**	<0.5 U	<0.5 U	dry	**36**	**22**	dry	**26**	<0.5 U	5	A
	Iron	ug/L	Tier 3	**320**	**20000**								**120000**	**5500**	260	dry	**220000**	**140000**	dry	**160000**	100	300	E
	Lead	ug/L	Tier 3	<1 U	**4.8**								**13**	<1 U	<1 U	dry	**24**	**13**	dry	**18**	<1 U	4	L
	Manganese	ug/L	Tier 3	**310**	**35000**								**6600**	**990**	**4400**	dry	**41000**	**6100**	dry	**40000**	**660**	50	E
	Nickel	ug/L	Tier 3	9.2	49								12	1.1	36	dry	**1900**	57	dry	**1700**	25	100	A
	VOC																						
	Benzene	ug/L	Tier 2															**29**				5	A
	Ethylbenzene	ug/L	Tier 2															**900**				74	E
	Xylenes	ug/L	Tier 2															**5400**				280	E
10/24/1995	**Metal**																						
	Iron	ug/L	Tier 2			**1000**		**34000**	<100 U	**9400**	**2000**											300	E
	Lead	ug/L	Tier 2			<3 U	<3 U	<3 U	<3 U	<3 U	<3 U											4	L
	Manganese	ug/L	Tier 2			**5800**		**3200**	**3200**	**1200**	**7200**											50	E
	Mercury	ug/L	Tier 2			<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U											2	A
	Nickel	ug/L	Tier 2			<50 U	**1400**	<50 U	<50 U	<50 U	<50 U											100	A
	VOC																						
	Benzene	ug/L	Tier 2						**27**		<5 U											5	A
	Xylenes	ug/L	Tier 2						**500**		<3 U											280	E
10/26/1995	**Metal**																						
	Arsenic	ug/L	Tier 3				<5 U		**12**													10	
	Iron	ug/L	Tier 3				**390000**		**30000**													300	E
	Manganese	ug/L	Tier 3				**22000**															50	E
11/7/1995	**Metal**																						
	Arsenic	ug/L	Tier 3	<2 U	3	6	<2 U	<2 U	8	<2 U	<2 U		**13**	<2 U	<2 U	<2 U	<2 U	**140**	dry	<2 U	<2 U	10	
	Barium	ug/L	Tier 3	85	49	56	36	60	210	38	63		110	30	67	60	60	280	dry	18	37	2000	A
	Cadmium	ug/L	Tier 3	<0.5 U	<0.5 U	0.7	**130**	0.6	**6**	<0.5 U	<0.5 U		**19**	<0.5 U	<0.5 U	<0.5 U	**41**	**30**	dry	**20**	<0.5 U	5	A
	Iron	ug/L	Tier 3	**4500**	**330**	**5500**	**440000**	**2800**	**41000**	**2700**	**520**		**190000**	**1800**	66	170	**410000**	**300000**	dry	**190000**	150	300	E
	Lead	ug/L	Tier 3	<1 U	<1.4 U	<1 U	**68**	<1 U	**4**	<1 U	<1 U		**11**	<1 U	<1 U	<1 U	**24**	**14**	dry	**11**	<1 U	4	L
	Manganese	ug/L	Tier 3	**7000**	**30000**	**8400**	**25000**	**4200**	**5700**	**1400**	**7600**		**6200**	**1500**	**2300**	**70**	**45000**	**6700**	dry	**35000**	**220**	50	E
	Mercury	ug/L	Tier 3	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U		<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	dry	<0.2 U	<0.2 U	2	A
	Nickel	ug/L	Tier 3	**150**	39	1	**1600**	2	22	4	11		4	2	18	28	**1500**	60	dry	**1100**	21	100	A
11/29/1995	**Metal**																						
	Cadmium	ug/L	Tier 3				**130**	0.6	**6**	0.5	0.5											5	A
	Iron	ug/L	Tier 3				**440000**	**2800**	**41000**	**2700**	52											300	E
	Lead	ug/L	Tier 3				**68**	1	**4**	<1 U	<1 U											4	L
	Manganese	ug/L	Tier 3				**25000**	**4200**	**5700**	**1470**	**7600**											50	E
	Nickel	ug/L	Tier 3				**1600**	2	22	4	11											100	A
6/5/1996	**Metal**																						
	Arsenic	ug/L	Tier 3	<3 U	<3 U	5	<3 U	<3 U	**11**	<3 U	<3 U		<3 U	<3 U	<3 U	<3 U	<3 U	**39**	dry	7	3	10	
	Cadmium	ug/L	Tier 3	0.6	**6**	0.5	**110**	2	**6**	0.9	0.6		**13**	0.5	0.5	1	**9**	**13**	dry	**28**	0.5	5	A
	Iron	ug/L	Tier 3	160	**10000**	**5200**	**690000**	**23000**	**65000**	**11000**	**440**		**140000**	**1900**	**500**	250	**62000**	**140000**	dry	**150000**	**3300**	300	E
	Lead	ug/L	Tier 3	3	**7**	**4**	**69**	3	**7**	<4 U	<2 U		**12**	<2 U	<2 U	3	**17**	**13**	dry	**17**	3	4	L
	Manganese	ug/L	Tier 3	**2300**	**36000**	**12000**	**27000**	**5800**	**4600**	**1200**	**3500**		**8600**	**1100**	**5100**	**460**	**50000**	**5600**	dry	**57000**	**230**	50	E
	Nickel	ug/L	Tier 3	28	**130**	<0.5 U	**2500**	8	24	<0.5 U	14		2	1	14	77	**1800**	20	dry	**3200**	<0.5 U	100	A
11/8/1996	**VOC**																						
	Ethylbenzene	ug/L	Tier 3						**3900**													74	E
	Xylenes	ug/L	Tier 3						**12000**													280	E
	VOC-PAH																						
	Naphthalene	ug/L	Tier 3						**1700**													520	
	Phenanthrene	ug/L	Tier 3						**510**													52	
9/16/1997	**VOC**																						
	Benzene	ug/L	Tier 3	<1 U	<1 U				**29**		<1 U				<1 U	<1 U	<1 U	**20**		<1 U	<1 U	5	A
	Ethylbenzene	ug/L	Tier 3	<1 U	<1 U				**170**		<1 U				<1 U	<1 U	<1 U	**110**		<1 U	<1 U	74	E
	Xylenes	ug/L	Tier 3	<1 U	<1 U				**780**		<1 U				<1 U	<1 U	<3 U	**1700**		<1 U	<1 U	280	E
	VOC-PAH																						
	1-Methyl-naphthalene	ug/L	Tier 3	<5 U	<5 U				700						<5 U	<5 U	<5 U	900		<5 U	<5 U		
	2-Methyl naphthalene	ug/L	Tier 3	<5 U	<5 U				**670**						<5 U	<5 U	<5 U	**650**		<5 U	<5 U	260	
	Acenaphthylene	ug/L	Tier 3	<5 U	<5 U				**270**						<5 U	<5 U	<5 U	**250**		<5 U	<5 U	52	
10/19/1999																							
	Metal																						
	Arsenic	ug/L	Tier 2		<5 U	**36**	7	**13**				**15**		9	<5 U	<5 U	**35**	**139**	<5 U	<5 U		10	
	Arsenic	ug/L	Tier 3		5							**15**	8		5	5	**35**	**139**	5	5	8	10	
	Cadmium	ug/L	Tier 2		4	<1 U	**5**	<1 U				<1 U	<1 U	<1 U	<1 U	<1 U	4	<1 U	<1 U	4	<1 U	5	A
	Cadmium	ug/L	Tier 3		4		**10**					1	1		1	1	4	1	1	4	1	5	A

Prepared by: SVF
Checked by: JSL

Table 3-2

Mill Area Historical Groundwater Results - Exceedances

Event Date	Parameter	Units	DataLevel	MW-1	MW-10	MW-101	MW-102	MW-103	MW-104	MW-105	MW-106	MW-107	MW-11	MW-12	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-9	Residential Commercial I Drinking Water Criteria[1]	Residential Commercial Code
	Chromium	ug/L	Tier 2		<10 U	<10 U	**140**	<10 U				<10 U	10	<10 U	<10 U	<10 U	20	20	<10 U	<10 U	<10 U	100	A
	Chromium, total	ug/L	Tier 3		10		**140**					10	10		10	10	20	20	10	10	10	100	A
	Iron	ug/L	Tier 2		280	**28900**	**1680000**	**74500**				**104000**		**9450**	210	<30 U	**305000**	**166000**		**182000**	**8060**	300	E
	Iron	ug/L	Tier 3		280							**104000**	**127000**		210	10	**305000**	**166000**	**399000**	**182000**		300	E
	Lead	ug/L	Tier 2		**10**	<10 U	<10 U	<10 U				<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U		<10 U	<10 U	4	L
	Lead	ug/L	Tier 3		**10**		**10**					**10**	**10**		**10**	**10**	**10**	**10**	**10**	<10 U	**10**	4	L
	Manganese	ug/L	Tier 2		**540**	**10400**		**7080**				**37800**		**1120**	**3300**	**60**	**41800**	**4870**	**24400**	**23400**		50	E
	Manganese	ug/L	Tier 3		**540**		**33400**					**37800**	**6490**		**3300**	**60**	**41800**	**4870**		**23400**	**1170**	50	E
	Nickel	ug/L	Tier 2		20	<10 U	**3800**	<10 U				<10 U	<10 U	<10 U	30	30	**1460**	50		**590**	10	100	A
	Nickel	ug/L	Tier 3		20							10	10		30	30	**1460**	50	**110**	**640**		100	A
	Sodium	ug/L	Tier 3		2000							24000	**167000**		14000	4000	14000	112000		9000		120000	
	Physical Property																						
	Nitrogen, Ammonia	mg/L	Tier 2		0.2	1.6	3.7	1.4	2.5			3.5	**12.6**	0.7	<0.1 U	<0.1 U	2.8	3.3		2.5	0.3	10	N
	Sulfate	mg/L	Tier 2		25	16	**6490**	**260**				**660**	25	5	215	91	**1550**	1		**1070**	94	250	E
	Sulfate	mg/L	Tier 3		25										215	91	**1550**	1		**1070**		250	E
	VOC																						
	Benzene	ug/L	Tier 2									<1.0 U						**18**				5	A
	Ethylbenzene	ug/L	Tier 2									<1.0 U						**96**				74	E
	VOC-PAH																						
	Naphthalene	ug/L	Tier 3						**19600**													520	
	Phenanthrene	ug/L	Tier 2						**16000**									<10 U				52	

Notes: [1] = Analytical results were compared to the residential/commercial I drinking water criteria. Exceedances are highlighted.

A = Criterion is the State of Michigan drinking water standard established persuant to Section 5 of 1976 PA 399, MCL 325.1005

E = Criterion is the aesthetic drinking water value, see MDEQ operational memoranda for the Part 201 and Part 231 programs for more details

L = Criterion for lead are derived using a biologically based model, see MDEQ operational memoranda for the Part 201 and Part 231 programs for more details.

N = The concentrations of all potential sources of nitrate-nitrogen (e.g., ammonia-N, nitrite-N, nitrate-N) in groundwater this is used as a source of drinking water shall not, when added together, exceed the nitrate drinking water criterion of 10,000 ug/L. Where leaching to groundwter is a relevant pathway, soil concentrations of all potential sources of nitrate-nitrogen shall not, when added together, exceed the nitrate drinking water protection criterion of 2.0E+5 ug/kg.

PAH = Polynuclear aromatic hydrocarbon

U = Analyte not detected at a level above the method detection limit

ug/L = micrograms/liter

VOC = Volatile Organic Compound

< = Analyte not detected at a level above the method detection limit

mg/L = milligrams/liter

IS = insufficient sample

Table 3-3

Mill Area Historical Surface Water Results - Exceedances

Event Date	Parameter	Units	Data Level	Pyrite Pad	Conv	SW-1	SW-1	SW-2	SW-2	SW-3	SW-3	HNV	WV	HCV	FCV	AMV	FAV
11/7/1995							Duplicate		Duplicate		Duplicate						
	Metal																
	Arsenic	ug/L	Tier 1	<3 U	68	**240**	**330**	**200**	**250**	19	62	280			150	340	680
	Mercury	ug/L	Tier 1	**2.8**	<0.2 U	<0.2 U		<0.2 U		<0.2 U		0.0018	0.0013		0.77	1.4	2.8
	Silver	ug/L	Tier 1	<0.5 U	<0.5 U	<0.5 U	**0.8**	<0.5 U		<0.5 U		11000			0.06	0.54	1.1
	Zinc	ug/L	Tier 1	100	1400	3500	3000	1400	990	990	840	16000					

Notes: Analytical results were compared to the lowest value (highlighted)
of the Michigan Department of Environmental Quality Rule 57 Water Quality Values
Exceedances are highlighted.
Source: MDEQ Rule 57 Water Quality Values
AMV - Aquatic maximum value
FAV - Final acute value
FCV - Final chronic value
HCV - Human cancer value
HNV - Human noncancer value
WV - Wildlife value
U - The analyte was not detected at or above the reporting limit
ug/L - micrograms/liter
< - The analyte was not detected at a level above the method detection limit

Prepared by: SVF
Checked by: JSL

Table 3-4
HTDF Historic Groundwater Results - Exceedances

Event Date	Parameter	Units	Data Level	HW-1	HW-1A	HW-2	HW-3	HW-4	HW-6	HW-6A	HYG-1	Residential Commercial Drinking Water Criteria [1]	Residential Commercial Code
11/4/1984	**Metal**												
	Iron, total	ug/L	Tier 2	**320**		<20	**3000**	**40000**				**300**	E
	Lead, total	ug/L	Tier 2	<50		<50	<50	**100**				**4**	L
	Silver, total	ug/L	Tier 2	9		**60**	**160**	8				**34**	
1/1/1990	**Metal**												
	Lead, total	ug/L	Tier 3	**40**		**60**	**40**	**70**				**4**	L
2/1/1990	**Metal**												
	Nickel, total	ug/L	Tier 3	<40		<40	**640**	<40				**100**	A
7/1/1995	**Metal**												
	Nickel, total	ug/L	Tier 3	<10	<10	<10	**130**	20	<10	<10	<10	**100**	A
	Nickel, total	ug/L	Tier 3	<20		20	**1300**	<20				**100**	A

Notes: [1] = Analytical results were compared to the residential/commercial I drinking water criteria. Exceedances are highlighted.
A = Criterion is the State of Michigan drinking water standard established persuant to Section 5 of 1976 PA 399, MCL 325.1005
E = Criterion is the aesthetic drinking water value, see MDEQ operational memoranda for the Part 201 and Part 231 programs for more details
L = Criterian for lead are derived using a biologically based model, see MDEQ operational memoranda for the Part 201 and Part 231 programs for more details.
ug/L = micrograms/liter
< = Analyte not detected at a level above the method detection limit

Prepared by: ECB/SVF
Checked by: JSL

Table 3-5
HTDF Historic Surface Water Results - Exceedances

Event Date	Parameter	Units	Data Level	Sample Depth (ft)	Confluence	Location A	Outfall	Pit	Pit Station #1	Pit Station #2	Weir #1	Weir #2	WLR-1	HNV	WV	HCV	FCV	AMV	FAV
10/10/1984	**Metal**																		
	Copper, total	ug/L	Tier 2								**40**	**30**		38000			16.19	25.82	51.65
	Copper, total	ug/L	Tier 2	0					**50**					38000			16.88	27.04	54.07
	Copper, total	ug/L	Tier 2	0						**80**				38000			17.57	28.25	56.50
	Copper, total	ug/L	Tier 2	200						**40**				38000			16.88	27.04	54.07
	Copper, total	ug/L	Tier 2	200-ft					**50**					38000			16.19	25.82	51.65
	Lead, total	ug/L	Tier 2	200-ft					**80**					190			21.71	193.24	386.47
	Nickel, total	ug/L	Tier 2								**100**	<20		210000			93.48	841.66	1683.32
	Nickel, total	ug/L	Tier 2	0					**140**					210000			97.42	877.13	1754.25
	Silver, total	ug/L	Tier 2								**1.7**	**1.3**		11000			0.06	0.54	1.10
	Silver, total	ug/L	Tier 2	200						**1.5**				11000			0.06	0.54	1.10
	Physical Property																		
1/1/1991	**Metal**																		
	Copper, total	ug/L	Tier 3				**60**							38000			16.19	25.82	51.65
	Nickel, total	ug/L	Tier 3				**620**							210000			93.48	841.66	1683.32
	Physical Property																		
	Cyanide, total	mg/L	Tier 3				**30**							48			0.0052	0.02	0.04
2/1/1991	**Metal**																		
	Copper, total	ug/L	Tier 3				**120**							38000			16.19	25.82	51.65
	Nickel, total	ug/L	Tier 3				**830**							210000			93.48	841.66	1683.32
	Physical Property																		
	Cyanide, total	mg/L	Tier 3				**50**							48			0.0052	0.02	0.04
3/1/1991	**Metal**																		
	Copper, total	ug/L	Tier 3				**120**							38000			16.19	25.82	51.65
	Nickel, total	ug/L	Tier 3				**760**							210000			93.48	841.66	1683.32
	Physical Property																		
	Cyanide, total	mg/L	Tier 3				**20**							48			0.0052	0.02	0.04
4/1/1991	**Metal**																		
	Copper, total	ug/L	Tier 3				**50**							38000			16.19	25.82	51.65
	Nickel, total	ug/L	Tier 3				**330**							210000			93.48	841.66	1683.32
	Physical Property																		
	Cyanide, total	mg/L	Tier 3				**20**							48			0.0052	0.02	0.04
5/1/1991	**Metal**																		
	Copper, total	ug/L	Tier 3				**90**							38000			16.19	25.82	51.65
	Nickel, total	ug/L	Tier 3				**720**							210000			93.48	841.66	1683.32
	Physical Property																		
	Cyanide, total	mg/L	Tier 3				**20**							48			0.0052	0.02	0.04
6/1/1991	**Metal**																		
	Copper, total	ug/L	Tier 3				**60**							38000			16.19	25.82	51.65
	Nickel, total	ug/L	Tier 3				**700**							210000			93.48	841.66	1683.32
	Physical Property																		
	Cyanide, total	mg/L	Tier 3				**20**							48			0.0052	0.02	0.04
7/1/1991	**Metal**																		
	Copper, total	ug/L	Tier 3				**20**							38000			16.19	25.82	51.65
	Nickel, total	ug/L	Tier 3				**620**							210000			93.48	841.66	1683.32
8/1/1991	**Metal**																		
	Copper, total	ug/L	Tier 3				**20**							38000			16.19	25.82	51.65
	Nickel, total	ug/L	Tier 3				**520**							210000			93.48	841.66	1683.32
9/1/1991	**Metal**																		
	Copper, total	ug/L	Tier 3				**20**							38000			16.19	25.82	51.65
	Nickel, total	ug/L	Tier 3				**520**							210000			93.48	841.66	1683.32
10/1/1991	**Metal**																		

Prepared by: ECB/SVF
Checked by: JSL

Table 3-5
HTDF Historic Surface Water Results - Exceedances

Event Date	Parameter	Units	Data Level	Sample Depth (ft)	Confluence	Location A	Outfall	Pit	Pit Station #1	Pit Station #2	Weir #1	Weir #2	WLR-1	HNV	WV	HCV	FCV	AMV	FAV
	Copper, total	ug/L	Tier 3				30							38000			16.19	25.82	51.65
	Nickel, total	ug/L	Tier 3				560							210000			93.48	841.66	1683.32
11/1/1991	**Metal**																		
	Copper, total	ug/L	Tier 3				40							38000			16.19	25.82	51.65
	Nickel, total	ug/L	Tier 3				650							210000			93.48	841.66	1683.32
12/1/1991	**Metal**																		
	Copper, total	ug/L	Tier 3				50							38000			16.19	25.82	51.65
	Nickel, total	ug/L	Tier 3				640							210000			93.48	841.66	1683.32
	Physical Property																		
	Cyanide, total	mg/L	Tier 3				34							48			0.0052	0.02	0.04
1/1/1992	**Metal**																		
	Copper, total	ug/L	Tier 3				60							38000			16.19	25.82	51.65
	Nickel, total	ug/L	Tier 3				720							210000			93.48	841.66	1683.32
2/1/1992	**Metal**																		
	Copper, total	ug/L	Tier 3				50							38000			16.19	25.82	51.65
	Nickel, total	ug/L	Tier 3				700							210000			93.48	841.66	1683.32
3/1/1992	**Metal**																		
	Copper, total	ug/L	Tier 3				50							38000			16.19	25.82	51.65
	Nickel, total	ug/L	Tier 3				660							210000			93.48	841.66	1683.32
	Physical Property																		
	Cyanide, total	mg/L	Tier 3				20							48			0.0052	0.02	0.04
4/1/1992	**Physical Property**																		
	Cyanide, total	mg/L	Tier 3				20							48			0.0052	0.02	0.04
5/1/1992	**Metal**																		
	Copper, total	ug/L	Tier 3				30							38000			16.19	25.82	51.65
	Nickel, total	ug/L	Tier 3				600							210000			93.48	841.66	1683.32
	Physical Property																		
	Cyanide, total	mg/L	Tier 3				10							48			0.0052	0.02	0.04
6/1/1992	**Metal**																		
	Copper, total	ug/L	Tier 3				30							38000			16.19	25.82	51.65
	Nickel, total	ug/L	Tier 3				650							210000			93.48	841.66	1683.32
	Physical Property																		
	Cyanide, total	mg/L	Tier 3				20							48			0.0052	0.02	0.04
7/1/1992	**Metal**																		
	Copper, total	ug/L	Tier 3				50							38000			16.19	25.82	51.65
	Nickel, total	ug/L	Tier 3				580							210000			93.48	841.66	1683.32
	Physical Property																		
	Cyanide, total	mg/L	Tier 3				8							48			0.0052	0.02	0.04
9/1/1992	**Metal**																		
	Copper, total	ug/L	Tier 3				20							38000			16.19	25.82	51.65
	Nickel, total	ug/L	Tier 3				500							210000			93.48	841.66	1683.32
	Physical Property																		
	Cyanide, total	mg/L	Tier 3				7							48			0.0052	0.02	0.04
10/1/1992	**Metal**																		
	Copper, total	ug/L	Tier 3				30							38000			16.19	25.82	51.65
	Nickel, total	ug/L	Tier 3				510							210000			93.48	841.66	1683.32
	Physical Property																		
	Cyanide, total	mg/L	Tier 3				12							48			0.0052	0.02	0.04
11/1/1992	**Metal**																		
	Copper, total	ug/L	Tier 3				30							38000			16.19	25.82	51.65
	Nickel, total	ug/L	Tier 3				520							210000			93.48	841.66	1683.32

Table 3-5
HTDF Historic Surface Water Results - Exceedances

Event Date	Parameter	Units	Data Level	Sample Depth (ft)	Confluence	Location A	Outfall	Pit	Pit Station #1	Pit Station #2	Weir #1	Weir #2	WLR-1	HNV	WV	HCV	FCV	AMV	FAV
	Physical Property																		
	Cyanide, total	mg/L	Tier 3				**12**							48			0.0052	0.02	0.04
12/1/1992	**Metal**																		
	Copper, total	ug/L	Tier 3				**30**							38000			16.19	25.82	51.65
	Nickel, total	ug/L	Tier 3				**530**							210000			93.48	841.66	1683.32
	Physical Property																		
	Cyanide, total	mg/L	Tier 3				**22**							48			0.0052	0.02	0.04
1/1/1993	**Metal**																		
	Copper, total	ug/L	Tier 3				**30**							38000			16.19	25.82	51.65
	Nickel, total	ug/L	Tier 3				**580**							210000			93.48	841.66	1683.32
	Physical Property																		
	Cyanide, total	mg/L	Tier 3				**110**							48			0.0052	0.02	0.04
2/1/1993	**Metal**																		
	Copper, total	ug/L	Tier 3				**30**							38000			16.19	25.82	51.65
	Nickel, total	ug/L	Tier 3				**560**							210000			93.48	841.66	1683.32
	Physical Property																		
	Cyanide, total	mg/L	Tier 3				**130**							48			0.0052	0.02	0.04
3/1/1993	**Metal**																		
	Copper, total	ug/L	Tier 3				**30**							38000			16.19	25.82	51.65
	Nickel, total	ug/L	Tier 3				**520**							210000			93.48	841.66	1683.32
	Physical Property																		
	Cyanide, total	mg/L	Tier 3				**20**							48			0.0052	0.02	0.04
4/1/1993	**Metal**																		
	Copper, total	ug/L	Tier 3		10		**30**							38000			16.19	25.82	51.65
	Nickel, total	ug/L	Tier 3		**200**		**440**							210000			93.48	841.66	1683.32
	Physical Property																		
	Cyanide, total	mg/L	Tier 3		<5		**11**							48			0.0052	0.02	0.04
5/1/1993	**Metal**																		
	Copper, total	ug/L	Tier 3		10		**30**						<10	38000			16.19	25.82	51.65
	Nickel, total	ug/L	Tier 3		**140**		**390**						**150**	210000			93.48	841.66	1683.32
6/1/1993	**Metal**																		
	Copper, total	ug/L	Tier 3		<10		**30**						10	38000			16.19	25.82	51.65
	Nickel, total	ug/L	Tier 3		**140**		**410**						**150**	210000			93.48	841.66	1683.32
	Physical Property																		
	Cyanide, total	mg/L	Tier 3		**16**		<10						**13**	48			0.0052	0.02	0.04
7/1/1993	**Metal**																		
	Nickel, total	ug/L	Tier 3		80		**340**						80	210000			93.48	841.66	1683.32
	Physical Property																		
	Cyanide, total	mg/L	Tier 3		**13**		**17**						**9**	48			0.0052	0.02	0.04
8/1/1993	**Metal**																		
	Nickel, total	ug/L	Tier 3		60		**130**						10	210000			93.48	841.66	1683.32
	Physical Property																		
	Cyanide, total	mg/L	Tier 3		**6**		**11**						**7**	48			0.0052	0.02	0.04
9/1/1993	**Metal**																		
	Nickel, total	ug/L	Tier 3		60		**150**						60	210000			93.48	841.66	1683.32
	Physical Property																		
	Cyanide, total	mg/L	Tier 3		<5		**9**						**5**	48			0.0052	0.02	0.04
10/1/1993	**Metal**																		
	Copper, total	ug/L	Tier 3		<10		**20**						<10	38000			16.19	25.82	51.65
	Nickel, total	ug/L	Tier 3		50		**250**						50	210000			93.48	841.66	1683.32
	Physical Property																		

Table 3-5
HTDF Historic Surface Water Results - Exceedances

Event Date	Parameter	Units	Data Level	Sample Depth (ft)	Confluence	Location A	Outfall	Pit	Pit Station #1	Pit Station #2	Weir #1	Weir #2	WLR-1	HNV	WV	HCV	FCV	AMV	FAV
	Cyanide, total	mg/L	Tier 3		<5		**17**						**6**	48			0.0052	0.02	0.04
11/1/1993	**Metal**																		
	Copper, total	ug/L	Tier 3		<10		**20**						<10	38000			16.19	25.82	51.65
	Nickel, total	ug/L	Tier 3		**130**		**380**						**130**	210000			93.48	841.66	1683.32
	Physical Property																		
	Cyanide, total	mg/L	Tier 3		**12**		**15**						**6**	48			0.0052	0.02	0.04
12/1/1993	**Metal**																		
	Nickel, total	ug/L	Tier 3				**380**							210000			93.48	841.66	1683.32
	Physical Property																		
	Cyanide, total	mg/L	Tier 3				**7**							48			0.0052	0.02	0.04
1/1/1994	**Metal**																		
	Copper, total	ug/L	Tier 3				**20**						10	38000			16.19	25.82	51.65
	Nickel, total	ug/L	Tier 3				**410**						**370**	210000			93.48	841.66	1683.32
	Physical Property																		
	Cyanide, total	mg/L	Tier 3				**19**						**18**	48			0.0052	0.02	0.04
2/1/1994	**Metal**																		
	Nickel, total	ug/L	Tier 3				**430**						**360**	210000			93.48	841.66	1683.32
	Physical Property																		
	Cyanide, total	mg/L	Tier 3				**14**						**15**	48			0.0052	0.02	0.04
3/1/1994	**Metal**																		
	Copper, total	ug/L	Tier 3				**20**						<10	38000			16.19	25.82	51.65
	Nickel, total	ug/L	Tier 3				**350**						**360**	210000			93.48	841.66	1683.32
	Physical Property																		
	Cyanide, total	mg/L	Tier 3				**9**						**12**	48			0.0052	0.02	0.04
4/1/1994	**Metal**																		
	Nickel, total	ug/L	Tier 3				**400**						**280**	210000			93.48	841.66	1683.32
	Physical Property																		
	Cyanide, total	mg/L	Tier 3				**8**						<5	48			0.0052	0.02	0.04
5/1/1994	**Metal**																		
	Nickel, total	ug/L	Tier 3		80		**350**						90	210000			93.48	841.66	1683.32
	Physical Property																		
	Cyanide, total	mg/L	Tier 3		NA		**19**						NA	48			0.0052	0.02	0.04
6/1/1994	**Metal**																		
	Nickel, total	ug/L	Tier 3		80		**230**						80	210000			93.48	841.66	1683.32
7/1/1994	**Metal**																		
	Nickel, total	ug/L	Tier 3		80		**110**						90	210000			93.48	841.66	1683.32
	Physical Property																		
	Cyanide, total	mg/L	Tier 3		NA		**7**						NA	48			0.0052	0.02	0.04
8/1/1994	**Metal**																		
	Nickel, total	ug/L	Tier 3		<20		**140**						30	210000			93.48	841.66	1683.32
9/1/1994	**Metal**																		
	Nickel, total	ug/L	Tier 3		50		**120**						50	210000			93.48	841.66	1683.32
10/1/1994	**Metal**																		
	Nickel, total	ug/L	Tier 3		60		**160**						90	210000			93.48	841.66	1683.32
11/1/1994	**Metal**																		
	Nickel, total	ug/L	Tier 3		70		**230**						70	210000			93.48	841.66	1683.32
12/1/1994	**Metal**																		
	Copper, total	ug/L	Tier 3		<10		**20**						10	38000			16.19	25.82	51.65
	Nickel, total	ug/L	Tier 3		**140**		**290**						**170**	210000			93.48	841.66	1683.32
1/1/1995	**Metal**																		
	Nickel, total	ug/L	Tier 3				**160**							210000			93.48	841.66	1683.32

Table 3-5
HTDF Historic Surface Water Results - Exceedances

Event Date	Parameter	Units	Data Level	Sample Depth (ft)	Confluence	Location A	Outfall	Pit	Pit Station #1	Pit Station #2	Weir #1	Weir #2	WLR-1	HNV	WV	HCV	FCV	AMV	FAV
2/1/1995	**Metal**																		
	Copper, total	ug/L	Tier 3		ND		**60**						ND	38000			16.19	25.82	51.65
	Nickel, total	ug/L	Tier 3		**300**		**280**						**310**	210000			93.48	841.66	1683.32
3/1/1995	**Metal**																		
	Copper, total	ug/L	Tier 3		<10		**20**						<10	38000			16.19	25.82	51.65
	Nickel, total	ug/L	Tier 3		**220**		**170**						**290**	210000			93.48	841.66	1683.32
	Physical Property																		
	Cyanide, total	mg/L	Tier 3		NA		**6.7**						NA	48			0.0052	0.02	0.04
4/1/1995	**Metal**																		
	Nickel, total	ug/L	Tier 3		**150**		**260**						**180**	210000			93.48	841.66	1683.32
	Physical Property																		
	Cyanide, total	mg/L	Tier 3		NA		**13**						NA	48			0.0052	0.02	0.04
5/1/1995	**Metal**																		
	Copper, total	ug/L	Tier 3				**80**						<10	38000			16.19	25.82	51.65
	Nickel, total	ug/L	Tier 3				**270**						90	210000			93.48	841.66	1683.32
	Physical Property																		
	Cyanide, total	mg/L	Tier 3				**14**						NA	48			0.0052	0.02	0.04
6/1/1995	**Metal**																		
	Nickel, total	ug/L	Tier 3		90		**190**						90	210000			93.48	841.66	1683.32
	Physical Property																		
	Cyanide, total	mg/L	Tier 3		NA		**17**						NA	48			0.0052	0.02	0.04
6/21/95 10:15	**Metal**																		
	Arsenic, total	ug/L	Tier 3					**1400**						280			150	340	680
	Copper, total	ug/L	Tier 3					**4600**						38000			16.19	25.82	51.65
	Nickel, total	ug/L	Tier 3					**230000**						210000			93.48	841.66	1683.32
	Cyanide, total	mg/L	Tier 3					**0.01**						48			0.0052	0.022	0.044
6/21/95 10:25	**Metal**																		
	Iron, total	ug/L	Tier 3				**270**												
	Nickel, total	ug/L	Tier 3				**130**							210000			93.48	841.66	1683.32
	Physical Property																		
	Cyanide, total	mg/L	Tier 3				**0.011**							48			0.0052	0.022	0.044
6/21/95 21:00	**Metal**																		
	Arsenic, total	ug/L	Tier 3					**1400**						280			150	340	680
	Copper, total	ug/L	Tier 3					**6300**						38000			16.19	25.82	51.65
	Nickel, total	ug/L	Tier 3					**230000**						210000			93.48	841.66	1683.32
	Physical Property																		
	Chloride	mg/L	Tier 3					20											
	Cyanide, total	mg/L	Tier 3					**0.012**						48			0.0052	0.022	0.044
	Metal																		
	Iron, total	ug/L	Tier 3				**240**												
	Chloride	mg/L	Tier 3				**18**												
	Cyanide, total	mg/L	Tier 3				**0.009**							48			0.0052	0.022	0.044
7/1/1995	**Metal**																		
	Nickel, total	ug/L	Tier 3		50		60						**110**	210000			93.48	841.66	1683.32
8/1/1995	**Physical Property**																		
	Cyanide, total	mg/L	Tier 3		NA		**10**						NA	48			0.0052	0.02	0.04
9/1/1995	**Metal**																		
	Copper, total	ug/L	Tier 3		**76**		3.7						<10	38000			16.19	25.82	51.65
9/1/1995	**Physical Property**																		
	Cyanide, total	mg/L	Tier 3		NA		**6.5**						NA	48			0.0052	0.02	0.04
10/1/1995	**Metal**																		
	Copper, total	ug/L	Tier 3		**160**		<1						<10	38000			16.19	25.82	51.65
	Nickel, total	ug/L	Tier 3		76		**130**						89	210000			93.48	841.66	1683.32
	Physical Property																		

Table 3-5
HTDF Historic Surface Water Results - Exceedances

Event Date	Parameter	Units	Data Level	Sample Depth (ft)	Confluence	Location A	Outfall	Pit	Pit Station #1	Pit Station #2	Weir #1	Weir #2	WLR-1	HNV	WV	HCV	FCV	AMV	FAV
	Cyanide, total	mg/L	Tier 3		NA		**11**						NA	48			0.0052	0.02	0.04
11/1/1995	**Metal**																		
	Nickel, total	ug/L	Tier 3				**190**							210000			93.48	841.66	1683.32
1/1/1996	**Metal**																		
	Nickel, total	ug/L	Tier 3				**200**							210000			93.48	841.66	1683.32
2/1/1996	**Metal**																		
	Nickel, total	ug/L	Tier 3				**340**							210000			93.48	841.66	1683.32
3/1/1996	**Metal**																		
	Nickel, total	ug/L	Tier 3				**180**							210000			93.48	841.66	1683.32
4/1/1996	**Metal**																		
	Nickel, total	ug/L	Tier 3				**170**							210000			93.48	841.66	1683.32
6/1/1996	**Metal**																		
	Nickel, total	ug/L	Tier 3				**290**							210000			93.48	841.66	1683.32
6/18/1996	**Metal**																		
	Copper, total	ug/L	Tier 3				**26**							38000			16.19	25.82	51.65
	Nickel, total	ug/L	Tier 3				**300**							210000			93.48	841.66	1683.32
7/1/1996	**Metal**																		
	Nickel, total	ug/L	Tier 3				**120**							210000			93.48	841.66	1683.32
11/1/1996	**Metal**																		
	Nickel, total	ug/L	Tier 3				**103**							210000			93.48	841.66	1683.32
12/1/1996	**Metal**																		
	Nickel, total	ug/L	Tier 3				**136**							210000			93.48	841.66	1683.32
1/1/1997	**Metal**																		
	Nickel, total	ug/L	Tier 3				**122**							210000			93.48	841.66	1683.32
2/1/1997	**Metal**																		
	Nickel, total	ug/L	Tier 3				**138**							210000			93.48	841.66	1683.32
3/1/1997	**Metal**																		
	Nickel, total	ug/L	Tier 3				**132**							210000			93.48	841.66	1683.32
5/1/1997	**Metal**																		
	Nickel, total	ug/L	Tier 3				**111**							210000			93.48	841.66	1683.32
4/17/2001	**Metal**																		
	Cadmium, total	ug/L	Tier 1				**6.2**							130			3.23	7.29	14.57
	Copper, total	ug/L	Tier 1				**348**							38000			13.67	21.42	42.84
	Nickel, total	ug/L	Tier 1				**159**							210000			79.03	711.58	1423.16
	Zinc	ug/L	Tier 1				**1290**							16000			179.65	178.19	356.39

Notes: Analytical results were compared to the lowest value (highlighted)
of the Michigan Department of Environmental Quality Rule 57 Water Quality Values
Exceedances are highlighted.
Source: MDEQ Rule 57 Water Quality Values
AMV - Aquatic maximum value
FAV - Final acute value
FCV - Final chronic value
HCV - Human cancer value
HNV - Human noncancer value
WV - Wildlife value
ND - no data
NA - not analyzed
< - The analyte was not detected at a level above the method detection limit
ft - feet
mg/L - milligrams/liter
ug/L - micrograms/liter
U - All the analyte was not detected at or above the reporting limit

Table 4-1

Well Construction and Soil Boring Details

Location ID	Location [Northing]	Location [Easting]	Date Completed	Drilling Method	Depth of Borehole (feet bgs)	Boring diameter (inches)	Surface Elevation (feet msl)	Well Diameter (inches)	TOC Elevation (feet)	Screen type and slot size (type/inches)	Depth to top of screen (feet)	Depth to bottom of screen (feet)	Depth to Top of Filter Pack (feet)	Date Developed	Date Abandoned
Monitoring Wells and Piezometers															
KMW-1	621492.58	26019934.42	9/18/2006	Sonic	15.0	6	1587.24	2	1588.75	SCH 40/0.01	5.0	15.0	4	10/4/2006	NA
KMW-2	621307.65	26020363.4	9/19/2006	Sonic	19.0	6	1589.43	2	1589.19	SCH 40/0.01	8	18	6	10/4/2006	NA
KMW-3	621078.65	26019986.7	9/26/2006	Sonic	32.0	6	1588.52	2	1590.58	SCH 40/0.01	22	32	20	10/4/2006	NA
KMW-4P	621249.69	26019645.27	9/26/2006	Sonic	43.0	6	1584.67	2	1586.62	SCH 40/0.01	33	43	31	9/29/2006	NA
KMW-5	621772.56	26019415.03	9/25/2006	Sonic	54.0	6	1596.51	2	1597.88	SCH 40/0.01	43	53	41	9/27/2006	NA
KMW-6	621641.17	26019348.2	9/19/2006	Sonic	34.0	6	1596.78	2	1598.47	SCH 40/0.01	23	33	21	9/19/2006	NA
KMW-6A	621641.17	26019348.2	10/3/2006	Sonic	46.0	6	1596.78	2	1598.47	SCH 40/0.01	36	46	33	10/4/2006	NA
KMW-7	621378.12	26019393.02	9/21/2006	Sonic	30.0	6	1580.37	2	1582.5	SCH 40/0.01	20	30	18	9/29/2006	NA
KMW-9	621430.84	26019202.45	9/21/2006	Sonic	32.0	6	1579.54	2	1581.4	SCH 40/0.01	22	32	20	9/29/2006	NA
KMW-9P	621432.53	26019193.56	9/21/2006	Sonic	57.0	6	1579.60	2	1581.47	SCH 40/0.01	52	57	50	9/29/2006	NA
KMW-10	620702.26	26021143.72	9/26/2006	Sonic	15.0	6	1595.03	2	1596.92	SCH 40/0.01	4	14	3	10/4/2006	NA
MW-601	621246.68	26021173.49	10/4/2006	Sonic	14.0	6	1601.06	2	1603.07	SCH 40/0.01	4	14	3	10/5/2006	NA
MW-602	620694.07	26022470.72	9/27/2006	H S A	22.0	6	1618.41	2	1621.41	SCH 40/0.01	11	21	9	9/28/2006	NA
MW-603	620342.91	26021748.82	9/19/2006	H S A	24.0	6	1610.89	2	1613.8	SCH 40/0.01	14	24	12	9/29/2006	NA
MW-604	620576.98	26020834.76	9/28/2006	Sonic	12.0	6	1594.63	2	1595.56	SCH 40/0.01	2	12	1.5	10/5/2006	NA
MW-605	620126.52	26021263.01	10/2/2006	Sonic	14.0	6	1594.56	2	1596.68	SCH 40/0.01	4	14	3	10/5/2006	NA
MW-606	620145.39	26022653.6	9/27/2006	H S A	18.0	6	1612.31	2	1615.1	SCH 40/0.01	7	17	5	9/28/2006	NA
P-602	620692.55	26022476.9	9/27/2006	H S A	46.0	6	1618.28	2	1621.32	SCH 40/0.01	41	46	39	9/28/2006	NA
P-604	620570.81	26020843.75	9/27/2006	Sonic	28.0	6	1594.59	2	1595.42	SCH 40/0.01	21.5	26.5	19	10/5/2006	NA
P-605	620116.04	26021264.96	10/2/2006	Sonic	34.5	6	1594.58	2	1596.6	SCH 40/0.01	27	34	29.5	10/5/2006	NA
Soil Borings															
KSB-1	621424.67	26020364	9/12/2006	H S A	7.0	6	1590.39	NA	NA	NA	NA	NA	NA	NA	9/12/2006
KSB-3	621476.83	26020181.23	9/12/2006	H S A	16.0	6	1589.36	NA	NA	NA	NA	NA	NA	NA	9/12/2006
KSB-4/4A	621500.32	26020090.72	9/12/2006	Sonic	16.0	6	1588.94	NA	NA	NA	NA	NA	NA	NA	9/12/2006
KSB-5	621492.6	26019992.3	9/18/2006	Sonic	20.0	6	1587.11	NA	NA	NA	NA	NA	NA	NA	9/18/2006
KSB-6	621439.48	26020036.68	9/18/2006	Sonic	20.0	6	1588.38	NA	NA	NA	NA	NA	NA	NA	9/18/2006
KSB-7	621297.43	26020409.5	9/19/2006	Sonic	20.0	6	1589.51	NA	NA	NA	NA	NA	NA	NA	9/19/2006
KSB-8	621202.81	26020520.3	10/4/2006	Sonic	9.0	6	1592.66	NA	NA	NA	NA	NA	NA	NA	BN
KSB-9	621179.02	26020384.48	9/14/2006	H S A	21.5	6	1594.14	NA	NA	NA	NA	NA	NA	NA	9/14/2006
KSB-10	621158.26	26020280.16	9/14/2006	H S A	6.0	6	1592.94	NA	NA	NA	NA	NA	NA	NA	9/14/2006
KSB-11	621199.3	26020056.03	9/13/2006	H S A	6.5	6	1588.80	NA	NA	NA	NA	NA	NA	NA	9/13/2006
KSB-12	621628.2	26019566.54	9/19/2006	Sonic	30.0	6	1599.31	NA	NA	NA	NA	NA	NA	NA	9/19/2006
KSB-13	621569.18	26019487.03	9/22/2006	Sonic	21.0	6	1598.57	NA	NA	NA	NA	NA	NA	NA	9/22/2006
KSB-14	621241.8	26020669.96	9/25/2006	Sonic	15.0	6	1593.90	NA	NA	NA	NA	NA	NA	NA	BN
KSB-15	621262.93	26020600.98	9/26/2006	Sonic	15.0	6	1594.46	NA	NA	NA	NA	NA	NA	NA	9/26/2006
KSB-16	621691.66	26019234.29	10/3/2006	Sonic	9.0	6	1595.92	NA	NA	NA	NA	NA	NA	NA	10/3/2006
KSB-18	621031.73	26020767.56	10/2/2006	Sonic	29.0	6	1594.49	NA	NA	NA	NA	NA	NA	NA	10/2/2006
KSB-19	621252.89	26021257.24	10/4/2006	Sonic	19.0	6	1603.03	NA	NA	NA	NA	NA	NA	NA	10/4/2006
SB-603	620342.91	26021748.82	9/19/2006	H S A	31.0	6	1610.89	NA	NA	NA	NA	NA	NA	NA	9/19/2006
SB-607	621120.54	26020809.82	9/12/2006	H S A	7.8	6	1595.73	NA	NA	NA	NA	NA	NA	NA	BN
SB-607A	621120.91	26020825.21	9/12/2006	H S A	16.0	6	1596.15	NA	NA	NA	NA	NA	NA	NA	9/12/2006
SB-608	621091.77	26020991.77	9/12/2006	H S A	6.1	6	1597.41	NA	NA	NA	NA	NA	NA	NA	BN
SB-608A	621089.58	26020997.22	9/12/2006	H S A	11.0	6	1597.44	NA	NA	NA	NA	NA	NA	NA	9/12/2006
SB-609	620932.59	26021586.88	9/13/2006	H S A	15.0	6	1605.11	NA	NA	NA	NA	NA	NA	NA	9/13/2006
SB-610	620927.29	26021384.46	9/13/2006	H S A	4.0	6	1601.38	NA	NA	NA	NA	NA	NA	NA	BN
SB-610A	620925.31	26021391.14	9/13/2006	H S A	18.0	6	1601.70	NA	NA	NA	NA	NA	NA	NA	9/13/2006
SB-611	620863.55	26021174.86	9/13/2006	H S A	28.0	6	1599.33	NA	NA	NA	NA	NA	NA	NA	9/13/2006
SB-612	620896.43	26020955.55	9/14/2006	H S A	18.0	6	1594.84	NA	NA	NA	NA	NA	NA	NA	9/14/2006
SB-613	620909.91	26020743.27	9/14/2006	H S A	22.0	6	1593.00	NA	NA	NA	NA	NA	NA	NA	9/14/2006
SB-614	620975.89	26020517.31	9/14/2006	H S A	24.0	6	1591.12	NA	NA	NA	NA	NA	NA	NA	BN

Prepared by: JSL
Checked by: SVF

Table 4-1

Well Construction and Soil Boring Details

Location ID	Location [Northing]	Location [Easting]	Date Completed	Drilling Method	Depth of Borehole (feet bgs)	Boring diameter (inches)	Surface Elevation (feet msl)	Well Diameter (inches)	TOC Elevation (feet)	Screen type and slot size (type/inches)	Depth to top of screen (feet)	Depth to bottom of screen (feet)	Depth to Top of Filter Pack (feet)	Date Developed	Date Abandoned
SB-615	620742.92	26020733.21	9/15/2006	H S A	16.0	6	1592.85	NA	NA	NA	NA	NA	NA	NA	9/15/2006
SB-616	620741.46	26020959.65	10/2/2006	Sonic	29.0	6	1591.99	NA	NA	NA	NA	NA	NA	NA	10/2/2006
SB-617	620728.04	26021321.31	9/26/2006	Sonic	28.0	6	1599.43	NA	NA	NA	NA	NA	NA	NA	9/26/2006
SB-618	620760.61	26021538.54	10/3/2006	Sonic	29.0	6	1603.84	NA	NA	NA	NA	NA	NA	NA	10/3/2006
SB-619	620749.97	26021783.55	10/3/2006	Sonic	1.0	6	1607.09	NA	NA	NA	NA	NA	NA	NA	9/20/2006
SB-619A	620749.97	26021783.55	9/28/2006	H S A	1.0	6	1607.09	NA	NA	NA	NA	NA	NA	NA	10/3/2006
SB-620	620500.91	26022173.85	9/20/2006	H S A	51.5	6	1618.13	NA	NA	NA	NA	NA	NA	NA	9/20/2006
SB-621	620573.87	26021976.5	9/20/2006	H S A	51.0	6	1612.36	NA	NA	NA	NA	NA	NA	NA	9/20/2006
SB-622	NR	NR	9/15/2006	H S A	14.0	6	NR	NA	NA	NA	NA	NA	NA	NA	9/15/2006
SB-622A	620533.79	26021389.61	9/27/2006	Sonic	28.0	6	1599.74	NA	NA	NA	NA	NA	NA	NA	9/27/2006
SB-622B	NR	NR	NR	NR	5.0	6	NR	NA	NA	NA	NA	NA	NA	NA	9/15/2006
SB-622C	NR	NR	NR	NR	3.0	6	NR	NA	NA	NA	NA	NA	NA	NA	9/15/2006
SB-623	620517.68	26021223.35	9/14/2006	H S A	12.0	6	1597.00	NA	NA	NA	NA	NA	NA	NA	BN
SB-623A	NR	NR	NR	H S A	12.0	6	NR	NA	NA	NA	NA	NA	NA	NA	9/14/2006
SB-623B	NR	NR	NR	H S A	3.0	6	NR	NA	NA	NA	NA	NA	NA	NA	9/14/2006
SB-623C	NR	NR	NR	H S A	10.0	6	NR	NA	NA	NA	NA	NA	NA	NA	9/14/2006
SB-624	620369.27	26021385.76	10/2/2006	Sonic	34.0	6	1599.93	NA	NA	NA	NA	NA	NA	NA	10/2/2006
SB-625	620558.34	26021614.49	10/3/2006	Sonic	24.0	6	1603.80	NA	NA	NA	NA	NA	NA	NA	10/3/2006
SB-626	620437.51	26021911.99	9/20/2006	H S A	23.5	6	1614.21	NA	NA	NA	NA	NA	NA	NA	BN
SB-627	NR	NR	NR		23.5	6	NR	NA	NA	NA	NA	NA	NA	NA	9/20/2006
SB-627B	620360.66	26022324.77	9/25/2006	H S A	56.0	6	1614.37	NA	NA	NA	NA	NA	NA	NA	9/25/2006
SB-628	620416.26	26022512.02	9/25/2006	H S A	66.0	6	1616.60	NA	NA	NA	NA	NA	NA	NA	9/25/2006
SB-629	620215.76	26022461.39	9/22/2006	H S A	53.0	6	1614.61	NA	NA	NA	NA	NA	NA	NA	9/22/2006
SB-630	620259.01	26022158.98	9/22/2006	H S A	50.5	6	1613.54	NA	NA	NA	NA	NA	NA	NA	9/22/2006
SB-631	620262.58	26021976.71	9/21/2006	H S A	51.0	6	1612.75	NA	NA	NA	NA	NA	NA	NA	9/21/2006
SB-632	620131.82	26021833.68	9/19/2006	H S A	41.0	6	1610.81	NA	NA	NA	NA	NA	NA	NA	9/19/2006
SB-633	619984.65	26021690.87	9/18/2006	H S A	47.0	6	1608.79	NA	NA	NA	NA	NA	NA	NA	9/18/2006
SB-634	619952.28	26021837.51	9/18/2006	H S A	43.5	6	1608.77	NA	NA	NA	NA	NA	NA	NA	9/18/2006
SB-635	620141.03	26021563.15	9/20/2006	H S A	36.0	6	1609.46	NA	NA	NA	NA	NA	NA	NA	9/20/2006
SB-636	619947.91	26021423.04	9/19/2006	H S A	45.0	6	1610.16	NA	NA	NA	NA	NA	NA	NA	9/19/2006
SB-637	619805.67	26021603.49	9/13/2006	H S A	29.0	6	1608.08	NA	NA	NA	NA	NA	NA	NA	9/13/2006
SB-638	619804.39	26021896.97	9/21/2006	H S A	51.0	6	1607.73	NA	NA	NA	NA	NA	NA	NA	9/21/2006
SB-639	620060.14	26021985.58	9/21/2006	H S A	51.0	6	1610.61	NA	NA	NA	NA	NA	NA	NA	9/21/2006
SB-640	620044.44	26022147.44	9/26/2006	H S A	51.0	6	1611.14	NA	NA	NA	NA	NA	NA	NA	9/26/2006
SB-641	619789.85	26022151.31	9/26/2006	H S A	41.0	6	1609.00	NA	NA	NA	NA	NA	NA	NA	9/26/2006
SB-642	620031.82	26022345.89	9/25/2006	H S A	50.5	6	1611.64	NA	NA	NA	NA	NA	NA	NA	9/25/2006
SB-643	619655.89	26022017.01	9/21/2006	H S A	29.5	6	1607.60	NA	NA	NA	NA	NA	NA	NA	9/21/2006
SB-644	619675.01	26021762.00	9/13/2006	H S A	32.5	6	1607.76	NA	NA	NA	NA	NA	NA	NA	9/13/2006
SB-645	619667.41	26021477.45	9/28/2006	H S A	14.0	6	1613.82	NA	NA	NA	NA	NA	NA	NA	9/28/2006
SB-645A	NR	NR	9/28/2007	H S A	6.0	6	1614.15	NA	NA	NA	NA	NA	NA	NA	9/28/2006
SB-646	619508.46	26021625.34	9/28/2006	H S A	1.5	6	1612.27	NA	NA	NA	NA	NA	NA	NA	BN
SB-647	619448.16	26021920.89	9/28/2006	H S A	5.1	6	1610.53	NA	NA	NA	NA	NA	NA	NA	BN
SB-647A	619447.49	26021914.14	9/28/2006	H S A	4.0	6	1610.29	NA	NA	NA	NA	NA	NA	NA	9/28/2006
SB-648	619437.45	26022141.84	9/26/2006	H S A	36.0	6	1606.18	NA	NA	NA	NA	NA	NA	NA	9/26/2006

Notes: Survey data in U.S. State Plane 1983, Michigan North , 2111

bgs = below ground surface

msl = mean sea level

NA = Not applicable

HSA = hollow stem auger

NR = not recorded

BN = backfilled w/ native soil

Table 4-2

Soil Analytical Program Summary

Boring ID (Sample Depth)	Total Metals	Cyanide	TCLP RCRAS Metals	SPLP RCRAS Metals	SPLP VOC	SPLP PAH	VOC	PAH	pH	PCB	Grain Size Analysis/Hydrometer (ASTM D422)	Consolidation Test (ASTM D2435)	Specific Gravity (ASTM D854)	Consolidated, Drained Direct Shear Test (ASTM D3080)	Flexible Well Hydraulic Conductivity Test (ASTM D5084)
SB-607 (2-2.9')	X	X	X						X						
SB-607 (6-7.1')											X		X		X
SB-607 (7.2-7.5')											X (H)				
SB 608 (2-3.1')	X	X	X						X						
SB 609 (14-16')	X	X	X						X						
SB 610A (12-14')	X	X	X						X						
SB 611 (4-6')	X	X	X						X						
SB 611 (14-16')											X (H)				
SB 612 (4-6')	X	X	X						X						
SB 613 (6-8')	X	X	X						X						
SB 614 (6-8')	X	X	X						X						
SB 615 (10-12')	X	X	X						X						
SB 616 (2-4')	X	X	X						X						
SB 616 (24-29')											X				
SB 617 (4-7')	X	X	X						X						
SB 618 (8-9')	X	X	X	X					X						
SB 619 (3-9')	X	X	X						X						
SB 620 (19-21')	X	X	X						X						
SB 621 (14-16')	X	X	X						X						
SB 622A (2-9')	X	X	X						X						
SB 623 (4-6')	X	X	X						X						
SB 624 (0-4')	X	X	X						X						
SB 625 (1-3')	X	X	X						X						
SB 625 (9-14')											X (H)				
SB 625 (14-19')											X				
SB 626 (14-16')	X	X	X						X						
SB 627 (24-26')	X	X	X						X						
SB 628 (14-16')	X	X	X						X						
SB 628 (29-31')	X	X	X						X						
SB 629 (9-11')											X	X	X		X
SB 629 (14-16')	X	X	X						X						
SB 630 (14-16')	X	X	X						X						
SB 631 (14-16')	X	X	X						X						
SB 632 (14-16')	X	X	X						X						
SB 633 (5-7')	X	X	X						X						
SB 634 (14-16')	X	X	X	X		X			X						
SB 635 (14-16')	X	X	X						X						
SB 636 (4-6')	X	X	X						X						
SB 637 (12-14')	X	X	X						X						
SB 638 (9-11')	X	X	X						X						
SB 639 (14-16')	X	X	X						X						
SB 639 (19-21')	X	X	X						X						
SB 640 (14-16')	X	X	X						X						
SB 641 (19-21')	X	X	X						X						
SB 642 (34-36')	X	X	X						X						

Prepared by: TMK1
Checked by: JSL

Table 4-2

Soil Analytical Program Summary

Boring ID (Sample Depth)	Total Metals	Cyanide	TCLP RCRAS Metals	SPLP RCRAS Metals	SPLP VOC	SPLP PAH	VOC	PAH	pH	PCB	Grain Size Analysis/Hydrometer (ASTM D422)	Consolidation Test (ASTM D2435)	Specific Gravity (ASTM D854)	Consolidated, Drained Direct Shear Test (ASTM D3080)	Flexible Well Hydraulic Conductivity Test (ASTM D5084)
SB 643 (14-16')	X	X	X						X						
SB 644 (12-15')	X	X	X						X						
SB 645 (4-6')	X	X	X						X						
SB 646															
SB 647 (4-6')	X	X	X						X						
SB 648 (4-6')	X	X	X						X						
MW-601 (8-9')	X	X	X				X	X	X					X	
MW-601 (9-11')											X (H)				
MW-602 (11-21')											X				
P-602 (14-16')	X	X	X						X						
P-602 (44-46')											X				
MW-603 (14-16')	X	X	X						X						
MW-603 (14-21')											X (H)				
MW-604 (9-11')											X (H)				
P-604 (9-14')	X	X	X						X						
P-604 (19-26')											X				
MW-605															
P-605 (8-9')											X				
MW-606 (14-16')	X	X	X						X		X (H)				
KSB-1 (5-7')	X	X	X		X		X	X	X						
KSB-2															
KSB-3 (0-2')	X	X	X						X						
KSB-3 (4-6')					X		X								
KSB-4 (0-2')	X	X	X						X						
KSB-4 (6-8')					X		X								
KSB-5 (5.7-8.5')	X	X	X				X	X	X						
KSB-6 (0-1.6')	X	X	X		X		X	X	X						
KSB-7 (4-5')	X	X	X	X	X	X	X	X							
KSB-8 (0-2')	X	X	X						X						
KSB-9 (4-6')	X	X	X						X						
KSB-9 (10-12')											X	X	X		X
KSB-9 (14-16')											X	X	X		X
KSB-10 (4-6')	X	X	X						X						
KSB-11 (0-2')	X	X	X						X						
KSB-12 (6-9')	X	X	X						X						
KSB-13 (4-9')	X	X	X						X						
KSB-14 (11.5-12')	X	X	X				X	X	X						
KSB-15 (3.5-4')	X	X	X	X	X	X	X	X	X						
KSB-16 (0-4')	X	X	X	X					X						
KSB-17															
KSB-18 (0-4')	X	X	X	X					X						
KSB-19 (2-4')	X	X	X						X						
KSB-19 (5-7')				X			X	X							

Table 4-2

Soil Analytical Program Summary

Boring ID (Sample Depth)	Total Metals	Cyanide	TCLP RCRAS Metals	SPLP RCRAS Metals	SPLP VOC	SPLP PAH	VOC	PAH	pH	PCB	Grain Size Analysis/Hydrometer (ASTM D422)	Consolidation Test (ASTM D2435)	Specific Gravity (ASTM D854)	Consolidated, Drained Direct Shear Test (ASTM D3080)	Flexible Well Hydraulic Conductivity Test (ASTM D5084)
KMW-1 (3-4')	X	X	X		X		X	X	X						
KMW-1 (4-15')											X (H)				
KMW-2 (9-9.5')	X	X	X	X	X	X	X	X	X						
KMW-2 (14-17')											X				
KMW-2 (17-18')											X (H)				
KMW-3 (6-7')	X	X	X						X						
KMW-3 (24-29')											X				
KMW-3 (29-32')											X				
KMW-4															
KMW-4P (12-14')	X	X	X						X						
KMW-4P (34-39')											X				
KMW-4P (40-41')											X (H)				
KMW-5 (14-14.5')	X	X	X						X						
KMW-5 (45-49')											X (H)				
KMW-6 (4-9')	X	X	X						X						
KMW-6A (3-4')	X	X	X	X		X		X	X	X					
KMW-6A (36-46')											X (H)				
KMW-7 (0-5')	X	X	X						X						
KMW-7 (24-29')											X				
KMW-8															
KMW-9 (24-29')											X				
KMW-9P (9-14')	X	X	X						X						
KMW-9P (52-57')											X				
KMW-10 (0.9-4')	X	X	X						X						

Notes: TCLP = Toxicity Characteristic Leaching Procedure
RCRA = Resource Conservation and Recovery Act
SPLP = Synthetic Precipitate Leaching Procedure
VOC = Volatile Organic Compound
PAH = Polynuclear Aromatic Hydrocarbon
PCB = Polychlorinated Byphenyl
ASTM = American Society for Testing & Materials
(H) = Hydrometer

Prepared by: TMK1
Checked by: JSL

Table 4-3
Groundwater Monitoring Program Summary

Parameter	Analytical Method	Location ID / Units	HW-1	HW-1A	HW-2	HW-3	HW-4	HW-5	HW-5A	HW-6	HW-6	HYG-1	KMW-1	KMW-2	KMW-3	KMW-4	KMW-5	KMW-6A	KMW-7	KMW-9	KMW-9P	KMW-10	MW-5	MW-6	MW-7	MW-9	MW-11	MW-12	MW-101	MW-102	MW-103
Field																															
Groundwater Elevation	Field	ft msl	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Temperature	Field	^{0}C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
D.O.	EPA-360.1	mg/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Specific Conductance	Field	umhos/cm	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Redox	Field	mV	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
pH	EPA-9040C	S.U.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Turbidity	Field	--	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Metals																															
Aluminum	EPA-200.7/6020	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Antimony	EPA-200.8/6020	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Arsenic	EPA-200.8/6020	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Barium	EPA-200.8/6020	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Beryllium	EPA-200.8/6020	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Boron	EPA-200.8/6020	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Cadmium	EPA-200.8/6020	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Chromium	EPA-200.8/6020	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Copper	EPA-200.8/6020	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Cobalt	EPA-200.8/6010B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Iron	EPA-200.7/6020	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Lead	EPA-200.8/6020	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Lithium	EPA-200.7/6020	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Manganese	EPA-200.8/6020	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Molybdenum	EPA-200.8/6020	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Nickel	EPA-200.8/6020	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Selenium	EPA-200.8/6020	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Silver	EPA-200.8/6020	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Zinc	EPA-200.8/6020	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Mercury (low level)	EPA-1631E	ng/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Thallium	EPA-200.8/6020	ug/L	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Vanadium	EPA-200.8/6020	ug/L	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Anions																															
Alkalinity, Bicarbonate	310.1/SM 2320 B	mg/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Alkalinity, Carbonate	310.1/SM 2320 B	mg/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Chloride	EPA-325.2/300.1	mg/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Fluoride	EPA-300.1	mg/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Nitrate	EPA-353.2/300.1	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Nitrite	EPA-353.2 /300.1	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Nitrogen, Ammonia	350.1/4500 NH36	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sulfate	EPA-300.1	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sulfide	376.1	mg/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Cations																															
Calcium	EPA-200.7/6010B	mg/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sodium	USEPA-6010B	mg/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Magnesium	EPA-200.7/6010B	mg/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Potassium	EPA-200.7/6010B	mg/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Others																															
Cyanide	USEPA-9012	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Hardness (calc) as CaCO3	SM 2340B	mg/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Volatile Organic Compounds																															
1,1,1-Trichloroethane	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
1,1,2,2-Tetrachloroethane	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
1,1,2-Trichloroethane	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
1,1-Dichloroethane	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
1,1-Dichloroethene	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
1,2-Dichloroethane	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
1,2-Dichloroethene, Total	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
1,2-Dichloropropane	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2-Butanone	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2-Hexanone	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4-Methyl-2-pentanone	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Acetone	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Benzene	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Bromodichloromethane	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Bromoform	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Bromomethane	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Carbon Disulfide	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Carbon Tetrachloride	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Chlorobenzene	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Chlorodibromomethane	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Chloroethane	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Chloroform	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Chloromethane	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
cis-1,3-Dichloropropene	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Ethylbenzene	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Methylene Chloride	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Styrene	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Tetrachloroethene	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Table 4-3
Groundwater Monitoring Program Summary

Parameter	Analytical Method	Location ID / Units	HW-1	HW-1A	HW-2	HW-3	HW-4	HW-5	HW-5A	HW-6	HW-6	HYG-1	KMW-1	KMW-2	KMW-3	KMW-4	KMW-5	KMW-6A	KMW-7	KMW-9	KMW-9P	KMW-10	MW-5	MW-6	MW-7	MW-9	MW-11	MW-12	MW-101	MW-102	MW-103
Toluene	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
trans-1,3-Dichloropropene	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Trichloroethene	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Vinyl Chloride	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Xylene, Total	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Polyaromatic Nuclear Hydrocarbon																															
Acenaphthene	8720C (SIM)	ug/l											X	X		X		X					X	X		X	X		X	X	X
Acenaphthylene	8720C (SIM)	ug/l											X	X		X		X					X	X		X	X		X	X	X
Anthracene	8720C (SIM)	ug/l											X	X		X		X					X	X		X	X		X	X	X
Benzo(a)anthracene	8720C (SIM)	ug/l											X	X		X		X					X	X		X	X		X	X	X
Benzo(a)pyrene	8720C (SIM)	ug/l											X	X		X		X					X	X		X	X		X	X	X
Benzo(b)fluoranthene	8720C (SIM)	ug/l											X	X		X		X					X	X		X	X		X	X	X
Benzo(ghi)perylene	8720C (SIM)	ug/l											X	X		X		X					X	X		X	X		X	X	X
Benzo(k)fluoranthene	8720C (SIM)	ug/l											X	X		X		X					X	X		X	X		X	X	X
Chrysene	8720C (SIM)	ug/l											X	X		X		X					X	X		X	X		X	X	X
Dibenzo(ah)anthracene	8720C (SIM)	ug/l											X	X		X		X					X	X		X	X		X	X	X
Fluoranthene	8720C (SIM)	ug/l											X	X		X		X					X	X		X	X		X	X	X
Fluorene	8720C (SIM)	ug/l											X	X		X		X					X	X		X	X		X	X	X
Indeno(123-cd)pyrene	8720C (SIM)	ug/l											X	X		X		X					X	X		X	X		X	X	X
Naphthalene	SW846-8260B	ug/l											X	X		X		X					X	X		X	X		X	X	X
Phenanthrene	8720C (SIM)	ug/l											X	X		X		X					X	X		X	X		X	X	X
Pyrene	8720C (SIM)	ug/l											X	X		X		X					X	X		X	X		X	X	X
Polychlorinated Biphenyl																															
PCB total	8082A	ug/l											X	X		X		X					X	X		X	X		X	X	X

Table 4-3
Groundwater Monitoring Program Summary

Parameter	Analytical Method	Location ID / Units	MW-104	MW-601	MW-602	MW-603	MW-604	MW-605	MW-606	P-602	P-604	P-605	PW-1	PW-2	PW-3	PW-4
Field																
Groundwater Elevation	Field	ft msl	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Temperature	Field	^{o}C	X	X	X	X	X	X	X	X	X	X	X	X	X	X
D.O.	EPA-360.1	mg/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Specific Conductance	Field	umhos/cm	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Redox	Field	mV	X	X	X	X	X	X	X	X	X	X	X	X	X	X
pH	EPA-9040C	S.U.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Turbidity	Field	--	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Metals																
Aluminum	EPA-200.7/6020	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Antimony	EPA-200.8/6020	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Arsenic	EPA-200.8/6020	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Barium	EPA-200.8/6020	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Beryllium	EPA-200.8/6020	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Boron	EPA-200.8/6020	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Cadmium	EPA-200.8/6020	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Chromium	EPA-200.8/6020	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Copper	EPA-200.8/6020	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Cobalt	EPA-200.8/6010B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Iron	EPA-200.7/6020	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Lead	EPA-200.8/6020	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Lithium	EPA-200.7/6020	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Manganese	EPA-200.8/6020	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Molybdenum	EPA-200.8/6020	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Nickel	EPA-200.8/6020	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Selenium	EPA-200.8/6020	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Silver	EPA-200.8/6020	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Zinc	EPA-200.8/6020	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Mercury (low level)	EPA-1631E	ng/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Thallium	EPA-200.8/6020	ug/L	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Vanadium	EPA-200.8/6020	ug/L	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Anions																
Alkalinity, Bicarbonate	310.1/SM 2320 B	mg/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Alkalinity, Carbonate	310.1/SM 2320 B	mg/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Chloride	EPA-325.2/300.1	mg/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Fluoride	EPA-300.1	mg/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Nitrate	EPA-353.2/300.1	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Nitrite	EPA-353.2 /300.1	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Nitrogen, Ammonia	350.1/4500 NH36	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sulfate	EPA-300.1	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sulfide	376.1	mg/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Cations																
Calcium	EPA-200.7/6010B	mg/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sodium	USEPA-6010B	mg/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Magnesium	EPA-200.7/6010B	mg/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Potassium	EPA-200.7/6010B	mg/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Others																
Cyanide	USEPA-9012	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Hardness (calc) as CaCO3	SM 2340B	mg/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Volatile Organic Compounds																
1,1,1-Trichloroethane	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
1,1,2,2-Tetrachloroethane	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
1,1,2-Trichloroethane	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
1,1-Dichloroethane	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
1,1-Dichloroethene	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
1,2-Dichloroethane	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
1,2-Dichloroethene, Total	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
1,2-Dichloropropane	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2-Butanone	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2-Hexanone	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4-Methyl-2-pentanone	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Acetone	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Benzene	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Bromodichloromethane	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Bromoform	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Bromomethane	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Carbon Disulfide	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Carbon Tetrachloride	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Chlorobenzene	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Chlorodibromomethane	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Chloroethane	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Chloroform	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Chloromethane	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
cis-1,3-Dichloropropene	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Ethylbenzene	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Methylene Chloride	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Styrene	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Tetrachloroethene	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Prepared By : SVF
Checked by: JSL

Parameter	Analytical Method	Location ID / Units	MW-104	MW-601	MW-602	MW-603	MW-604	MW-605	MW-606	P-602	P-604	P-605	PW-1	PW-2	PW-3	PW-4
Toluene	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
trans-1,3-Dichloropropene	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Trichloroethene	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Vinyl Chloride	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Xylene, Total	SW846 8260B	ug/l	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Polyaromatic Nuclear Hydrocarbon																
Acenaphthene	8720C (SIM)	ug/l	X	X									X			X
Acenaphthylene	8720C (SIM)	ug/l	X	X									X			X
Anthracene	8720C (SIM)	ug/l	X	X									X			X
Benzo(a)anthracene	8720C (SIM)	ug/l	X	X									X			X
Benzo(a)pyrene	8720C (SIM)	ug/l	X	X									X			X
Benzo(b)fluoranthene	8720C (SIM)	ug/l	X	X									X			X
Benzo(ghi)perylene	8720C (SIM)	ug/l	X	X									X			X
Benzo(k)fluoranthene	8720C (SIM)	ug/l	X	X									X			X
Chrysene	8720C (SIM)	ug/l	X	X									X			X
Dibenzo(ah)anthracene	8720C (SIM)	ug/l	X	X									X			X
Fluoranthene	8720C (SIM)	ug/l	X	X									X			X
Fluorene	8720C (SIM)	ug/l	X	X									X			X
Indeno(123-cd)pyrene	8720C (SIM)	ug/l	X	X									X			X
Naphthalene	SW846-8260B	ug/l	X	X									X			X
Phenanthrene	8720C (SIM)	ug/l	X	X									X			X
Pyrene	8720C (SIM)	ug/l	X	X									X			X
Polychlorinated Biphenyl																
PCB total	8082A	ug/l	X	X									X			X

Notes:
ft msl = feet mean sea level
mV = millivolt
mg/l = milligrams per liter
ng/L = nanograms per liter
^{o}C = degrees Celcius
S.U. = Standard Unit
ug/l = micrograms/liter
umhos/cm = micro mhos per centimeter
DO = Dissolved oxygen

Table 4-4

Water Truck Sample Results

Event Date	Location	Parameter	Units	Flag	Result	Residential Commercial I Drinking Water Criteria	Residential Commercial Code
9/12/06	MINISONIC	Carbonate Alkalinity	mg/L	U	<1.7		
9/12/06	MINISONIC	Chloride	mg/L		52	250	E
9/12/06	MINISONIC	Chlorobenzene	ug/L	U	<0.41	100	A
9/12/06	MINISONIC	Chlorodibromomethane	ug/L	U	<0.81	100	A,W
9/12/06	MINISONIC	Chloroethane	ug/L	U	<0.97	430	
9/12/06	MINISONIC	Chloroform	ug/L		43	80	A,W
9/12/06	MINISONIC	Chloromethane	ug/L	U	<0.24	260	
9/12/06	MINISONIC	Chrysene	ug/L	U	<0.019	1.6	S
9/12/06	MINISONIC	cis-1,2-Dichloroethene	ug/L	U	<0.83	70	S
9/12/06	MINISONIC	cis-1,3-Dichloropropene	ug/L	U	<0.19	8.5	
9/12/06	MINISONIC	Dibenzo (a,h) anthracene	ug/l	U	<0.019	2	M
9/12/06	MINISONIC	Dibromomethane	ug/L	U	<0.60	80	
9/12/06	MINISONIC	Dichlorodifluoromethane	ug/L	U	<0.99	1700	
9/12/06	MINISONIC	Diisopropyl Ether	ug/L	U	<0.76	30	
9/12/06	MINISONIC	Ethylbenzene	ug/l	U	<0.54	74	E
9/12/06	MINISONIC	Fluoranthene	ug/L	U	<0.015	210	S
9/12/06	MINISONIC	Fluorene	ug/L	U	<0.0091	880	
9/12/06	MINISONIC	Fluoride	mg/L		1.1		
9/12/06	MINISONIC	Fluorotrichloromethane	ug/L	U	<0.79	2600	
9/12/06	MINISONIC	Hexachlorobutadiene	ug/L	U	<0.67	15	
9/12/06	MINISONIC	Indeno (1,2,3 - cd) pyrene	ug/l	U	<0.019	2	M
9/12/06	MINISONIC	Isopropylbenzene	ug/L	U	<0.59	800	
9/12/06	MINISONIC	Mercury - low level	ng/L		0.900	2000	A
9/12/06	MINISONIC	Methylene Chloride	ug/L	U	<0.43	5	A
9/12/06	MINISONIC	Methy T-Butyl ether	ug/L	U	<0.61	40	E
9/12/06	MINISONIC	Naphthalene	ug/L	U	<0.012	520	
9/12/06	MINISONIC	Naphthalene	ug/L	U	<0.74	520	
9/12/06	MINISONIC	n-Butylbenzene	ug/L	U	<0.93	80	
9/12/06	MINISONIC	Nitrogen, Ammonia	mg/L	U	<0.20	10	N
9/12/06	MINISONIC	n-Propylbenzene	ug/L	U	<0.81	80	
9/12/06	MINISONIC	Phenanthrene	ug/L	U	<0.011	52	
9/12/06	MINISONIC	p-Isopropyltoluene	ug/L	U	<0.67		
9/12/06	MINISONIC	Pyrene	ug/L	U	<0.015	140	S
9/12/06	MINISONIC	s-Butylbenzene	ug/L	U	<0.89	80	
9/12/06	MINISONIC	Styrene	ug/L	U	<0.86	100	A
9/12/06	MINISONIC	Sulfate	mg/L		26	250	E
9/12/06	MINISONIC	t-Butylbenzene	ug/L	U	<0.97	80	
9/12/06	MINISONIC	Tetrachloroethene	ug/L	U	<0.45	5	A
9/12/06	MINISONIC	Toluene	ug/L	U	<0.67	790	E
9/12/06	MINISONIC	trans-1,2-Dichloroethene	ug/L	U	<0.89	100	A
9/12/06	MINISONIC	trans-1,3-Dichloropropene	ug/L	U	<0.19	8.5	
9/12/06	MINISONIC	Trichloroethene	ug/L	U	<0.48	5	A
9/12/06	MINISONIC	Vinyl Chloride	ug/L	U	<0.18	2	A
9/12/06	MINISONIC	Xylenes, m + p	ug/L	U	<1.8	280	E
9/12/06	MINISONIC	xylenes, o	ug/L	U	<0.83	280	E
9/12/06	MINISONIC	Thallium	ug/L	U	<0.020	2	A
9/12/06	MINISONIC	Vanadium	ug/L		0.24	4.5	
9/12/06	MINISONIC	Potassium	ug/L		1480		
9/12/06	MINISONIC	Zinc	ug/L		19	2400	
9/12/06	MINISONIC	Aluminum	ug/L		11	50	V
9/12/06	MINISONIC	Manganese	ug/L		5.3	50	E
9/12/06	MINISONIC	Sodium	ug/L		30500	120000	
9/12/06	MINISONIC	Iron	ug/L		225	300	E

Prepared By: JSL
Checked By: SVF

Table 4-4

Water Truck Sample Results

Event Date	Location	Parameter	Units	Flag	Result	Residential Commercial I Drinking Water Criteria	Residential Commercial Code
9/12/06	MINISONIC	Molybdenum	ug/L		0.35	73	
9/12/06	MINISONIC	Total Hardness	ug/L		191000		
9/12/06	MINISONIC	Chromium	ug/L	J	0.25	100	A
9/12/06	MINISONIC	Silver	ug/L	U	<0.043	34	
9/12/06	MINISONIC	Selenium	ug/L	J	0.29	50	A
9/12/06	MINISONIC	Lithium	ug/L		2.1	170	
9/12/06	MINISONIC	Nickel	ug/L		0.77	100	A
9/12/06	MINISONIC	Lead	ug/L		0.66	4	L
9/12/06	MINISONIC	Barium	ug/L		14.8	2000	A
9/12/06	MINISONIC	Calcium	ug/L		52500		
9/12/06	MINISONIC	Cobalt	ug/L		0.077	40	
9/12/06	MINISONIC	Antimony	ug/L	J	0.064	6	A
9/12/06	MINISONIC	Cadmium	ug/L	U	<0.017	5	A
9/12/06	MINISONIC	Copper	ug/L		3.3	1000	E
9/12/06	MINISONIC	Arsenic	ug/L		1.4	10	
9/12/06	MINISONIC	Beryllium	ug/L	U	<0.017	4	A
9/12/06	MINISONIC	Boron	ug/L		16.6	500	F
9/12/06	MINISONIC	Magnesium	ug/L		14500	400000	
9/12/06	MINISONIC	1,1,1,2-Tetrachloroethane	ug/L	U	<0.92	77	
9/12/06	MINISONIC	1,1,1-Trichloroethane	ug/L	U	<0.90	200	A
9/12/06	MINISONIC	1,1,2,2-Tetrachloroethane	ug/L	U	<0.20	8.5	
9/12/06	MINISONIC	1,1,2-Trichloroethane	ug/L	U	<0.42	5	A
9/12/06	MINISONIC	1,1-Dichloroethane	ug/L	U	<0.75	880	
9/12/06	MINISONIC	1,1-Dichloroethene	ug/L	U	<0.57	7	A
9/12/06	MINISONIC	1,1-Dichloropropene	ug/L	U	<0.75		
9/12/06	MINISONIC	1,2,3-Trichlorobenzene	ug/L	U	<0.74		
9/12/06	MINISONIC	1,2,3-Trichloropropane	ug/L	U	<0.99	42	
9/12/06	MINISONIC	1,2,4-Trichlorobenzene	ug/L	U	<0.97	70	A
9/12/06	MINISONIC	1,2,4-Trimethylbenzene	ug/L	U	<0.97	63	E
9/12/06	MINISONIC	1,2-Dibromo-3-chloropropane	ug/L	U	<0.87	0.2	A
9/12/06	MINISONIC	1,2-Dibromoethane	ug/L	U	<0.56		
9/12/06	MINISONIC	1,2-Dichlorobenzene	ug/L	U	<0.83	600	A
9/12/06	MINISONIC	1,2-Dichloroethane	ug/L	U	<0.36	5	A
9/12/06	MINISONIC	1,2-Dichloropropane	ug/L	U	<0.46	5	A
9/12/06	MINISONIC	1,3,5-Trimethylbenzene	ug/L	U	<0.83	72	E
9/12/06	MINISONIC	1,3-Dichlorobenzene	ug/L	U	<0.87	6.6	
9/12/06	MINISONIC	1,3-Dichloropropane	ug/L	U	<0.61	8.5	
9/12/06	MINISONIC	1,4-Dichlorobenzene	ug/L	U	<0.95	75	A
9/12/06	MINISONIC	1-Methyl-naphthalene	ug/L	U	<0.010		
9/12/06	MINISONIC	2,2-Dichloropropane	ug/L	U	<0.62		
9/12/06	MINISONIC	2-Chlorotoluene	ug/L	U	<0.85	150	
9/12/06	MINISONIC	2-Methyl naphthalene	ug/L	U	<0.011	260	
9/12/06	MINISONIC	4-Chlorotoluene	ug/L	U	<0.74		
9/12/06	MINISONIC	Acenaphthene	ug/L	J	0.011	1300	
9/12/06	MINISONIC	Acenaphthylene	ug/L	U	<0.0081	52	
9/12/06	MINISONIC	Anthracene	ug/L	U	<0.012	43	S
9/12/06	MINISONIC	Benzene	ug/L	U	<0.41	5	A
9/12/06	MINISONIC	Benzo (a) anthracene	ug/L	U	<0.016	2.1	
9/12/06	MINISONIC	Benzo (a) pyrene	ug/L	U	<0.018	5	A
9/12/06	MINISONIC	Benzo (b) Fluoranthene	ug/L	U	<0.016	1.5	S.AA
9/12/06	MINISONIC	Benzo (g,h,i) perylene	ug/L	U	<0.019	1.0	M
9/12/06	MINISONIC	Benzo (k) Fluoranthene	ug/l	U	<0.019	1.0	M
9/12/06	MINISONIC	Bicarbonate Alkalinity	mg/L		160		

Table 4-4

Water Truck Sample Results

Event Date	Location	Parameter	Units	Flag	Result	Residential Commercial I Drinking Water Criteria	Residential Commercial Code
9/12/06	MINISONIC	Bromobenzene	ug/L	U	<0.82	18	
9/12/06	MINISONIC	Bromochloromethane	ug/L	U	<0.97		
9/12/06	MINISONIC	Bromodichloromethane	ug/L		6.3	80	A,W
9/12/06	MINISONIC	Bromoform	ug/L	U	<0.94	80	A,W
9/12/06	MINISONIC	Bromomethane	ug/L	U	<0.91	10	
9/12/06	MINISONIC	Carbon Tetrachloride	ug/L	U	<0.49	5	A
9/12/06	C WATER	Sulfide	mg/L	U	<2.5		
9/12/06	C WATER	Nitrogen, Nitrate	mg/L	B	0.25	10	A,N
9/12/06	C WATER	Nitrogen, Nitrite	mg/L	U	<0.040	1	A,N
9/12/06	TRUCK	Thallium	ug/L	U	<0.020	2	A
9/12/06	TRUCK	Vanadium	ug/L		0.23	4.5	
9/12/06	TRUCK	Acenaphthene	ug/L	U	<0.0082	1300	
9/12/06	TRUCK	Acenaphthylene	ug/L	U	<0.0081	52	
9/12/06	TRUCK	Mercury - low level	ng/L		0.741	2000	A
9/12/06	TRUCK	Bicarbonate Alkalinity	mg/L		160		
9/12/06	TRUCK	Chloride	mg/L		57	250	E
9/12/06	TRUCK	Sulfate	mg/L		26	250	E
9/12/06	TRUCK	Carbonate Alkalinity	mg/L	U	<1.7		
9/12/06	TRUCK	Fluoride	mg/L		0.96		
9/12/06	TRUCK	Nitrogen, Ammonia	mg/L	U	<0.20	10	N
9/12/06	TRUCK	Chloroform	ug/L		56	80	A,W
9/12/06	TRUCK	Bromodichloromethane	ug/L		7.2	80	A,W
9/12/06	TRUCK	Xylenes, m + p	ug/L	U	<1.8	280	E
9/12/06	TRUCK	Toluene	ug/L		1.4	790	E
9/12/06	TRUCK	1,2,3-Trichloropropane	ug/L	U	<0.99	42	
9/12/06	TRUCK	Dichlorodifluoromethane	ug/L	U	<0.99	1700	
9/12/06	TRUCK	1,2,4-Trichlorobenzene	ug/L	U	<0.97	70	A
9/12/06	TRUCK	1,2,4-Trimethylbenzene	ug/L	U	<0.97	63	E
9/12/06	TRUCK	Bromochloromethane	ug/L	U	<0.97		
9/12/06	TRUCK	Chloroethane	ug/L	U	<0.97	430	
9/12/06	TRUCK	t-Butylbenzene	ug/L	U	<0.97	80	
9/12/06	TRUCK	1,4-Dichlorobenzene	ug/L	U	<0.95	75	A
9/12/06	TRUCK	Bromoform	ug/L	U	<0.94	100	A,W
9/12/06	TRUCK	n-Butylbenzene	ug/L	U	<0.93	80	
9/12/06	TRUCK	1,1,1,2-Tetrachloroethane	ug/L	U	<0.92	77	
9/12/06	TRUCK	Bromomethane	ug/L	U	<0.91	10	
9/12/06	TRUCK	1,1,1-Trichloroethane	ug/L	U	<0.90	200	A
9/12/06	TRUCK	Calcium	ug/L		50300		
9/12/06	TRUCK	s-Butylbenzene	ug/L	U	<0.89	80	
9/12/06	TRUCK	Cobalt	ug/L		0.078	40	
9/12/06	TRUCK	trans-1,2-Dichloroethene	ug/L	U	<0.89	100	A
9/12/06	TRUCK	Silver	ug/L	U	<0.043	34	
9/12/06	TRUCK	1,2-Dibromo-3-chloropropane	ug/L	U	<0.87	0.2	A
9/12/06	TRUCK	Antimony	ug/L	J	0.065	6	A
9/12/06	TRUCK	1,3-Dichlorobenzene	ug/L	U	<0.87	6.6	
9/12/06	TRUCK	Magnesium	ug/L		14400	400000	
9/12/06	TRUCK	Styrene	ug/L	U	<0.86	100	A
9/12/06	TRUCK	Boron	ug/L		16.2	500	F
9/12/06	TRUCK	2-Chlorotoluene	ug/L	U	<0.85	150	
9/12/06	TRUCK	Sodium	ug/L		29900	120000	
9/12/06	TRUCK	1,2-Dichlorobenzene	ug/L	U	<0.83	600	A
9/12/06	TRUCK	Beryllium	ug/L	U	<0.017	4	A

Prepared By: JSL
Checked By: SVF

Table 4-4

Water Truck Sample Results

Event Date	Location	Parameter	Units	Flag	Result	Residential Commercial I Drinking Water Criteria	Residential Commercial Code
9/12/06	TRUCK	1,3,5-Trimethylbenzene	ug/L	U	<0.83	72	E
9/12/06	TRUCK	Potassium	ug/L		1440		
9/12/06	TRUCK	cis-1,2-Dichloroethene	ug/L	U	<0.83	70	S
9/12/06	TRUCK	Cadmium	ug/L	U	<0.017	5	A
9/12/06	TRUCK	xylenes, o	ug/L	U	<0.83	280	E
9/12/06	TRUCK	Barium	ug/L		14.6	2000	A
9/12/06	TRUCK	Bromobenzene	ug/L	U	<0.82	18	
9/12/06	TRUCK	Iron	ug/L		146	300	E
9/12/06	TRUCK	Chlorodibromomethane	ug/L	U	<0.81	100	A,W
9/12/06	TRUCK	Arsenic	ug/L		1.1	10	
9/12/06	TRUCK	n-Propylbenzene	ug/L	U	<0.81	80	
9/12/06	TRUCK	Zinc	ug/L		16.8	2400	
9/12/06	TRUCK	Fluorotrichloromethane	ug/L	U	<0.79	2600	
9/12/06	TRUCK	Total Hardness	ug/L		185000		
9/12/06	TRUCK	Diisopropyl Ether	ug/L	U	<0.76	30	
9/12/06	TRUCK	Aluminum	ug/L		7.7	50	V
9/12/06	TRUCK	1,1-Dichloroethane	ug/L	U	<0.75	880	
9/12/06	TRUCK	Lithium	ug/L		2.1	170	
9/12/06	TRUCK	1,1-Dichloropropene	ug/L	U	<0.75		
9/12/06	TRUCK	Manganese	ug/L		4.7	50	E
9/12/06	TRUCK	1,2,3-Trichlorobenzene	ug/L	U	<0.74		
9/12/06	TRUCK	Selenium	ug/L	J	0.36	50	A
9/12/06	TRUCK	4-Chlorotoluene	ug/L	U	<0.74		
9/12/06	TRUCK	Copper	ug/L		2.6	1000	E
9/12/06	TRUCK	Naphthalene	ug/L	U	<0.74	520	
9/12/06	TRUCK	Molybdenum	ug/L		0.34	73	
9/12/06	TRUCK	Ethylbenzene	ug/l	J	0.71	74	E
9/12/06	TRUCK	Chromium	ug/L	J	0.16	100	A
9/12/06	TRUCK	Hexachlorobutadiene	ug/L	U	<0.67	15	
9/12/06	TRUCK	Nickel	ug/L		0.56	100	A
9/12/06	TRUCK	p-Isopropyltoluene	ug/L	U	<0.67		
9/12/06	TRUCK	Lead	ug/L		0.43	4	L
9/12/06	TRUCK	2,2-Dichloropropane	ug/L	U	<0.62		
9/12/06	TRUCK	1,3-Dichloropropane	ug/L	U	<0.61	8.5	
9/12/06	TRUCK	Methy T-Butyl ether	ug/L	U	<0.61	40	E
9/12/06	TRUCK	Dibromomethane	ug/L	U	<0.60	80	
9/12/06	TRUCK	Isopropylbenzene	ug/L	U	<0.59	800	
9/12/06	TRUCK	1,1-Dichloroethene	ug/L	U	<0.57	7	A
9/12/06	TRUCK	1,2-Dibromoethane	ug/L	U	<0.56		
9/12/06	TRUCK	Carbon Tetrachloride	ug/L	U	<0.49	5	A
9/12/06	TRUCK	Trichloroethene	ug/L	U	<0.48	5	A
9/12/06	TRUCK	1,2-Dichloropropane	ug/L	U	<0.46	5	A
9/12/06	TRUCK	Tetrachloroethene	ug/L	U	<0.45	5	A
9/12/06	TRUCK	Methylene Chloride	ug/L	U	<0.43	5	A
9/12/06	TRUCK	1,1,2-Trichloroethane	ug/L	U	<0.42	5	A
9/12/06	TRUCK	Benzene	ug/L	U	<0.41	5	A
9/12/06	TRUCK	Chlorobenzene	ug/L	U	<0.41	100	A
9/12/06	TRUCK	1,2-Dichloroethane	ug/L	U	<0.36	5	A
9/12/06	TRUCK	Chloromethane	ug/L	U	<0.24	260	
9/12/06	TRUCK	1,1,2,2-Tetrachloroethane	ug/L	U	<0.20	8.5	
9/12/06	TRUCK	cis-1,3-Dichloropropene	ug/L	U	<0.19	8.5	
9/12/06	TRUCK	trans-1,3-Dichloropropene	ug/L	U	<0.19	8.5	

Prepared By: JSL
Checked By: SVF

Table 4-4

Water Truck Sample Results

Event Date	Location	Parameter	Units	Flag	Result	Residential Commercial I Drinking Water Criteria	Residential Commercial Code
9/12/06	TRUCK	Vinyl Chloride	ug/L	U	<0.18	2	A
9/12/06	TRUCK	Benzo (g,h,i) perylene	ug/L	U	<0.019	1.0	M
9/12/06	TRUCK	Benzo (k) Fluoranthene	ug/l	U	<0.019	1.0	M
9/12/06	TRUCK	Chrysene	ug/L	U	<0.019	1.6	S
9/12/06	TRUCK	Dibenzo (a,h) anthracene	ug/l	U	<0.019	2	M
9/12/06	TRUCK	Indeno (1,2,3 - cd) pyrene	ug/l	U	<0.019	2	M
9/12/06	TRUCK	Benzo (a) pyrene	ug/L	U	<0.018	5	A
9/12/06	TRUCK	Benzo (a) anthracene	ug/L	U	<0.016	2.1	
9/12/06	TRUCK	Benzo (b) Fluoranthene	ug/L	U	<0.016	1.5	S,AA
9/12/06	TRUCK	Fluoranthene	ug/L	U	<0.015	210	S
9/12/06	TRUCK	Pyrene	ug/L	U	<0.015	140	S
9/12/06	TRUCK	Anthracene	ug/L	U	<0.012	43	S
9/12/06	TRUCK	Naphthalene	ug/L	U	<0.012	520	
9/12/06	TRUCK	2-Methyl naphthalene	ug/L	U	<0.011	260	
9/12/06	TRUCK	Phenanthrene	ug/L	U	<0.011	52	
9/12/06	TRUCK	1-Methyl-naphthalene	ug/L	U	<0.010		
9/12/06	TRUCK	Fluorene	ug/L	U	<0.0091	880	
9/12/06	WATER	Sulfide	mg/L	U	<2.5		
9/12/06	WATER	Nitrogen, Nitrate	mg/L	B	0.39	10	A,N
9/12/06	WATER	Nitrogen, Nitrite	mg/L	U	<0.040	1	A,N

Notes: mg/L - milligrams/liter

ug/L - micrograms/liter

U = The analyte was not detected at or above the reporting limit

< = All the analyte was not detected at or above the reporting limit

E = Criterion is the aesthetic drinking water value, as required by Section 20120a(5) of the Nat Res & EPA Act, 1994 PA 451, as amended.

A = Criterion is the state of Michigan drinking water standard established pursuant to Section 5 of 1976 PA 399, MCL 325.1005.

W = Concentrations of trihalomethanes in groundwater shall be added together to determine compliance with the MI drinking water standard of 80 ug/L. Concentrations of trihalomethanes in soil shall be added together to determine compliance with the drinking water protection criterion of 1,600 ug/kg.

M = Calculated criterion is below the analytical target detection limit, therefore, the criterion defaults to the target detection limit.

S = Criterion defaults to the hazardous substance-specific water solubility limit.

N = The concentrations of all potential sources of nitrate-nitrogen (e.g., ammonia-N, nitrite-N, nitrate-N) in groundwater that is used as a source of drinking water shall not, when added together, exceed the nitrate drinking water criterion of 10,000 ug/L. Where leaching to groundwater is a relevant pathway, soil concentrations of all potential sources of nitrate-nitrogen shall not, when added together, exceed the nitrate drinking water protection criterion of 2.0E+5 ug/kg.

F = Criterion is based on adverse impacts to plant life and phytotoxicity.

V = Criterion is the aesthetic drinking water value as required by Section 20120(a)(5) of the NREPA. Concentrations up to 200 ug/L may be acceptable, and still allow for drinking water use, as part of a site-specific cleanup under Section 20120a(2) of the NREPA.

L = Criteria for lead are derived using a biologically based model, as allowed for under Section 20120a(10) of the NREPA, and are not calculated using the algorithms and assumptions specified in pathway-specified rules.

Water results were compared to the Res/Comm I DW Criteria Res/Comm I DW criteria source: MDEQ Part 201 Generic cleanup criteria screening levels.

J = Concentration detected equal to or greater than the method detection limit but less than the reporting limit.

B = Inorganic - The analyte has been detected between the method detection limit and the reporting limit.

ng/L = nanograms/liter

Prepared By: JSL

Checked By: SVF

Table 4-5
Groundwater Quality Monitoring Program
Inorganic Parameter List

Parameter	Analytical Method	Target Detection Limit[1]	Units
Field			
Groundwater Elevation	Field	NA	ft MSL
Temperature	Field	NA	°C
D.O.	EPA-360.1	NA	mg/l
Specific Conductance	Field	NA	umhos/cm
Redox	Field	NA	mV
pH	EPA-9040C	NA	S.U.
Turbidity	Field	NA	--
Metals			
Aluminum	EPA-200.7/6020	50	ug/l
Antimony	EPA-200.8/6020	2.0	ug/l
Arsenic	EPA-200.8/6020	5.0	ug/l
Barium	EPA-200.8/6020	100	ug/l
Beryllium	EPA-200.8/6020	1.0	ug/l
Boron	EPA-200.8/6020	300	ug/l
Cadmium	EPA-200.8/6020	1.0	ug/l
Chromium	EPA-200.8/6020	10	ug/l
Copper	EPA-200.8/6020	4.0	ug/l
Cobalt	EPA-200.8/6010B	20	ug/l
Iron	EPA-200.7/6020	200	ug/l
Lead	EPA-200.8/6020	3.0	ug/l
Lithium	EPA-200.7/6020	10	ug/l
Manganese	EPA-200.8/6020	50	ug/l
Molybdenum	EPA-200.8/6020	50	ug/l
Nickel	EPA-200.8/6020	20	ug/l
Selenium	EPA-200.8/6020	5.0	ug/l
Silver	EPA-200.8/6020	0.2	ug/l
Zinc	EPA-200.8/6020	10	ug/l
Mercury (low level)	EPA-1631E	1	ng/l
Thallium	EPA-200.8/6020	2	ug/L
Vanadium	EPA-200.8/6020	4	ug/L
Anions			
Alkalinity, Bicarbonate	310.1/SM 2320 B	2.0	mg/l
Alkalinity, Carbonate	310.1/SM 2320 B	2.0	mg/l
Chloride	EPA-325.2/300.1	10	mg/l
Fluoride	EPA-300.1	1.0	mg/l
Nitrate	EPA-353.2/300.1	100	ug/l
Nitrite	EPA-353.2 /300.1	100	ug/l
Nitrogen, Ammonia	350.1/4500 NH36	25	ug/l
Sulfate	EPA-300.1	1	ug/l
Sulfide	376.1	0.2	mg/l

Table 4-5 *(cont'd)*

Parameter	Analytical Method	Target Detection Limit[1]	Units
Cations			
Calcium	EPA-200.7/6010B	NL	mg/l
Sodium	USEPA-6010B	1.0	mg/l
Magnesium	EPA-200.7/6010B	1.0	mg/l
Potassium	EPA-200.7/6010B	0.50	mg/l
Others			
Cyanide	USEPA-9012	5	ug/l
Hardness (calc) as CaCO3	SM 2340B	NL	mg/l

1 Per MDEQ RRD Operational Memorandum No. 2 Prepared by: JSL
NL – not listed in RRD Operational Memorandum No. 2 Checked by: JSK
ft MSL – feet mean sea level
^{o}C – Degrees Celsius
mg/L – milligrams/liter
umhos/cm – micromhos/centimeter
mV = millivolt
su = standard unit
ug/L – micrograms/liter
USEPA – United States Environmental Protection Agency
DO – dissolved oxygen

Table 4-6
Groundwater Quality Monitoring Program
Volatile Organic Compounds Parameter List

Parameter	Analytical Method	Target Detection Limit[1]	Units
1,1,1-Trichloroethane	SW846 8260B	1	ug/l
1,1,2,2-Tetrachloroethane	SW846 8260B	1	ug/l
1,1,2-Trichloroethane	SW846 8260B	1	ug/l
1,1-Dichloroethane	SW846 8260B	1	ug/l
1,1-Dichloroethene	SW846 8260B	1	ug/l
1,2-Dichloroethane	SW846 8260B	1	ug/l
1,2-Dichloroethene, Total	SW846 8260B	1	ug/l
1,2-Dichloropropane	SW846 8260B	1	ug/l
2-Butanone	SW846 8260B	25	ug/l
2-Hexanone	SW846 8260B	50	ug/l
4-Methyl-2-pentanone	SW846 8260B	50	ug/l
Acetone	SW846 8260B	50	ug/l
Benzene	SW846 8260B	1	ug/l
Bromodichloromethane	SW846 8260B	1	ug/l
Bromoform	SW846 8260B	1	ug/l
Bromomethane	SW846 8260B	5	ug/l
Carbon Disulfide	SW846 8260B	5	ug/l
Carbon Tetrachloride	SW846 8260B	1	ug/l
Chlorobenzene	SW846 8260B	1	ug/l
Chlorodibromomethane	SW846 8260B	5	ug/l
Chloroethane	SW846 8260B	5	ug/l
Chloroform	SW846 8260B	1	ug/l
Chloromethane	SW846 8260B	5	ug/l
cis-1,3-Dichloropropene	SW846 8260B	1	ug/l
Ethylbenzene	SW846 8260B	1	ug/l
Methylene Chloride	SW846 8260B	5	ug/l
Styrene	SW846 8260B	1	ug/l
Tetrachloroethene	SW846 8260B	1	ug/l
Toluene	SW846 8260B	1	ug/l
trans-1,3-Dichloropropene	SW846 8260B	1	ug/l
Trichloroethene	SW846 8260B	1	ug/l
Vinyl Chloride	SW846 8260B	1	ug/l
Xylene, Total	SW846 8260B	3	ug/l

[1] Per MDEQ RRD Operational Memorandum No. 2
ug/L – micrograms/liter

Prepared by: JSL
Checked by: JSK

Table 4-7
Groundwater Quality Monitoring Program
Polynuclear Aromatic Hydrocarbon Parameter List

Parameter	Analytical Method	Target Detection Limit[1]	Units
Acenaphthene	8720C (SIM)	5	ug/l
Acenaphthylene	8720C (SIM)	5	ug/l
Anthracene	8720C (SIM)	5	ug/l
Benzo(a)anthracene	8720C (SIM)	1	ug/l
Benzo(a)pyrene	8720C (SIM)	1	ug/l
Benzo(b)fluoranthene	8720C (SIM)	1	ug/l
Benzo(ghi)perylene	8720C (SIM)	1	ug/l
Benzo(k)fluoranthene	8720C (SIM)	1	ug/l
Chrysene	8720C (SIM)	1	ug/l
Dibenzo(ah)anthracene	8720C (SIM)	2	ug/l
Fluoranthene	8720C (SIM)	1	ug/l
Fluorene	8720C (SIM)	5	ug/l
Indeno(123-cd)pyrene	8720C (SIM)	2	ug/l
Naphthalene	SW846-8260B	1.8	ug/l
Phenanthrene	8720C (SIM)	2	ug/l
Pyrene	8720C (SIM)	5	ug/l

Polychlorinated Biphenyls

Parameter	Analytical Method	Target Detection Limit[1]	Units
PCB total	8082A	0.2	ug/l

1 Per MDEQ RRD Operational Memorandum No. 2
ug/L – micrograms/liter

Prepared by: JSL
Checked by: JSK

Table 4-8
Surface Water Quality Monitoring Program
Parameter List

Parameter	Analytical Method	Method Reporting Limit	Units
Field			
Temperature	Field	NA	^{o}C
D.O.	Field	NA	mg/l
Specific Conductance	Field	NA	umhos/cm
pH	Field	NA	S.U.
Metals			
Aluminum	EPA-200.7/6020	50	ug/l
Lithium	EPA-200.7/6020	10	ug/l
Antimony	EPA-200.8/6020	2.0	ug/l
Arsenic	EPA-200.8/6020	1.0	ug/l
Barium	EPA-200.8/6020	10	ug/l
Iron	EPA-200.7/6020	40	ug/l
Beryllium	EPA-200.8/6020	1.0	ug/l
Boron	EPA-200.8/6020	50	ug/l
Cadmium	EPA-200.8/6020	0.40	ug/l
Chromium	EPA-200.8/6020	1.0	ug/l
Copper	EPA-200.8/6020	2.0	ug/l
Cobalt	EPA-200.8/6010B	10	ug/l
Lead	EPA-200.8/6020	1.0	ug/l
Manganese	EPA-200.8/6020	10	ug/l
Molybdenum	EPA-200.8/6020	10	ug/l
Nickel	EPA-200.8/6020	1.2	ug/l
Selenium	EPA-200.8/6020	4.0	ug/l
Silver	EPA-200.8/6020	0.4	ug/l
Zinc	EPA-200.8/6020	10	ug/l
Mercury	EPA-1631E	0.25	ng/l
Thallium	EPA-200.8/6020	1.2	ug/l
Vanadium	EPA-200.8/6020	1.2	ug/l
Anions			
Alkalinity, Bicarbonate	310.1/SM 2320 B	2.0	mg/l
Alkalinity, Carbonate	310.1/SM 2320 B	2.0	mg/l
Chloride	325.2/4500-CLE	1.0	mg/l
Fluoride	SM 4500 F-C	0.10	mg/l
Nitrate	353.2/4500 NO3F	0.05	mg/l
Nitrite	EPA-353.2 or 354.1/4500 NO2B	0.05	mg/l
Nitrogen, Ammonia	350.1/4500 NH36	0.50	mg/l
Sulfate	EPA-375.4/4038	1.0	mg/l
Sulfide[1]	376.1/4500 S2-F	5.0	mg/l

Table 4-8 *(cont'd)*

Parameter	Analytical Method	Method Reporting Limit	Units
Cations			
Calcium	EPA-200.7/6010B	0.50	mg/l
Potassium	EPA-200.7/6010B	0.50	mg/l
Magnesium	EPA-200.7/6010B	0.50	mg/l
Sodium	EPA-200.7/6010B	0.50	mg/l
General Chemistry			
Hardness (calc) as CaCO3	EPA-6010/6020	0.002	mg/l
Total Dissolved Solids	EPA-160.1/SM 2540 C	50	mg/l
Total Suspended Solids	EPA 160.2/SM 2540 D	1.0	mg/l
Alkalinity, Total	310.1/SM 2320 B	2.0	mg/l
COD	410.4/SM 5220 D	2.0	mg/l
Carbon, Dissolved Organic	415.1/5310 D/9060	1.0	mg/l
Carbon, Total Organic	415.1/5310 D/9060	1.0	mg/l
Turbidity	EPA 180.1	10	mg/l
Gross-Alpha	703	3.0	pCi/L
Gross-Beta	703	4.0	pCi/L
Organics (BETX)			
Benzene	EPA 8260	1.0	ug/l
Ethylbenzene	EPA 8260	1.0	ug/l
Toluene	EPA 8260	1.0	ug/l
Xylene (total)	EPA 8260	3.0	ug/l
SGT-HEM; Nonpolar Material (Total Petroleum Hydrocarbons)	EPA 1664	10.0	mg/l

Prepared by: JSL
Checked by: JSK

^{o}C – degrees Celsius
mg/L – milligrams/liter
umhos/cm – micromhos/centimeter
S.U. – standard unit
NA – not applicable
ug/L – micrograms/liter
ng/L – nanograms/liter
pCi/L – picocuries/liter
EPA – Environmental Protection Agency
SM – standard method
D.O. – dissolved oxygen

Table 4-9
Sediment Quality Monitoring Program
Parameter List

Parameter	Analytical Method	Target Detection Limit	Units
Metals			
Aluminum	SW-846-6010B	1000	ug/Kg
Lithium	SW-846-6010B	400	ug/Kg
Antimony	SW-846-6010B	300	ug/Kg
Arsenic	SW-846-6010B	100	ug/Kg
Barium	SW-846-6010B	1000	ug/Kg
Iron	SW-846-6010B	5000	ug/Kg
Beryllium	SW-846-6010B	500	ug/Kg
Boron	SW-846-6010B	8000	ug/Kg
Cadmium	SW-846-6010B	200	ug/Kg
Chromium	SW-846-6010B	2000	ug/Kg
Copper	SW-846-6010B	1000	ug/Kg
Cobalt	SW-846-6010B	500	ug/Kg
Lead	SW-846-6010B	1000	ug/Kg
Manganese	SW-846-6010B	1000	ug/Kg
Magnesium	SW-846-6010B	1000	ug/Kg
Molybdenum	SW-846-6010B	1000	ug/Kg
Nickel	SW-846-6010B	1000	ug/Kg
Selenium	SW-846-6010B	200	ug/Kg
Silver	SW-846-6010B	100	ug/Kg
Zinc	SW-846-6010B	1000	ug/Kg
Mercury	SW-846-7471A	50	ug/Kg
Thallium	SW-846-6010B	500	ug/Kg
Vanadium	SW-846-6010B	1000	ug/Kg
Sulfide	SW-846 9030B	1000	ug/Kg

ug/kg – micrograms per kilograms

Prepared by: JSK
Checked by: JSL

Table 5-1

2006 Soil Results - Exceedances

Event Date	Parameter	Units	Data Level	Location Name	HA-1-BP	HA-2-BP	HA-3-BP	HA-1	HA-2	HA-2 (dup)	HA-3	KMW-1	KMW-2	KMW-3	KMW-4	KMW-5	KMW-6	KMW-6A	KMW-7	KMW-9P	KMW-10	KSB-1	KSB-3	KSB-3	KSB-4	KSB-4
				Field ID	HA-1	HA-2	HA-3	HA-1	HA-2	DUP	HA-3	KMW-1-3-4'	KMW-2-9-9	KMW-3-6-7'	KMW-4P 12'-14'	KMW-5-14'-14_5'	KMW-6-4-9'	KMW-6A-3-4	KMW-7 S-1	KMW-9P S-3	KMW-10-0_9-4'	KSB-1-3	KSB-3-1	KSB-3-3,4'-6'	KSB-4-1	KSB-4-4
				Depth (ft)								3-4'	9-9.5	6-7'	12-14'	14-14.5	4-9'	3-4	0-5	9-14'	0.9-4'	3	1	4-6	1	4
6/6/2006	**Metal**																									
	Arsenic	mg/kg	Tier 1		**320**	**60**	**32**																			
	Nickel	mg/kg	Tier 1		**300**	34	27																			
	Silver	mg/kg	Tier 1		**18**	3.4	<1.0																			
9/12/2006	**Metal**																									
	Aluminum	mg/kg	Tier 1									**5230**	**7840**	**8780**	**15600**	**4130**	**1340**	**2100**	**5300**	**3980**	**3140**	**18000**	**19000**		**21000**	
	Antimony	mg/kg	Tier 1									**21.9**	0.4	0.17	0.19	0.18	0.29	0.35	0.25	0.11	0.12	0.11 B	0.82		0.93	
	Arsenic	mg/kg	Tier 1									2.1	**8.9**	**6.9**	**5.1**	2.1	**9.4**	**12**	**7.3**	4	4.3	**4.7**	3.6		3	
	Boron	mg/kg	Tier 1									<3.3 U	3.6	3.2	4.8	2.1 J	1.8 J	<3.3 U	<5.4 U	2.1	2.7	**12**	**12**		**13**	
	Cobalt	mg/kg	Tier 1									**8.1**	**7.3**	**8.2**	**10.8**	**6**	**8.4**	**8.5**	**4.9**	**3.9**	**4.1**	**14**	**9.8**		**13**	
	Iron	mg/kg	Tier 1									**28800**	**17900**	**23800**	**46100**	**9080**	**69700**	**30000**	**45000**	**11000**	**11400**	**27000**	**25000**		**27000**	
	Lead	mg/kg	Tier 1									13.6	5	3.6	6.1	2.2	**889**	**12000**	24	1.3	2	8	7.5		7.7	
	Lithium	mg/kg	Tier 1									**6.2**	**7.8**	**10.1**	**14.5**	**3.9**	2.2	2.7	**7.8**	**4.9**	**4.6**	**11**	3		**5.2**	
	Magnesium	mg/kg	Tier 1									2370	2780	3840	6210	1430	983	1100	3450	2060	1860	**13000**	**13000**		**14000**	
	Manganese	mg/kg	Tier 1									**211**	**191**	**441**	**247**	**201**	**298**	**300**	**205**	**71.5**	**187**	**470**	**390**		**480**	
	Molybdenum	mg/kg	Tier 1									<0.33 U	**2.7**	0.59	**2.1**	0.43	**2.1**	**3.3**	**1.5**	0.63	1.4	0.87 B	0.71 B		1.0 B	
	Nickel	mg/kg	Tier 1									14	27.8	21.7	33	13.5	29.5	14	22.4	13.2	10.8	32	29		35	
	Selenium	mg/kg	Tier 1									<0.33 U	<0.26 U	<0.25 U	<0.23 U	<0.054 U	<0.27 U	0.3	<0.27 U	<0.23 U	<0.26 U	0.19 B	<0.19 U		<0.20 U	
	Silver	mg/kg	Tier 1									<0.22 U	0.24	0.29	0.12 J	0.9	0.25	0.037 B	<0.11 U	0.63	0.82	<0.014 U	0.5		0.11 B	
	Thallium	mg/kg	Tier 1									<0.44 U	0.056 J	0.065 J	0.11	<0.054 U	<0.054 U	0.011 B	<0.054 U	<0.045 U	<0.051 U	0.071 B	<0.016 U		0.059 B	
	Zinc	mg/kg	Tier 1									20.1	28.8	20.2	58.7	9.3	35.7	19	34.8	11.2	14.4	57	51		56	
	Inorganics																									
	Cyanide, total	mg/kg	Tier 1									<0.16 U	<0.24 U	<0.21 U	<0.37 U	<0.28 U	<0.28 U	<0.17 U	<0.22 U	<0.13 U	<0.26 U	<0.22 U	<0.21 U		<0.31 U	
	VOC																									
	1,2,4-Trimethylbenzene	ug/Kg	Tier 1					<30 U	**35000**	**15000**	<23 U	34 J	<21 U									<21 U		<20 U		**5600**
	1,3,5-Trimethylbenzene	ug/Kg	Tier 1					<14 U	**27000**	**11000**	<11 U	<10 U	<10 U									<10 U		<9.9 U		1600
	n-Propylbenzene	ug/Kg	Tier 1					<16 U	**2500**	1000	<12 U	67	<11 U									<11 U		<11 U		660
	s-Butylbenzene	ug/Kg	Tier 1					<13 U	**2300**	880	<9.7 U	600	<8.9 U									<8.7 U		<8.6 U		520

Prepared by: SVF
Checked by: JSL

Table 5-1

2006 Soil Results - Exceedances

Event Date	Parameter	Units	Data Level	Location Name	KSB-5	KSB-6	KSB-7	KSB-8	KSB-9	KSB-10	KSB-11	KSB-12	KSB-13	KSB-14	KSB-15	KSB-16	KSB-18	KSB-18 (dup)	KSB-19	KSB-19 (dup)	KSB-19	MW-601	MW-603
				Field ID	KSB-5-5_7-8_5'	KSB-6-0-1_6'	KSB-7-4-5'	KSB-8-0-2	KSB-9-3	KSB-10-3	KSB-11-1	KSB-12-6-9'	KSB-13-S-2	KSB-14-11_5-12'	KSB-15-3_5-4'	KSB-16-0-4	KSB-18-0-4	DUP-10-2	KSB-19-2-4	DUP-10-4A	KSB-19-5'-7'	MW-601-8'-9'	MW-603-14-16
				Depth (ft)	5.7-8.5	0-1.6	4-5	0-2	3	3'	1	6-9	4-9'	11.5-12	3.5-4	0-4	0-4	0-4	2-4	2-4	5-7	8-9	14-16
6/6/2006	**Metal**																						
	Arsenic	mg/kg	Tier 1																				
	Nickel	mg/kg	Tier 1																				
	Silver	mg/kg	Tier 1																				
9/12/2006	**Metal**																						
	Aluminum	mg/kg	Tier 1		**5960**	**5570**	**16000**	**2000**	**1910**	**2250**	**4580**	**5170**	**3270**	**17900**	**10800**	**8000**	**2000**	**1100**	**8400**	**9500**		**9000**	**2000**
	Antimony	mg/kg	Tier 1		**13.7**	**36.8**	0.34	**37**	**54.7**	**65.3**	**79.1**	0.33	**27.8**	0.044 J	0.18	**180**	2.6	2	0.31	0.36		0.36	0.13
	Arsenic	mg/kg	Tier 1		1.1	<0.28 U	**23.7**	**39**	<0.28 U	**13.3**	<0.3 U	**9.2**	**150**	2.7	2.8	**420**	**15**	**15**	**5.1**	**5**		**11**	**5.3**
	Boron	mg/kg	Tier 1		<3.2 U	<3.7 U	**13.1**	<3.5 U	<3.7 U	<3.6 U	<4 U	4.3	5.3	3.8	2.6	<3.9 U	<3.7 U	<3.6 U	<3.7 U	<3.7 U		<3.6 U	3.5
	Cobalt	mg/kg	Tier 1		**10.4**	**8.2**	**28.5**	**11**	**8.7**	**4.5**	**8.6**	**6.5**	**103**	**19.8**	**12.6**	**260**	**4.1**	**2.5**	**5.7**	**7.2**		**7.3**	**4.5**
	Iron	mg/kg	Tier 1		**20100**	**61200**	**60300**	**33000**	**77600**	**104000**	**123000**	**59100**	**102000**	**31800**	**34600**	**200000**	**24000**	**22000**	**15000**	**18000**		**20000**	**36600**
	Lead	mg/kg	Tier 1		9.2	14.6	9.4	110	12.2	10.7	51.2	8.6	282	3.9	5.4	330	14	7.8	3.2	3.2		5.2	1.2
	Lithium	mg/kg	Tier 1		**5.8**	**4.8**	**18.4**	**4.6**	0.97	1.4	**6**	**7.2**	**3.9**	**29.4**	**15.6**	**6.6**	3.1	**4.2**	**7.9**	**7.5**		**9.6**	**3.5**
	Magnesium	mg/kg	Tier 1		2060	1880	7590	2500	632	1060	3650	2620	4270	**12700**	7600	**10000**	1200	580	3500	4200		4600	890
	Manganese	mg/kg	Tier 1		**7830**	**283**	**637**	**63**	**331**	**204**	**2570**	**323**	**99.4**	**321**	**265**	**120**	**97**	**69**	**180**	**200**		**270**	**98.2**
	Molybdenum	mg/kg	Tier 1		<0.32 U	<0.37 U	**9.6**	**55**	<0.37 U	<0.36 U	<0.4 U	1.3	**111**	0.63	**2.2**	**220**	**5.4**	**2.8**	0.50 B	0.41 B		1.4	0.75
	Nickel	mg/kg	Tier 1		22	13.8	**104**	66	31.4	11.8	53.8	17.7	**223**	54.9	49.7	**740**	11	6.7	14	14		20	11.3
	Selenium	mg/kg	Tier 1		3.2	<0.37 U	0.35 J	0.95	<0.37 U	<0.36 U	<0.4 U	<0.27 U	3	<0.22 U	<0.25 U	**6.2**	0.31	0.3	0.18	0.19		0.23	<0.3 U
	Silver	mg/kg	Tier 1		1.4	<0.25 U	0.23	**9.3**	0.5	0.3 J	1.1	0.98	**17**	0.71	0.25	**36**	0.68	0.47	0.041 B	0.063		0.045 B	0.23 J
	Thallium	mg/kg	Tier 1		**3.3**	<0.49 U	0.3	0.027 B	<0.5 U	<0.48 U	<0.54 U	<0.053 U	0.046 J	0.23	<0.05 U	0.069 B	<0.0067 U	<0.0066 U	0.049 B	0.068 B		0.096 B	<0.059 U
	Zinc	mg/kg	Tier 1		29.7	30.2	153	52	52.3	12.2	109	20.7	49.2	40.5	58.2	170	13	8.7	19	23		35	6.1
	Inorganics																						
	Cyanide, total	mg/kg	Tier 1		<0.21 U	<0.16 U	<0.20 U	2.9	<0.16 U	<0.15 U	0.44	<0.29 U	<0.21 U	<0.22 U	0.27 B	**37**	**14**	**12**	<0.26 U	<0.20 U		<0.23 U	<0.25 U
	VOC																						
	1,2,4-Trimethylbenzene	ug/Kg	Tier 1		<22 U	<21 U	<21 U							<21 U	730						<21 U	<21 U	
	1,3,5-Trimethylbenzene	ug/Kg	Tier 1		<11 U	<10 U	<10 U							<10 U	210						<10 U	<10 U	
	n-Propylbenzene	ug/Kg	Tier 1		<12 U	<11 U	<11 U							<11 U	120						<11 U	<11 U	
	s-Butylbenzene	ug/Kg	Tier 1		<9.4 U	<8.9 U	<8.9 U							<9.0 U	79						<8.7 U	<8.8 U	

Table 5-1
2006 Soil Results - Exceedances

Event Date	Parameter	Units	Data Level	Location Name	MW-606	P-602	P-604	SB-607	SB-608	SB-609	SB-610A	SB-611	SB-612	SB-613	SB-614	SB-615	SB-616	SB-617	SB-618	SB-618 (dup)	SB-619	SB-620
				Field ID	MW-606-14-16	P-602-14-16	P-604-9-14	SB607S-2,2'-2_9'	SB608S-2,2'-3_1'	SB-609-S-8	SB-610A-S-5A	SB-611-S-3	SB-612-S-3	SB-613-S-4	SB-614-S-4	SB-615-S-6	SB-616-2-4	SB617-4-7'	SB-618-8-9	DUP-10-3	SB-619-3-9	SB-620 S-4
				Depth (ft)	14-16	14-16	9-14	2-2.9	2-3.1	14-16	12-14	4-6	4-6	6-8	6-8	10-12	2-4	4-7	8-9	8-9	3-9	19-21
6/6/2006	**Metal**																					
	Arsenic	mg/kg	Tier 1																			
	Nickel	mg/kg	Tier 1																			
	Silver	mg/kg	Tier 1																			
9/12/2006	**Metal**																					
	Aluminum	mg/kg	Tier 1		**2200**	**2400**	**11000**	**10000**	**9600**	**7890**	**4530**	**4460**	**3190**	**9700**	**6070**	**2620**	**11000**	**1940**	**10000**	**7800**	**1600**	**3280**
	Antimony	mg/kg	Tier 1		0.099 B	0.11 B	0.38	0.34	0.25 B	**26**	**7.7**	**6.5**	**20.8**	**18.7**	**9.9**	**50.6**	0.3	0.067 J	0.24	0.27	0.32	<0.061 U
	Arsenic	mg/kg	Tier 1		0.94	0.71	**6.4**	2.3 B	**25**	**8.2**	<0.32 U	0.37 J	<0.25 U	4.2	<0.3 U	<0.3 U	2.7	0.75	**5**	**5.7**	1.7	1.3
	Boron	mg/kg	Tier 1		<4.0 U	<4.4 U	<4.1 U	3.3 B	4.4 B	<3.6 U	<4.3 U	<3.5 U	<3.4 U	<3.7 U	<4 U	<4 U	9.6 B	5.7	<3.6 U	<3.6 U	<3.5 U	4.6
	Cobalt	mg/kg	Tier 1		**3.2**	**3**	**9.6**	**9.9**	**5.8**	**9.8**	**3.6**	**3.1**	**3.8**	**6.4**	**5.1**	**8.3**	**18**	**2**	**8.3**	**7**	**1.8**	**3.6**
	Iron	mg/kg	Tier 1		**16000**	**12000**	**33000**	**28000**	**32000**	**32000**	**9280**	**7690**	**25000**	**20400**	**10700**	**64300**	**33000**	**12800**	**21000**	**16000**	**14000**	**20700**
	Lead	mg/kg	Tier 1		1	0.77	4	4.2	9.2	5.3	3.2	3.7	5.1	6.1	4.2	11.4	2.2	2.2	3	2.8	1.9	1.2
	Lithium	mg/kg	Tier 1		**4.8**	**6.3**	**18**	**4.3**	**16**	**4.4**	1.1	2.1	0.81	**5.5**	3.3	3.2	**23**	**5.1**	**7.8**	**8.6**	**4.2**	**6.5**
	Magnesium	mg/kg	Tier 1		1200	1100	5900	6000	5300	5010	1530	1350	1400	3330	1830	1680	7100	864	5200	4200	800	1390
	Manganese	mg/kg	Tier 1		**160**	**130**	**170**	**320**	**210**	**403**	**79.5**	**60.1**	**122**	**216**	**125**	**360**	**480**	**33**	**380**	**460**	**77**	**152**
	Molybdenum	mg/kg	Tier 1		0.87 B	0.76 B	1.2 B	0.96 B	**4.4**	<0.36 U	<0.43 U	<0.35 U	<0.34 U	<0.37 U	<0.4 U	<0.4 U	0.57 B	1.2	0.54 B	0.66 B	1.3	0.55
	Nickel	mg/kg	Tier 1		12	9.3	36	19	33	18	11.6	8.4	8.3	18.4	10.4	16.3	27	5.8	18	16	6.2	9.6
	Selenium	mg/kg	Tier 1		0.29	0.42	<0.086 U	<0.21 U	<0.18 U	<0.36 U	<0.43 U	<0.35 U	<0.34 U	<0.37 U	<0.4 U	<0.4 U	0.2	0.23 J	0.21	0.24	0.17	<0.31 U
	Silver	mg/kg	Tier 1		0.034 B	0.041 B	0.010 B	0.061 B	0.024 B	<0.24 U	<0.29 U	<0.23 U	<0.23 U	<0.25 U	<0.26 U	<0.27 U	0.037 B	0.17	0.025 B	0.032 B	0.065	0.14 J
	Thallium	mg/kg	Tier 1		<0.0074 U	<0.0080 U	0.16	0.070 B	0.14 B	<0.48 U	<0.58 U	<0.47 U	<0.45 U	<0.5 U	<0.53 U	<0.53 U	0.047 B	<0.041 U	0.074 B	0.081 B	<0.0063 U	<0.061 U
	Zinc	mg/kg	Tier 1		9.9	12	26	50	29	28.9	11.9	17.1	18.8	17.5	14.3	10.6	24	2.7 J	27	22	4.9	7.9
	Inorganics																					
	Cyanide, total	mg/kg	Tier 1		<0.21 U	<0.25 U	<0.15 U	<0.21 U	<0.27 U	<0.25 U	<0.31 U	<0.30 U	<0.22 U	<0.25 U	<0.28 U	<0.17 U	<0.27 U	<0.22 U	<0.17 U	<0.28 U	<0.20 U	<0.23 U
	VOC																					
	1,2,4-Trimethylbenzene	ug/Kg	Tier 1																			
	1,3,5-Trimethylbenzene	ug/Kg	Tier 1																			
	n-Propylbenzene	ug/Kg	Tier 1																			
	s-Butylbenzene	ug/Kg	Tier 1																			

Table 5-1

2006 Soil Results - Exceedances

Event Date	Parameter	Units	Data Level	Location Name	SB-621	SB-622	SB-622 (dup)	SB-623	SB-624	SB-625	SB-626	SB-627	SB-628	SB-628	SB-629	SB-630	SB-631	SB-632	SB-633	SB-634	SB-635	SB-636
				Field ID	SB-621 S-3	SB-622-S-2	DUP-15	SB-623-S-3	SB-624-0-4	SB-625-1-3	SB-626 S-3	SB627-24-26'	SB628-14-16'	SB628-29-31'	SB-629 14-16'	SB-630 14-16'	SB-631 14-16'	SB-632-14-16'	SB-633-5-7'	SB-634-14-16'_	SB-635 S-3	SB-636-4-6'
				Depth (ft)	14-16	2-9	2-9	S-3	0-4	1-3	14-16	24-26	14-16	29-31	14-16	14-16	14-16	14-16	5-7	14-16	14-16	4-6
6/6/2006	**Metal**																					
	Arsenic	mg/kg	Tier 1																			
	Nickel	mg/kg	Tier 1																			
	Silver	mg/kg	Tier 1																			
9/12/2006	**Metal**																					
	Aluminum	mg/kg	Tier 1		**1340**	**4500**	**4700**	**3000**	**3800**	**5500**	**1710**	**2450**	**5640**	**1800**	**1920**	**3570**	**3530**	**2750**	**2380**	**4140**	**4140**	**2780**
	Antimony	mg/kg	Tier 1		<0.049 U	**18.8**	0.61	**17.1**	0.36	0.11	0.072 J	0.047 J	0.27	0.051 J	0.1 J	0.074 J	0.06 J	0.11 J	**22**	**31.5**	0.12	0.059 J
	Arsenic	mg/kg	Tier 1		0.83	<0.28 U	3.8	<0.29 U	**8.8**	2.2	**5**	1.1	2.6	0.94	1.3	1.5	0.8	0.92	<0.27 U	<0.3 U	1.5	1
	Boron	mg/kg	Tier 1		2.9	<3.7 U	<3.4 U	<3.8 U	<3.7 U	<3.4 U	6.1 J	6.1	4.6	2.8	1.6 J	5.8	6.7	2.5	<3.6 U	<4.1 U	2.8	1.3 J
	Cobalt	mg/kg	Tier 1		**1.9**	**4.8**	**8.6**	**2.4**	**8.1**	**9.6**	**5.4**	**2.7**	**8**	**2.8**	**3.8**	**4**	**7.3**	**4.7**	**2.9**	**5.1**	**5.3**	**3.4**
	Iron	mg/kg	Tier 1		**15600**	**21500**	**16000**	**20900**	**20000**	**17000**	**26000**	**26600**	**79900**	**19600**	**37100**	**33500**	**28400**	**40800**	**29100**	**43500**	**61700**	**26800**
	Lead	mg/kg	Tier 1		1.5	4.6	5.5	3.6	8.1	2.5	1.4	1.4	5.1	1.2	1.8	1.1	1.2	1.6	3.2	4.4	4.4	1.3
	Lithium	mg/kg	Tier 1		**4.2**	**16.9**	**19**	1.5	**6.4**	**11**	**5.9**	**6.8**	**9.4**	**5.3**	**4.6**	**7.2**	**7.7**	**5.8**	**3.7**	**6.8**	**7.5**	**3.9**
	Magnesium	mg/kg	Tier 1		757	2010	2800	1200	1900	2800	1100	1330	2830	1020	1180	2210	2200	1450	1220	2090	2020	1300
	Manganese	mg/kg	Tier 1		**78.5**	**120**	**170**	**110**	**230**	**290**	**87.1**	**131**	**333**	**127**	**184**	**334**	**274**	**211**	**158**	**241**	**253**	**164**
	Molybdenum	mg/kg	Tier 1		0.44	<0.37 U	0.56 B	<0.38 U	1.2	0.98 B	0.76	1	**2.3**	0.58	1.1	0.95	1.2	1.1	<0.36 U	<0.41 U	**2**	0.79
	Nickel	mg/kg	Tier 1		4.7	11.2	17	5.8	14	16	13.1	7.8	43.1	6.9	15.9	10.1	27.1	19.2	6.6	10	27	7.5
	Selenium	mg/kg	Tier 1		<0.24 U	<0.37 U	0.32	<0.38 U	0.2	0.24	<0.26 U	<0.23 U	0.35 J	0.29 J	<0.3 U	<0.26 U	<0.3 U	<0.31 U	<0.36 U	<0.41 U	<0.3 U	<0.26 U
	Silver	mg/kg	Tier 1		0.18 J	<0.25 U	0.06	<0.26 U	0.031 B	0.15	0.12 J	0.2	0.69	0.12 J	0.54	0.2 J	0.14 J	0.29	<0.24 U	<0.27 U	<0.12 U	0.11 J
	Thallium	mg/kg	Tier 1		<0.049 U	<0.49 U	0.042 B	<0.51 U	0.036 B	0.041 B	<0.053 U	<0.045 U	<0.053 U	<0.05 U	<0.061 U	<0.052 U	<0.06 U	<0.061 U	<0.48 U	<0.54 U	<0.059 U	<0.052 U
	Zinc	mg/kg	Tier 1		5.1	12.8	23	10	36	24	10.3	7.9	16	10.5	11.2	23.1	18.2	11.1	9.8	10.8	16.6	7.7
	Inorganics																					
	Cyanide, total	mg/kg	Tier 1		<0.16 U	<0.23 U	<0.18 U	<0.21 U	<0.15 U	<0.21 U	<0.25 U	<0.26 U	<0.37 U	<0.25 U	<0.34 U	<0.22 U	<0.25 U	<0.30 U	<0.30 U	<0.23 U	<0.35 U	<0.31 U
	VOC																					
	1,2,4-Trimethylbenzene	ug/Kg	Tier 1																			
	1,3,5-Trimethylbenzene	ug/Kg	Tier 1																			
	n-Propylbenzene	ug/Kg	Tier 1																			
	s-Butylbenzene	ug/Kg	Tier 1																			

Table 5-1

2006 Soil Results - Exceedances

Event Date	Parameter	Units	Data Level	Location Name	SB-637	SB-637 (dup)	SB-638	SB-639	SB-639	SB-640	SB-640 (dup)	SB-641	SB-642	SB-643	SB-644	SB-645	SB-647	SB-648	Drinking Water Protection	Drinking Water Protection Code
				Field ID	SB-637-S-7	DUP-13	SB-638 9'-11'	SB-639 14-16'	SB-639-19-21'	SB640-14-16'	DUP-9-26	SB641-19-21'	SB642-34-36'	SB-643 14'-16'	SB-644-S-4	SB-645-4-6	SB-647-4-6	SB-648-4-6		
				Depth (ft)	12-14	12-14	9-11	14-16	19-21	14-16	14-16	19-21	34-36	14-16	12-15	4-6	4-6	4-6		
6/6/2006	**Metal**																			
	Arsenic	mg/kg	Tier 1																4.6	
	Nickel	mg/kg	Tier 1																100	
	Silver	mg/kg	Tier 1																4.5	
9/12/2006	**Metal**																			
	Aluminum	mg/kg	Tier 1		**3920**	**3400**	**3630**	**3050**	**7010**	**2880**	**2900**	**1860**	**2020**	**2380**	**2850**	**3600**	**5900**	**2900**	1	
	Antimony	mg/kg	Tier 1		**46.2**	0.29	0.072 J	<0.06 U	0.45	0.11	0.10 B	0.089 J	<0.057 U	0.085 J	**25.4**	0.17	0.19	0.17	4.3	
	Arsenic	mg/kg	Tier 1		<0.32 U	1.2	0.98	0.72	4	0.95	1	0.91	0.49	1.2	<0.32 U	1.6	**8**	1.2	4.6	
	Boron	mg/kg	Tier 1		<4.2 U	4.2 B	<5.7 U	4.6 J	9.7	2.9	<4.3 U	2 J	6.3	<6 U	<4.3 U	<3.8 U	<3.5 U	<3.5 U	10	
	Cobalt	mg/kg	Tier 1		**5.5**	**3.8**	**4.8**	**4.1**	**11**	**4**	**3.3**	**2.6**	**2.3**	**3.7**	**3.7**	**3.8**	**4.9**	**3.5**	0.8	
	Iron	mg/kg	Tier 1		**56300**	**27000**	**25100**	**22900**	**118000**	**24100**	**18000**	**30900**	**26600**	**38200**	**29100**	**25000**	**19000**	**21000**	6	
	Lead	mg/kg	Tier 1		6.6	1.2	0.93	1.2	6.6	1.2	1	2.5	1.2	1.7	3.4	1.2	2	1.7	700	
	Lithium	mg/kg	Tier 1		**7.9**	**6**	**8.2**	**7**	**18.2**	**5.7**	**5.3**	**5**	**6.6**	**5.4**	**3.4**	**6.5**	**5.3**	**4.2**	3.4	
	Magnesium	mg/kg	Tier 1		2070	1700	1850	1820	3590	1790	1700	1150	1220	1360	1360	2000	3000	1500	8000	
	Manganese	mg/kg	Tier 1		**245**	**210**	**178**	**214**	**410**	**216**	**220**	**130**	**104**	**167**	**174**	**210**	**220**	**240**	1	
	Molybdenum	mg/kg	Tier 1		<0.42 U	0.55 B	0.5	0.56	**2.9**	0.7	0.84 B	0.94	0.84	0.88	<0.43 U	0.72 B	0.83 B	0.72 B	1.5	
	Nickel	mg/kg	Tier 1		24.8	9.5	10	11.4	60.7	11.2	9.7	9.7	6.5	17.5	8.6	8.1	12	7.7	100	
	Selenium	mg/kg	Tier 1		<0.42 U	0.19	<0.29 U	<0.3 U	<0.35 U	<0.27 U	0.23	0.33 J	<0.29 U	<0.3 U	<0.43 U	0.17	0.23	0.17	4	
	Silver	mg/kg	Tier 1		<0.28 U	0.045 B	0.76	<0.12 U	1.1	0.33	0.087	0.24	0.18 J	0.21 J	<0.29 U	0.024 B	0.07	0.031 B	4.5	
	Thallium	mg/kg	Tier 1		<0.56 U	0.015 B	<0.057 U	<0.06 U	<0.07 U	<0.053 U	0.013 B	<0.054 U	<0.057 U	<0.06 U	<0.57 U	0.0095 B	0.040 B	0.011 B	2.3	
	Zinc	mg/kg	Tier 1		11.1	12	8.7	10.6	19.1	11.2	11	7.9	5.7	10	8.5	11	15	12	2400	
	Inorganics																			
	Cyanide, total	mg/kg	Tier 1		<0.31 U	<0.33 U	<0.31 U	<0.36 U	<0.33 U	<0.32 U	<0.36 U	<0.22 U	<0.37 U	<0.35 U	<0.35 U	<0.28 U	<0.31 U	<0.21 U	4	
	VOC																			
	1,2,4-Trimethylbenzene	ug/Kg	Tier 1																2100	
	1,3,5-Trimethylbenzene	ug/Kg	Tier 1																1800	
	n-Propylbenzene	ug/Kg	Tier 1																1600	
	s-Butylbenzene	ug/Kg	Tier 1																1600	

Notes:

mg/kg = milligrams/kilogram
ug/kg = micrograms/kilogram
B = Inorganic - the analyte has been detected between the method detection limit and the reporting limit
J = All concentration detected equal to or greater than the method detection limit but less than the reporting limit
M = Calculated criterion is below the analytical target detection limit, therefore, the criterion defaults to the target detection limit.
VOC = Volatile organic compound
U = The analyte was not detected at or above the reporting limit.
Dup = duplicate
< = All - the analyte was not detected at or above the reporting limit.
Results were compared to the MDEQ drinking water protection criteria. Exceedances are highlighted.
Drinking water protection criteria source: MDEQ Part 201 generic cleanup and screening levels.
ft = feet

Prepared by: SVF
Checked by: JSL

Table 5-2
2006-2007 Groundwater Results - Exceedances

Event Date	Parameter	Units	Data Level	Location	EQB-001	EQB-002	FB-001	FB-002	Field Blank	HW-1	HW-1A	HW-2	HW-3	HW-4	HW-5	HW-5A	HW-6	HW-6	HW-6A	HYG-1	KMW-1	KMW-1	KMW-10	KMW-2	KMW-3	KMW-3	KMW-4
				Field ID	EQB-001	EQB-002	FB-001	FB-002	Field Blank	HW-1	HW-1A	HW-2	HW-3	HW-4	HW-5	HW-5A	HW-6	Dup	HW-6A	HYG-1	KMW-1	Dup	KMW-10	KMW-2	KMW-3	Dup	KMW-4
6/22/06	**Metal**																										
	Aluminum, total	ug/L	Tier 1		3.4	5.7																					
	Arsenic	ug/L	Tier 1		<0.2 U																						
	Arsenic, total	ug/L	Tier 1			<0.12 U																					
	Beryllium	ug/L	Tier 1		**41**																						
	Beryllium, total	ug/L	Tier 1			**37.6**																					
	Cadmium, total	ug/L	Tier 1			<0.057 U																					
	Chromium, total	ug/L	Tier 1			0.35																					
	Cobalt, total	ug/L	Tier 1																								
	Copper, total	ug/L	Tier 1		0.15	0.11																					
	Iron	ug/L	Tier 1		<50 U																						
	Iron, total	ug/L	Tier 1			24																					
	Lithium, total	ug/L	Tier 1			1.3																					
	Manganese	ug/L	Tier 1		<0.5 U	0.052																					
	Manganese, total	ug/L	Tier 1																								
	Nickel, total	ug/L	Tier 1																								
	Zinc, total	ug/L	Tier 1		3.9	1.5																					
	Physical Property																										
	Sulfate	mg/L	Tier 1				1.6 B	1.7 B																			
	VOC																										
	Benzene	ug/L	Tier 1				<0.14 U	<0.14 U																			
	Ethylbenzene	ug/l	Tier 1				<0.40 U	<0.40 U																			
	Xylenes, m + p	ug/L	Tier 1				<0.74 U	<0.74 U																			
	xylenes, o	ug/L	Tier 1				<0.36 U	<0.36 U																			
11/2/06	**Metal**																										
	Aluminum	ug/L	Tier 1																		**62**		9.0 B	16 B	<6.3 U	<6.3 U	12 B
	Arsenic	ug/L	Tier 1																		7.9		3.6	**24**	7.7	7.6	1.4
	Beryllium	ug/L	Tier 1																		<0.10 U		<0.10 U	<0.10 U	<0.10 U	<0.10 U	<0.10 U
	Cadmium	ug/L	Tier 1																		<0.14 U		<0.14 U	<0.14 U	<0.14 U	<0.14 U	<0.14 U
	Chromium	ug/L	Tier 1																		2.2		0.37 B	<0.32 U	0.34 B	0.42 B	<0.32 U
	Cobalt	ug/L	Tier 1																		3.4		2.5	1.3	1.8	1.7	3.3
	Copper	ug/L	Tier 1																		0.33 B		0.3 B	<0.15 U	0.15 B	0.65 B	0.46 B
	Iron	ug/L	Tier 1																		**9300**		**3800**	**10000**	**23000**	**23000**	**4700**
	Lithium	ug/L	Tier 1																		0.63		2.4	2	2.2	2.4	0.57
	Manganese	ug/L	Tier 1																		**3300**		**2000**	**3900**	**5700**	**5600**	**4900**
	Nickel	ug/L	Tier 1																		1.1		2.5	1.5	0.66 B	0.69 B	4.7
	Vanadium	ug/L	Tier 1																		4.2		0.88 B	0.69 B	0.66 B	0.65 B	0.45 B
	Zinc	ug/L	Tier 1																		5.6 B		4.8 B	5.8 B	5.4 B	5.1 B	15
	Physical Property																										
	Nitrogen, Ammonia	mg/L	Tier 1						<0.20 U												0.87		0.24 B	0.46 B	<0.50 U	0.71 B	0.62
	Sulfate	mg/L	Tier 1						<0.77 U												7.9		13	61	130	130	86
	VOC																										
	Benzene	ug/L	Tier 1						<0.41 U												<0.41 U		<0.41 U	<0.41 U	<0.41 U	<0.41 U	<0.41 U
	Ethylbenzene	ug/l	Tier 1						<0.54 U												<0.54 U		<0.54 U	<0.54 U	<0.54 U	<0.54 U	<0.54 U
	Xylenes	ug/l	Tier 1						<2.6 U												<2.6 U		<2.6 U	<2.6 U	<2.6 U	<2.6 U	<2.6 U
3/5/07	**Metal**																										
	Aluminum	ug/L	Tier 1																		**61**	**63**	12 B		<6.3 U		<6.3 U
	Aluminum, total	ug/L	Tier 1																			**3100**					
	Arsenic	ug/L	Tier 1																		8.8	8.8	4.4		**12**		2.6
	Arsenic, total	ug/L	Tier 1																			**10**					
	Cadmium	ug/L	Tier 1																		<0.12 U	<0.12 U	<0.12 U		<0.12 U		<0.12 U
	Chromium	ug/L	Tier 1																		2	2	0.40 B		0.40 B		<0.32 U

Prepared by: ECB/SVF
Checked by: JSL

Table 5-2
2006-2007 Groundwater Results - Exceedances

Event Date	Parameter	Units	Data Level	Location	EQB-001	EQB-002	FB-001	FB-002	Field Blank	HW-1	HW-1A	HW-2	HW-3	HW-4	HW-5	HW-5A	HW-6	HW-6	HW-6A	HYG-1	KMW-1	KMW-1	KMW-10	KMW-2	KMW-3	KMW-3	KMW-4
	Cobalt	ug/L	Tier 1																		3.2	3.2	3.9		1.5		2.5
	Copper	ug/L	Tier 1																		<0.59 U	<0.59 U	<0.59 U		<0.59 U		<0.59 U
	Iron	ug/L	Tier 1																		**20000**	**21000**	**7400**		**22000**		**5100**
	Iron, total	ug/L	Tier 1																			**21000**					
	Lead, total	ug/L	Tier 1																			**4.3**					
	Lithium	ug/L	Tier 1																		0.74	0.64	2.2		2.2		0.96
	Manganese	ug/L	Tier 1																		**4000**	**4000**	**2200**		**4700**		**4500**
	Manganese, total	ug/L	Tier 1																			**4100**					
	Molybdenum, total	ug/L	Tier 1																			1.3 B					
	Nickel	ug/L	Tier 1																		0.68 B	0.72 B	1.8		0.83 B		3.6
	Vanadium	ug/L	Tier 1																		**5.1**	**5.1**	0.87 B		0.75 B		0.57 B
	Vanadium, total	ug/L	Tier 1																			**13**					
	Zinc	ug/L	Tier 1																		5.0 B	5.3 B	<0.98 U		<0.98 U		<0.98 U
	PCB's																										
	Aroclor-1242	ug/L	Tier 1																		<0.12 U	**2.5**					<0.12 U
	Total PCBs	ug/L	Tier 1																		<0.12 U	**2.5**					<0.12 U
	Physical Property																										
	Nitrogen, Ammonia	mg/L	Tier 1																		1.2	1.2	<0.50 U		0.75 B		0.62 B
	Sulfate	mg/L	Tier 1																		2.5 B	2.2 B	14		110		93
	VOC																										
	Xylenes	ug/l	Tier 1																		<2.6 U	<2.6 U	<2.6 U		<2.6 U		<2.6 U
6/5/07	**Metal**																										
	Aluminum	ug/L	Tier 1						7.0 B	5.2 B	<4.4 U	<4.4 U	**150**	5.1 B	<4.4 U	4.9 B	5.7 B	6.3 B	6.8 B	9.2 B	**650**		**53**	**710**	**950**	**800**	**1400**
	Antimony	ug/L	Tier 1						0.15 B	<0.10 U	**6.8**	**6.1**	0.13 B	<0.10 U	<0.10 U	**9.3**	<0.10 U	<0.10 U	4.8	**9.6**	<0.10 U		<0.10 U	<0.10 U	0.17 B	0.15 B	0.18 B
	Arsenic	ug/L	Tier 1						0.11 B	0.82 B	0.23 B	0.38 B	0.59 B	3.4	3.2	0.33 B	4.4	4.2	0.15 B	0.48 B	8.1		4.1	**32**	**18**	**19**	3
	Beryllium	ug/L	Tier 1						0.11 B	<0.070 U	<0.070 U	<0.070 U	0.14 B	<0.070 U	<0.070 U	<0.070 U	<0.070 U	<0.070 U	<0.070 U	<0.070 U	0.070 B		<0.070 U	<0.070 U	0.11 B	0.090 B	0.090 B
	Cadmium	ug/L	Tier 1						<0.097 U	<0.097 U	<0.097 U	<0.097 U	<0.097 U	<0.097 U	<0.097 U	<0.097 U	<0.097 U	<0.097 U	<0.097 U	<0.097 U	<0.097 U		<0.097 U	<0.097 U	<0.097 U	<0.097 U	<0.097 U
	Chromium	ug/L	Tier 1						<0.43 U	<0.43 U	<0.43 U	<0.43 U	<0.43 U	0.51 B	<0.43 U	<0.43 U	<0.43 U	<0.43 U	<0.43 U	<0.43 U	3.1		<0.43 U	3.1	3.1	3.1	5.6
	Cobalt	ug/L	Tier 1						<0.059 U	1.9	2.5	2	4.9	0.060 B	0.37 B	3.2	0.42 B	0.43 B	0.64 B	3.5	4.2		3.5	2.5	3.7	4	3.7
	Copper	ug/L	Tier 1						1.6	0.71 B	3.9	0.78 B	20	<0.12 U	<0.12 U	0.67 B	<0.12 U	<0.12 U	0.59 B	1.4	2		0.92 B	3.9	3.9	3.9	9.7
	Iron	ug/L	Tier 1						12 B	**640**	**3500**	**980**	**7200**	**39000**	**2500**	**810**	**3000**	**2900**	**960**	200	**23000**		**6800**	**14000**	**24000**	**26000**	**7700**
	Lead	ug/L	Tier 1						0.20 B	<0.044 U	0.55 B	0.15 B	0.24 B	**15**	<0.044 U	0.050 B	<0.044 U	<0.044 U	<0.044 U	<0.044 U	1.2		0.11 B	1.7	1.2	1.2	1.6
	Manganese	ug/L	Tier 1						1	**330**	29	**290**	**61**	**850**	**350**	9.9	**350**	**330**	27	26	**4100**		**2000**	**3200**	**4400**	**4700**	**4600**
	Nickel	ug/L	Tier 1						0.27 B	3.3	0.76 B	0.94 B	20	1.3	0.94 B	23	0.72 B	0.72 B	<0.075 U	0.71 B	1.2		1.4	6.1	3	3.1	8.2
	Vanadium	ug/L	Tier 1						<0.41 U	<0.41 U	<0.41 U	<0.41 U	0.67 B	0.91 B	<0.41 U	<0.41 U	<0.41 U	<0.41 U	<0.41 U	0.55 B	**6.4**		0.52 B	2.9	3.9	3.8	4
	Zinc	ug/L	Tier 1						2.8 B	4.0 B	<2.1 U	<2.1 U	12	2.2 B	<2.1 U	<2.1 U	<2.1 U	<2.1 U	<2.1 U	<2.1 U	2.9 B		2.1 B	8.2 B	9.0 B	4.4 B	12
	Physical Property																										
	Nitrogen, Ammonia	mg/L	Tier 1						<0.50 U	<0.50 U	<0.50 U	<0.50 U	<0.50 U	1.3	<0.50 U	<0.50 U	<0.50 U	<0.50 U	<0.50 U	<0.50 U	1.3		<0.50 U	<0.50 U	0.69 B	0.71 B	0.59 B
	Sulfate	mg/L	Tier 1						<0.51 U	120	120	130	29	8.5	130	140	110	110	120	140	10		21	62	97	100	95
	VOC																										
	Benzene	ug/L	Tier 1						<0.41 U	<0.41 U	<0.41 U	<0.41 U	<0.41 U	<0.41 U	<0.41 U	<0.41 U	<0.41 U	<0.41 U	<0.41 U	<0.41 U	<0.14 U						
	Ethylbenzene	ug/l	Tier 1						<0.54 U	<0.54 U	<0.54 U	<0.54 U	<0.54 U	<0.54 U	<0.54 U	<0.54 U	<0.54 U	<0.54 U	<0.54 U	<0.54 U	<0.40 U						
	Xylenes, m + p	ug/L	Tier 1						<0.74 U												<0.74 U						
	xylenes, o	ug/L	Tier 1						<0.36 U												<0.36 U						

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Table 5-2
2006-2007 Groundwater Results - Exceedances

Event Date	Parameter	Units	Data Level	KMW-5	KMW-5 Dup	KMW-6A	KMW-6A Dup	KMW-7	KMW-7 Dup	KMW-9	KMW-9P	KMW-9P Dup	MW-101	MW-101 Dup	MW-102	MW-103	MW-104	MW-11	MW-11 Dup	MW-12	MW-12 Dup	MW-5	MW-5 Dup
				KMW-5	Dup	KMW-6A	Dup	KMW-7	Dup	KMW-9	KMW-9P	Dup	MW-101	Dup	MW-102	MW-103	MW-104	MW-11	Dup	MW-12	Dup	MW-5	Dup
6/22/06	**Metal**																						
	Aluminum, total	ug/L	Tier 1												154000		76.4	483	487			389	
	Arsenic	ug/L	Tier 1										22.1	21.9		13.8				10.6			
	Arsenic, total	ug/L	Tier 1												363		30	11	10.5			95.7	
	Beryllium	ug/L	Tier 1										13.2	12.8		6.9				4.8			
	Beryllium, total	ug/L	Tier 1												73.1		9.9	2.6	2.6			65.9	
	Cadmium, total	ug/L	Tier 1												34		<0.057 U	<0.1 U	<0.1 U			<0.057 U	
	Chromium, total	ug/L	Tier 1												3600		2.8	8.7	9.9			10.1	
	Cobalt, total	ug/L	Tier 1												3010		0.15	10.3	10.5			2.3	
	Copper, total	ug/L	Tier 1											0.17	3920		0.28	1.1	1.1			0.27	
	Iron	ug/L	Tier 1										34700	35200		77600				9190			
	Iron, total	ug/L	Tier 1												2080000		48000	331000	417000			166000	
	Lithium, total	ug/L	Tier 1												366		1.8	2	2.4			0.3	
	Manganese	ug/L	Tier 1										6000	6280		6300				893			
	Manganese, total	ug/L	Tier 1												15100		2140	21200	26600			4460	
	Nickel, total	ug/L	Tier 1												8010		1.6	6.1	6.1			12.3	
	Zinc, total	ug/L	Tier 1										3.6		3710		9.6	6.9	<5 U	2.8		3.1	
	Physical Property																						
	Sulfate	mg/L	Tier 1										1.6 B	<0.77 U	7700	270	2.2 B	1000	950	14		4.3	
	VOC																						
	Benzene	ug/L	Tier 1										0.20 J	0.19 J	<0.14 U	<0.14 U	0.77 J	0.42 J	0.41 J	<0.14 U		10	
	Ethylbenzene	ug/l	Tier 1										1.1	1	<0.40 U	<0.40 U	3.1	<0.40 U	<0.40 U	<0.40 U		75	
	Xylenes, m + p	ug/L	Tier 1										<0.74 U	<0.74 U	<0.74 U	<0.74 U	8.5	<0.74 U	<0.74 U	<0.74 U		520	
	xylenes, o	ug/L	Tier 1										<0.36 U	<0.36 U	<0.36 U	<0.36 U	15	<0.36 U	<0.36 U	<0.36 U		510	
11/2/06	**Metal**																						
	Aluminum	ug/L	Tier 1	8.9 B		26 B		23 B	26 B	16 B	<6.3 U		37 B		400000	13 B	80	430		19 B	8.2 B	360	
	Arsenic	ug/L	Tier 1	0.95 B		12		4.4	4.6	3.8	3.4		31		5600	14	28	18		10	10	160	
	Beryllium	ug/L	Tier 1	<0.10 U		<0.10 U		0.18 B	0.18 B	0.26 B	<0.10 U		<0.10 U		29	<0.10 U	<0.10 U	0.18 B		<0.10 U	<0.10 U	<0.10 U	
	Cadmium	ug/L	Tier 1	<0.14 U		<0.14 U		<0.14 U	<0.14 U	<0.14 U	<0.14 U		<0.14 U		49	<0.14 U	<0.14 U	<0.14 U		<0.14 U	<0.14 U	<0.14 U	
	Chromium	ug/L	Tier 1	0.69 B		2		1.6	1.8	1.3	0.87 B		1.8		8000	1.4	2.9	8.9		0.91 B	0.36 B	10	
	Cobalt	ug/L	Tier 1	67		14		120	120	11	17		0.22 B		6400	0.31 B	0.19 B	12		0.27 B	0.27 B	5.5	
	Copper	ug/L	Tier 1	1		0.33 B		0.22 B	0.31 B	0.44 B	0.25 B		0.23 B		10000	<0.15 U	0.3 B	2.2		<0.15 U	<0.15 U	2.3	
	Iron	ug/L	Tier 1	6100		73000		170000	170000	8000	160000		37000		5100000	57000	59000	270000		10000	9900	140000	
	Lithium	ug/L	Tier 1	10		0.63		4.9	4.8	0.97	5.9		0.63		450	1	1	1.8		1.6	1.5	0.33	
	Manganese	ug/L	Tier 1	2300		17000		21000	22000	8700	27000		6800		17000	4500	2500	19000		970	940	3600	
	Nickel	ug/L	Tier 1	7.4		44		84	85	13	1.5		0.41 B		14000	0.47 B	0.91 B	2.4		0.4 B	<0.32 U	24	
	Vanadium	ug/L	Tier 1	0.48 B		3.2		4.8	4.9	1.8	1.2		3.5		220	2.6	4.6	16		1.2	0.97 B	21	
	Zinc	ug/L	Tier 1	10		7.6 B		9.1 B	13	57	5.4 B		2.9 B		5800	<0.98 U	11	8.5 B		<0.98 U	<0.98 U	6.8 B	
	Physical Property																						
	Nitrogen, Ammonia	mg/L	Tier 1	<0.20 U		1.6		1.8	1.8	0.62	1.3		2.1		<0.50 U	1.4		22		0.84	0.89	19	
	Sulfate	mg/L	Tier 1	91		360		750	750	150	850		1.5 B		13000	170		<0.77 U		12	12	1.4 B	
	VOC																						
	Benzene	ug/L	Tier 1	<0.41 U		<0.41 U		<0.41 U	<0.41 U	<0.41 U	<0.41 U		<0.41 U		<4.1 U	<0.41 U	0.65 J	<0.41 U		<0.41 U	<0.41 U	10	
	Ethylbenzene	ug/l	Tier 1	<0.54 U		<0.54 U		<0.54 U	<0.54 U	<0.54 U	<0.54 U		<0.54 U		<5.4 U	<0.54 U	3.2	<0.54 U		<0.54 U	<0.54 U	90	
	Xylenes	ug/l	Tier 1	<2.6 U		<2.6 U		<2.6 U	<2.6 U	<2.6 U	<2.6 U		<2.6 U		<26 U	<2.6 U	27	<2.6 U		<2.6 U	<2.6 U	1400	
3/5/07	**Metal**																						
	Aluminum	ug/L	Tier 1	<6.3 U		<6.3 U		27 B		13 B	<6.3 U	12 B	35 B		180000	<6.3 U		470	470	<6.3 U		410	
	Aluminum, total	ug/L	Tier 1													89				11 B			
	Arsenic	ug/L	Tier 1	1.5		30		4.1		3.7	3.2	3.5	19		270	14		9.7	9.8	9.2		120	
	Arsenic, total	ug/L	Tier 1													13				9.5			
	Cadmium	ug/L	Tier 1	0.14 B		<0.12 U		0.26 B		<0.12 U	<0.12 U	<0.12 U	<0.12 U		18	<0.12 U		<0.12 U	<0.12 U	<0.12 U		<0.12 U	
	Chromium	ug/L	Tier 1	<0.32 U		1.4		1.8		0.96 B	0.54 B	0.80 B	1.1		2400	0.50 B		7.2	7.2	<0.32 U		11	

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Table 5-2
2006-2007 Groundwater Results - Exceedances

Event Date	Parameter	Units	Data Level	KMW-5	KMW-5	KMW-6A	KMW-6A	KMW-7	KMW-7	KMW-9	KMW-9P	KMW-9P	MW-101	MW-101	MW-102	MW-103	MW-104	MW-11	MW-11	MW-12	MW-12	MW-5	MW-5
	Cobalt	ug/L	Tier 1	**58**		8.5		**110**		6.3	13	14	0.18 B		**2900**	0.22 B		9.4	9.6	0.24 B		4.8	
	Copper	ug/L	Tier 1	<0.59 U		<0.59 U		<0.59 U		2	<0.59 U	<0.59 U	<0.59 U		**4100**	<0.59 U		<0.59 U	<0.59 U	<0.59 U		1.1	
	Iron	ug/L	Tier 1	**21000**		**81000**		**150000**		**5900**	**130000**	**130000**	**34000**		**2100000**	**44000**		**260000**	**340000**	**8600**		**170000**	
	Iron, total	ug/L	Tier 1													**45000**				**9400**			
	Lead, total	ug/L	Tier 1													0.21 B				0.10 B			
	Lithium	ug/L	Tier 1	12		<0.050 U		4.9		0.57	6.1	5.3	0.67		**310**	1.2		1.1	0.97	1.6		0.7	
	Manganese	ug/L	Tier 1	**2600**		**22000**		**21000**		**6600**	**25000**	**25000**	**6200**		**19000**	**3700**		**17000**	**21000**	**890**		**4100**	
	Manganese, total	ug/L	Tier 1													**3700**				**940**			
	Molybdenum, total	ug/L	Tier 1													0.92 B				<0.61 U			
	Nickel	ug/L	Tier 1	3.8		20		79		12	1.7	2.1	0.62 B		**7200**	0.53 B		2.4	2.3	0.63 B		26	
	Vanadium	ug/L	Tier 1	0.41 B		2.5		**4.6**		2.2	1.2	1.4	2.9		**130**	2.3		**14**	**15**	0.80 B		**24**	
	Vanadium, total	ug/L	Tier 1													2.8				0.86 B			
	Zinc	ug/L	Tier 1	13		4.5 B		5.8 B		180	50	51	<0.98 U		**3000**	6.1 B		6.9 B	8.2 B	11		26	
	PCB's																						
	Aroclor-1242	ug/L	Tier 1			<0.12 U							<0.11 U		<0.12 U	<0.12 U		<0.13 U	<0.13 U			<0.13 U	
	Total PCBs	ug/L	Tier 1			<0.12 U							<0.11 U		<0.12 U	<0.12 U		<0.13 U	<0.13 U			<0.13 U	
	Physical Property																						
	Nitrogen, Ammonia	mg/L	Tier 1	0.54 B		1.2		1.9		0.55 B	1.3	1.3	1.6		<0.50 U	1.1		**18**	**20**	0.67 B		**18**	
	Sulfate	mg/L	Tier 1	110		**520**		**840**		130	**900**	**880**	<0.51 U		**9900**	120		**940**	**940**	15		1.8 B	
	VOC																						
	Xylenes	ug/l	Tier 1	<2.6 U		<2.6 U		<2.6 U		<2.6 U	<2.6 U	<2.6 U	<2.6 U		<2.6 U	<2.6 U		<2.6 U	<2.6 U	<2.6 U		**1000**	
6/5/07	**Metal**																						
	Aluminum	ug/L	Tier 1	**3700**	**3800**	**1100**	**1100**	**1200**		**63**	**67**		**200**	**210**	**320000**	41 B	**110**	**740**		<4.4 U		**430**	**480**
	Antimony	ug/L	Tier 1	0.59 B	0.62 B	0.18 B	<0.10 U	<0.10 U		<0.10 U	<0.10 U		<0.10 U	<0.10 U	**16**	0.21 B	0.39 B	0.28 B		<0.10 U		0.22 B	<0.10 U
	Arsenic	ug/L	Tier 1	5.6	5.8	**26**	**26**	5.5		3.9	3.5		**23**	**23**	**290**	**12**	**54**	9.1		9.1		**110**	**110**
	Beryllium	ug/L	Tier 1	0.51 B	0.47 B	<0.070 U	<0.070 U	0.26 B		0.080 B	<0.070 U		0.070 B	0.070 B	**43**	0.13 B	<0.070 U	**5**		<0.070 U		0.14 B	0.10 B
	Cadmium	ug/L	Tier 1	<0.097 U	0.11 B	<0.097 U	<0.097 U	<0.097 U		<0.097 U	<0.097 U		<0.097 U	<0.097 U	**67**	0.10 B	<0.097 U	<0.097 U		<0.097 U		0.17 B	0.11 B
	Chromium	ug/L	Tier 1	13	13	9.7	10	3.6		1.3	0.97 B		1.5	1.5	**3200**	0.95 B	3.1	9.3		<0.43 U		8.4	8.8
	Cobalt	ug/L	Tier 1	33	34	14	15	**130**		7.8	13		0.34 B	0.34 B	**4700**	0.37 B	0.64 B	10		0.21 B		2.5	2.6
	Copper	ug/L	Tier 1	16	18	4.1	4.2	3.3		14	2.8		0.72 B	0.74 B	**11000**	8.5	3.2	640		<0.12 U		1.3	1.3
	Iron	ug/L	Tier 1	**21000**	**22000**	**57000**	**56000**	**190000**		**7700**	**170000**		**39000**	**39000**	**2900000**	**48000**	**54000**	**280000**		**10000**		**140000**	**140000**
	Lead	ug/L	Tier 1	**5**	**5.5**	0.69 B	0.62 B	0.58 B		0.52 B	2.1		0.15 B	0.15 B	**45**	0.52 B	**6.3**	**9**		<0.044 U		1.2	1.4
	Manganese	ug/L	Tier 1	**1600**	**1600**	**15000**	**15000**	**23000**		**11000**	**28000**		**6500**	**6300**	**18000**	**3800**	**2200**	**18000**		**1000**		**3400**	**3400**
	Nickel	ug/L	Tier 1	8.3	8.6	49	53	**120**		13	1.2		0.68 B	0.69 B	**13000**	1.2	6	2.4		0.12 B		14	15
	Vanadium	ug/L	Tier 1	4.2	**4.5**	**5.8**	**5.8**	**9.2**		1.8	1.2		3.3	3.4	**200**	2.4	**4.5**	**14**		<0.41 U		**20**	**20**
	Zinc	ug/L	Tier 1	17	17	6.7 B	10	7.4 B		25	14		<2.1 U	<2.1 U	**5700**	22	21	400		<2.1 U		9.6 B	10
	Physical Property																						
	Nitrogen, Ammonia	mg/L	Tier 1	<0.50 U	<0.50 U	1.3	1.1	2.1		0.51 B	1.3		1.8	1.9		1.1	1.1	**19**		0.61 B		**14**	**14**
	Sulfate	mg/L	Tier 1		88	**300**	**300**	**870**		210	**920**		<0.51 U	<0.51 U		130	22	**860**		10		3.3 B	3.2 B
	VOC																						
	Benzene	ug/L	Tier 1														0.35 J					**10**	**10**
	Ethylbenzene	ug/l	Tier 1														<0.40 U					**86**	**88**
	Xylenes, m + p	ug/L	Tier 1														1.1 J					**670**	**700**
	xylenes, o	ug/L	Tier 1														1.9					**610**	**630**

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Table 5-2
2006-2007 Groundwater Results - Exceedances

Event Date	Parameter	Units	Data Level	MW-6	MW-601	MW-602	MW-603	MW-604	MW-604	MW-605	MW-606	MW-606	MW-7	MW-9	P-602	P-602	P-604	P-605	PW-1	PW-1	PW-2	PW-4	PW-4	Residential Commercial Drinking Water Criteria	Residential Commercial Code
				MW-6	MW-601	MW-602	MW-603	MW-604	Dup	MW-605	MW-606	Dup	MW-7	MW-9	P-602	Dup	P-604	P-605	PW-1	Dup	PW-2	PW-4	Dup		
6/22/06	**Metal**																								
	Aluminum, total	ug/L	Tier 1	**88.7**									**72200**	7.9					**82.2**	**80.4**	15.6	**161**	**160**	**50**	V
	Arsenic	ug/L	Tier 1																					**10**	EPA 2006
	Arsenic, total	ug/L	Tier 1	3.3									<12 U	7.6					1.4	1.4	0.3	**102**	**98.2**	**10**	EPA 2006
	Beryllium	ug/L	Tier 1																					**4**	A
	Beryllium, total	ug/L	Tier 1	**12.6**									**14.5**	**5.6**					**8.3**	**8**	**11**	**20.6**	**20.1**	**4**	A
	Cadmium, total	ug/L	Tier 1										4.1	<0.057 U					<0.057 U		1.5	<0.057 U	<0.057 U	**5**	A
	Chromium, total	ug/L	Tier 1	3.2									1.6	<0.3 U					3.2	1.9	0.43	4.3	4.1	**100**	A
	Cobalt, total	ug/L	Tier 1	4.9									**451**	0.8					0.75	0.73	19.1	0.49	0.47	**40**	
	Copper, total	ug/L	Tier 1	2.1									484	0.28					0.9	0.61	2.3	0.12	0.11	**1000**	E
	Iron	ug/L	Tier 1																					**300**	E
	Iron, total	ug/L	Tier 1	**214000**									**153000**	**9470**					**12200**	**12100**	**335**	**82800**	**80600**	**300**	E
	Lithium, total	ug/L	Tier 1	6									67.3	0.54					0.1	0.083	8.8	0.22	0.12	**170**	
	Manganese	ug/L	Tier 1																					**50**	E
	Manganese, total	ug/L	Tier 1	**10900**									**18500**	**367**					**2670**	**2610**	**382**	**5560**	**5440**	**50**	E
	Nickel, total	ug/L	Tier 1	23.1									**1170**	3.6					1.4	0.83	58.1	1	0.96	**100**	A
	Zinc, total	ug/L	Tier 1	42									752	2.5					3.7	3.7	33.7	1.8	2	**2400**	
	Physical Property																								
	Sulfate	mg/L	Tier 1	**650**									**1300**	20					48	43	180	1.8 B	1.8 B	**250**	E
	VOC																								
	Benzene	ug/L	Tier 1	1									<0.14 U	<0.14 U					<0.14 U	<0.14 U	<0.14 U	0.15 J	0.16 J	**5**	A
	Ethylbenzene	ug/l	Tier 1	<0.40 U									<0.40 U	<0.40 U					<0.40 U	<0.40 U	<0.40 U	<0.40 U	<0.40 U	**74**	E
	Xylenes, m + p	ug/L	Tier 1	0.74 J									<0.74 U	<0.74 U					<0.74 U	<0.74 U	<0.74 U	<0.74 U	<0.74 U	**280**	E
	xylenes, o	ug/L	Tier 1	0.83 J									<0.36 U	<0.36 U					<0.36 U	<0.36 U	<0.36 U	<0.36 U	<0.36 U	**280**	E
11/2/06	**Metal**																								
	Aluminum	ug/L	Tier 1		**58**	9.0 B	17 B	32 B		11 B	9.9 B			7.0 B	9.7 B	11 B	11 B	13 B	**130**	**130**	22 B	**230**		**50**	V
	Arsenic	ug/L	Tier 1		**26**	1.1	3.3	2.9		1.1	0.63 B			**29**	6.6	6.4	1.4	6.9	3.1	3.2	0.33 B	**93**		**10**	EPA 2006
	Beryllium	ug/L	Tier 1		0.12 B	<0.10 U	<0.10 U	<0.10 U		<0.10 U	<0.10 U			<0.10 U	<0.10 U	<0.10 U	<0.10 U	<0.10 U	<0.10 U	<0.10 U	<0.10 U	<0.10 U		**4**	A
	Cadmium	ug/L	Tier 1		<0.14 U	<0.14 U	<0.14 U	<0.14 U		<0.14 U	<0.14 U			<0.14 U	<0.14 U	<0.14 U	<0.14 U	<0.14 U	<0.14 U	<0.14 U	2.1	<0.14 U		**5**	A
	Chromium	ug/L	Tier 1		2.6	<0.32 U	<0.32 U	0.44 B		0.44 B	<0.32 U			<0.32 U	<0.32 U	<0.32 U	<0.32 U	<0.32 U	2.2	2.3	0.41 B	5.5		**100**	A
	Cobalt	ug/L	Tier 1		9.2	3.9	11	2.2		2.2	0.66 B			1.5	0.44 B	0.48 B	3.4	0.45 B	0.12 B	0.10 B	27	1.1		**40**	
	Copper	ug/L	Tier 1		1	0.32 B	<0.15 U	0.2 B		0.97 B	0.19 B			5.1	<0.15 U	<0.15 U	<0.15 U	<0.15 U	0.2 B	0.17 B	1.3	0.57 B		**1000**	E
	Iron	ug/L	Tier 1		**41000**	**5500**	**2600**	**9200**		100	**410**			**30000**	**2300**	**2400**	**1000**	**4800**	**17000**	**18000**	**580**	**81000**		**300**	E
	Lithium	ug/L	Tier 1		1	5.9	7.3	4.4		2.3	4			1.4	3.1	2.8	0.61	2.3	0.056	0.089 B	9.2	0.4		**170**	
	Manganese	ug/L	Tier 1		**7800**	**5000**	**1200**	**2800**		**4900**	**1100**			**1500**	**900**	**950**	**390**	**3500**	**2100**	**2100**	**810**	**6100**		**50**	E
	Nickel	ug/L	Tier 1		8.5	15	67	1.2		6.1	6.3			2.7	<0.32 U	<0.32 U	0.85 B	1.7	<0.32 U	<0.32 U	79	3.4		**100**	A
	Vanadium	ug/L	Tier 1		**5**	0.32 B	0.53 B	1.1		0.67 B	0.61 B			0.76 B	0.49 B	0.51 B	0.61 B	0.89 B	**5.2**	**5.3**	0.49 B	**11**		**4.5**	
	Zinc	ug/L	Tier 1		12	6.2 B	4.7 B	5.4 B		5.4 B	5.4 B			7.8 B	4.9 B	4.4 B	4.8 B	3.7 B	5.3 B	5 B	50	5.2 B		**2400**	
	Physical Property																								
	Nitrogen, Ammonia	mg/L	Tier 1		6.9	<0.20 U	<0.20 U	0.46 B		0.34 B	<0.20 U			0.33 B	0.33 B	0.33 B	<0.20 U	0.32 B	0.89	0.95	<0.20 U	4.9		**10**	N
	Sulfate	mg/L	Tier 1		15	34	16	2.8 B		11	25			51	2.4 B	2.5 B	9.6	9.1	19	19	160	3.7 B		**250**	E
	VOC																								
	Benzene	ug/L	Tier 1		<0.41 U	<0.41 U	<0.41 U	<0.41 U		<0.41 U	<0.41 U			<0.41 U	<0.41 U	<0.41 U	<0.41 U	<0.41 U	<0.41 U	<0.41 U	<0.41 U	<0.41 U		**5**	A
	Ethylbenzene	ug/l	Tier 1		<0.54 U	<0.54 U	<0.54 U	<0.54 U		<0.54 U	<0.54 U			<0.54 U	<0.54 U	<0.54 U	<0.54 U	<0.54 U	<0.54 U	<0.54 U	<0.54 U	<0.54 U		**74**	E
	Xylenes	ug/l	Tier 1		<2.6 U	<2.6 U	<2.6 U	<2.6 U		<2.6 U	<2.6 U			<2.6 U	<2.6 U	<2.6 U	<2.6 U	<2.6 U	<2.6 U	<2.6 U	<2.6 U	<2.6 U		**280**	E
3/5/07	**Metal**																								
	Aluminum	ug/L	Tier 1		45 B	<6.3 U	18 B	8.4 B		<6.3 U	<6.3 U	<6.3 U			11 B	<6.3 U	<6.3 U	<6.3 U	**100**	**100**	<6.3 U	**220**		**50**	V
	Aluminum, total	ug/L	Tier 1																		**700**			**50**	V
	Arsenic	ug/L	Tier 1		**24**	1.4	3.7	2.8		1.6	0.51 B	0.48 B			7.6	7.4	0.88 B	6.6	2	2	0.30 B	**25**		**10**	EPA 2006
	Arsenic, total	ug/L	Tier 1																		2.2			**10**	EPA 2006
	Cadmium	ug/L	Tier 1		<0.12 U	<0.12 U	<0.12 U	<0.12 U		<0.12 U	<0.12 U	<0.12 U			0.16 B	<0.12 U	<0.12 U	<0.12 U	<0.12 U	<0.12 U	1.4	<0.12 U		**5**	A
	Chromium	ug/L	Tier 1		2.6	<0.32 U	<0.32 U	0.44 B		<0.32 U	<0.32 U	<0.32 U			0.50 B	<0.32 U	<0.32 U	<0.32 U	1.6	1.7	0.41 B	3.4		**100**	A

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Table 5-2
2006-2007 Groundwater Results - Exceedances

Event Date	Parameter	Units	Data Level	MW-6	MW-601	MW-602	MW-603	MW-604	MW-604	MW-605	MW-606	MW-606	MW-7	MW-9	P-602	P-602	P-604	P-605	PW-1	PW-1	PW-2	PW-4	PW-4	Residential Commercial Drinking Water Criteria	Residential Commercial Code
	Cobalt	ug/L	Tier 1		7.8	0.20 B	16	0.95 B		1.9	0.45 B	0.45 B			0.36 B	0.26 B	1.8	0.39 B	0.050 B	0.050 B	12	15		**40**	
	Copper	ug/L	Tier 1		<0.59 U	<0.59 U	<0.59 U	<0.59 U		<0.59 U	<0.59 U	<0.59 U			<0.59 U	<0.59 U	<0.59 U	<0.59 U	<0.59 U	<0.59 U	1.7	<0.59 U		**1000**	E
	Iron	ug/L	Tier 1		**63000**	**8900**	**3900**	**14000**		**990**	**350**	**370**			**4400**	**4500**	**1600**	**4700**	**16000**	**16000**	200	**74000**		**300**	E
	Iron, total	ug/L	Tier 1																		**1800**			**300**	E
	Lead, total	ug/L	Tier 1																		0.47 B			**4**	L
	Lithium	ug/L	Tier 1		0.99	7	9.2	3.5		2.6	4.4	4.2			3.3	3.5	0.52	2.5	8.3	<0.050 U	8.8	0.49		**170**	
	Manganese	ug/L	Tier 1		**6900**	**4900**	**1700**	**2300**		**4400**	**790**	**790**			**1400**	**1400**	**80**	**3300**	**2000**	**2000**	**1700**	**6100**		**50**	E
	Manganese, total	ug/L	Tier 1																		**2100**			**50**	E
	Molybdenum, total	ug/L	Tier 1																		0.74 B			**73**	
	Nickel	ug/L	Tier 1		7.2	0.82 B	**100**	0.70 B		4.2	3.4	3.5			0.50 B	0.38 B	1.2	0.67 B	0.36 B	0.39 B	53	16		**100**	A
	Vanadium	ug/L	Tier 1		**4.8**	0.32 B	0.46 B	0.82 B		0.42 B	0.37 B	0.29 B			0.39 B	0.34 B	0.39 B	0.69 B	4.2	4.3	0.40 B	**6.4**		**4.5**	
	Vanadium, total	ug/L	Tier 1																		2.5			**4.5**	
	Zinc	ug/L	Tier 1		6.7 B	<0.98 U	<0.98 U	<0.98 U		<0.98 U	<0.98 U	<0.98 U			<0.98 U	<0.98 U	<0.98 U	<0.98 U	2.2 B	2.2 B	27	11		**2400**	
	PCB's																								
	Aroclor-1242	ug/L	Tier 1		<0.11 U														<0.12 U	<0.12 U		<0.15 U		**0.5**	A
	Total PCBs	ug/L	Tier 1		<0.11 U														<0.12 U	<0.12 U		<0.15 U		**0.5**	A
	Physical Property																								
	Nitrogen, Ammonia	mg/L	Tier 1		8.7	<0.50 U	<0.50 U	<0.50 U		<0.50 U	<0.50 U	<0.50 U			<0.50 U	<0.50 U	<0.50 U	<0.50 U	0.86 B	0.86 B	<0.50 U	4.4		**10**	N
	Sulfate	mg/L	Tier 1		9.3	35	26	1.8 B		11	27	27			2.1 B	2.1 B	8.4	8.8	23	20	170	48		**250**	E
	VOC																								
	Xylenes	ug/l	Tier 1		<2.6 U	<2.6 U	<2.6 U	<2.6 U		<2.6 U	<2.6 U	<2.6 U			<2.6 U	<2.6 U	<2.6 U	<2.6 U	<2.6 U	<2.6 U	<2.6 U	<2.6 U		**280**	E
6/5/07	**Metal**																								
	Aluminum	ug/L	Tier 1		**5500**			**66**	50 B					20 B			**630**		**410**		**4600**	**220**		**50**	V
	Antimony	ug/L	Tier 1		0.95 B			<0.10 U	<0.10 U					0.15 B			0.11 B		<0.10 U		0.58 B	0.17 B		**6**	A
	Arsenic	ug/L	Tier 1		**67**			2.1	2.1					5.4			0.74 B		1.8		**12**	**63**		**10**	EPA 2006
	Beryllium	ug/L	Tier 1		0.30 B			<0.070 U	<0.070 U					<0.070 U			0.65 B		<0.070 U		0.17 B	<0.070 U		**4**	A
	Cadmium	ug/L	Tier 1		0.22 B			<0.097 U	<0.097 U					<0.097 U			<0.097 U		0.16 B		4.8	0.20 B		**5**	A
	Chromium	ug/L	Tier 1		17			<0.43 U	<0.43 U					<0.43 U			2.1		2		12	4.6		**100**	A
	Cobalt	ug/L	Tier 1		13			1.1	1.1					4.6			2.3		0.54 B		**150**	7.7		**40**	
	Copper	ug/L	Tier 1		32			1.4	1.2					3.4			200		2.1		23	13		**1000**	E
	Iron	ug/L	Tier 1		**26000**			**8200**	**8800**					**4900**			**1400**		**15000**		**13000**	**99000**		**300**	E
	Lead	ug/L	Tier 1		**11**			0.13 B	0.17 B					0.53 B			**6.3**		2.8		3.3	3.7		**4**	L
	Manganese	ug/L	Tier 1		**7700**			**1600**	**1600**					**670**			37		**1900**		**4200**	**8100**		**50**	E
	Nickel	ug/L	Tier 1		32			1.4	1.3					15			3.9		0.68 B		**320**	3		**100**	A
	Vanadium	ug/L	Tier 1		**18**			<0.41 U	<0.41 U					0.52 B			2.4		4.4		**13**	**10**		**4.5**	
	Zinc	ug/L	Tier 1		45			3.2 B	3.5 B					8.1 B			72		2.8 B		120	7.6 B		**2400**	
	Physical Property																								
	Nitrogen, Ammonia	mg/L	Tier 1					<0.50 U	<0.50 U					<0.50 U			<0.50 U		0.67 B		<0.50 U	2.9		**10**	N
	Sulfate	mg/L	Tier 1					11	11				88	56			11		21		170	52		**250**	E
	VOC																								
	Benzene	ug/L	Tier 1																					**5**	A
	Ethylbenzene	ug/l	Tier 1																					**74**	E
	Xylenes, m + p	ug/L	Tier 1																					**280**	E
	xylenes, o	ug/L	Tier 1																					**280**	E

mg/l = milligram/liter
ug/L = micrograms/liter
VOC = volatile organic compound
A = Criterion is the state of Michigan drinking water standard established pursuant to Section 5 of 1976 PA 399, MCL 325.1005.
B = Inorganic - The analyte has been detected between the method detection limit and the reporting limit.
Dup = duplicate
E = Criterion is the aesthetic drinking water value, as required by Section 20120a(5) of the Nat Res & EPA Act, 1994 PA 451, as amended.
EQB = equipment blank
FB = field blank
L = Criteria for lead are derived using a biologically based model, as allowed for under Section 20120a(10) of the NREPA, and are not calculated using the algorithms and assumptions specified in pathway-specified rules.
J = Concentration detected equal to or greater than the method detection limit but less than the reporting limit.
N = The concentrations of all potential sources of nitrate-nitrogen (e.g., ammonia-N, nitrite-N, nitrate-N) in groundwater that is used as a source of drinking water shall not, when added together, exceed the nitrate drinking water criterion of 10,000 ug/L. Where leaching to groundwater is a relevant pathway, soil concentrations of all potential sources of nitrate-nitrogen shall not, when added together, exceed the nitrate drinking water protection criterion of 2.0E+5 ug/kg.
PCB = polychlorinated byphenyls
U = The analyte was not detected at or above the reporting limit.
V = Criterion is the aesthetic drinking water value as required by Section 20120(a)(5) of the NREPA. Concentrations up to 200 ug/L may be acceptable, and still allow for drinking water use, as part of a site-specific cleanup under Section 20120a(2) of the NREPA.
< = All the analyte was not detected at or above the reporting limit
Residential Commercial I drinking water criteria source = MDEQ Part 201 generic cleanup criteria and screening levels
Results were compared to the MDEQ res/com I DW criteria. Exceedances are highlighted.

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Checked by: JSL

Table 5-3
2006-2007 Surface Water Results - Exceedance

EventDate	Parameter	Units	Data Level	Location ID	EBR-001	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	HMP-001	HMP-001	HMP-001	HMP-001	HMP-004	HMP-005	HMP-005	HMP-006	HMP-007	HMP-009	HPL-003	HPL-003	HPL-003	HPL-003	HPL-003	HPL-003	HPL-003	HPL-004
				Field ID	EBRS-001	FBK-001	FBK-002	FBKS	FBKS-001	FBKS-001	FBKS-002	FBKS-003	FBKS-004	DUPS-004	HMP-001E	HMPS-001E	HMPS-001H	HMP-004	DUP-002	HMP-005	HMP-006	HMP-007	HMP-009	HPL-003 3'	HPL-003 3	HPL-003 15'	HPL-003 60'	HPL-003 120'	HPL-003 175'	DUP-001	HPL-004 3'
				Sample Depth (ft)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3	3	15	60	120	175	NA	3
8/3/2006	Metal																														
	Copper, total	ug/L	Tier 1					**1.7**																							
	Lead, total	ug/L	Tier 1					**0.26**																							
	Manganese, total	ug/L	Tier 1																												
	Manganese, total	ug/L	Tier 1																												
	Mercury - low level	ng/L	Tier 1		1				<0.169 U	0.213 B						0.557	0.521														
	Nickel	ug/L	Tier 1														**187**														
	Silver, total	ug/L	Tier 1		<0.14			<0.14		<0.14																					
	Zinc, total	ug/L	Tier 1					**5**																							
10/2/2006	Metal																														
	Copper, total	ug/L	Tier 1						**2**																						
	Lead, total	ug/L	Tier 1						**0.2**																						
	Mercury - low level	ng/L	Tier 1		1.23				<0.169 U							0.290 B	0.296 B														
	Nickel, total	ug/L	Tier 1						**0.24**																						
	Nickel, total	ug/L	Tier 1														**214**														
	Zinc, total	ug/L	Tier 1						**3.3**																						
	Zinc, total	ug/L	Tier 1																												
2/7/2007	Metal																														
	Manganese	ug/L	Tier 1																												
	Manganese	ug/L	Tier 1																												
	Mercury - low level	ng/L	Tier 1		0.939				<0.183 U		0.27	0.208	<0.183 U	<0.183 U		<0.183 U															
	Nickel	ug/L	Tier 1																												
4/2/2007	Metal																														
	Manganese	ug/L	Tier 1																												
	Mercury - low level	ng/L	Tier 1		**3.14**										0.499 B																
	Zinc	ug/L	Tier 1																												
5/30/2007	Metal																														
	Copper	ug/L	Tier 1															**25**													
	Copper	ug/L	Tier 1																		**2.3**										
	Lead	ug/L	Tier 1																		**1.3**										
	Manganese	ug/L	Tier 1																			**1700**									
	Mercury - low level	ng/L	Tier 1			0.247	0.235											**16.6**	0.396 B	0.467 B	**36.8**	**1.86**	**1.36**	0.366 B		0.353 B	0.322 B	0.499 B	0.459 B	0.468 B	0.489 B
	Nickel	ug/L	Tier 1																												
	Nickel	ug/L	Tier 1																									**210**	**280**		

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Table 5-3
2006-2007 Surface Water Results - Exceedance

EventDate	Parameter	Units	Data Level	Location ID	HPL-004	HPL-004	HPL-004	HPL-004	HPL-004	HTP-001	HTP-002	HTP-002	LKL-001	LKL-001	LKL-001	LKL-001	LKL-002	LKL-002	LKL-002	MBR-001	MBR-001	MER-001	MER-002	MER-002	MER-002	MER-002	MER-003	WBR-001	WBR-002	WBR-003
				Field ID	HPL-004 15'	HPL-004 60'	HPL-004 120'	HPL-004 175'	HPL-004 175'	HTPS-001E	DUPS--003	HTPS-002E	DUPS--002	DUPS-003	LKLS-001E	LKLS-001H	LKLS-002E	LKLS-002E	LKLS-002H	DUPS-001	MBRS-001	MERS-001	DUP--002	DUPS--001	DUPS-002	MERS-002	MERS-003	WBRS-001	WBRS-002	DUP001
				Sample Depth (ft)	15	60	120	175	175	NA	NA	NA	NA	NA	NA	NA	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
8/3/2006	Metal																													
	Copper, total	ug/L	Tier 1																											
	Lead, total	ug/L	Tier 1																											
	Manganese, total	ug/L	Tier 1																**2400**											
	Manganese, total	ug/L	Tier 1													**2140**														
	Mercury - low level	ng/L	Tier 1							**1.56**		1.06			0.689	**1.85**		0.775	**2.21**		**1.32**	**1.55**		**3.16**		**3**	**1.51**	**11.7**	**3.43**	
	Nickel	ug/L	Tier 1																											
	Silver, total	ug/L	Tier 1							<0.14		**0.15**			<0.14	<0.14		0.048 J	<0.14		<0.14	<0.14		<0.14		0.048 J	<0.14	<0.14	<0.14	
	Zinc, total	ug/L	Tier 1																											
10/2/2006	Metal																													
	Copper, total	ug/L	Tier 1																											
	Lead, total	ug/L	Tier 1																											
	Mercury - low level	ng/L	Tier 1							**1.42**		0.812	0.681		0.7			0.633		0.807	0.724	1.04				1.15	1.27	**3.8**	0.947	
	Nickel, total	ug/L	Tier 1																											
	Nickel, total	ug/L	Tier 1																											
	Zinc, total	ug/L	Tier 1																											
	Zinc, total	ug/L	Tier 1																									**81**		
2/7/2007	Metal																													
	Manganese	ug/L	Tier 1																											
	Manganese	ug/L	Tier 1																											
	Mercury - low level	ng/L	Tier 1									0.768		0.491 B	0.507			0.470 B		1	0.881	**1.59**			**1.47**	**1.5**	**1.6**	**5.25**	1.12	
	Nickel	ug/L	Tier 1																							<0.32 U	**64**			
4/2/2007	Metal																													
	Manganese	ug/L	Tier 1																											
	Mercury - low level	ng/L	Tier 1							**2.07**	1.23	1.2			0.99			1.09			**3.96**	**6.09**	**5.86**			**6.09**	**5.79**	**8.72**	**3.33**	**2.89**
	Zinc	ug/L	Tier 1																											
5/30/2007	Metal																													
	Copper	ug/L	Tier 1																											
	Copper	ug/L	Tier 1																											
	Lead	ug/L	Tier 1																											
	Manganese	ug/L	Tier 1																											
	Mercury - low level	ng/L	Tier 1		0.626	0.546	0.344 B	0.445 B																						
	Nickel	ug/L	Tier 1					**280**																						
	Nickel	ug/L	Tier 1				**210**																							

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Checked by: JSL

Table 5-3
2006-2007 Surface Water Results - Exceedance

EventDate	Parameter	Units	Data Level	Location ID	WBR-003	WLD-001	WLD-001SE	WLD-002	WLD-002	WLD-003	WLD-003	WLD-003	WLD-003	HNV	WV	HCV	FCV	AMV	FAV
				Field ID	WBRS-003	WLDS-001	WLDS-001SE	WLDS-002	WLDS-002E	DUPS001	DUPS--004	WLDS-003	WLDS-003E						
				Sample Depth (ft)	NA	NA	NA	NA	NA	NA	NA	NA	NA						
8/3/2006	Metal																		
	Copper, total	ug/L	Tier 1											38000			0.015	0.012	0.023
	Lead, total	ug/L	Tier 1											190			0.002	0.016	0.031
	Manganese, total	ug/L	Tier 1											59000			827	1784	3567
	Manganese, total	ug/L	Tier 1											59000			765	1651	3303
	Mercury - low level	ng/L	Tier 1		**2.23**	0.738			0.69	0.741			0.543	1.8	1.3		770	1400	2800
	Nickel	ug/L	Tier 1											210000			117	1051	2102
	Silver, total	ug/L	Tier 1		<0.14	<0.14				<0.14			<0.14	11000			0.060	0.54	1.1
	Zinc, total	ug/L	Tier 1											16000			0.21	0.20	0.41
10/2/2006	Metal																		
	Copper, total	ug/L	Tier 1											38000			0.017	0.014	0.027
	Lead, total	ug/L	Tier 1											190			0.002	0.019	0.038
	Mercury - low level	ng/L	Tier 1		0.747	0.338 B			0.989				0.638	1.8	1.3		770	1400	2800
	Nickel, total	ug/L	Tier 1											210000			0.11	0.95	1.91
	Nickel, total	ug/L	Tier 1											210000			109	985	1971
	Zinc, total	ug/L	Tier 1											16000			0.24	0.24	0.47
	Zinc, total	ug/L	Tier 1											16000			37	37	73
2/7/2007	Metal																		
	Manganese	ug/L	Tier 1						270				**850**	59000			709	1530	3060
	Manganese	ug/L	Tier 1			**4600**								59000			2265	4887	9773
	Mercury - low level	ng/L	Tier 1		**1.63**	0.537			1.21				0.306 B	1.8	1.3		770	1400	2800
	Nickel	ug/L	Tier 1											210000			29	265	530
4/2/2007	Metal																		
	Manganese	ug/L	Tier 1				**1700**							59000			1250	2697	5393.7
	Mercury - low level	ng/L	Tier 1		**2.96**		**1.7**	**1.61**			1.13	1.04		1.8	1.3		770	1400	2800
	Zinc	ug/L	Tier 1				**360**							16000			78	77	154
5/30/2007	Metal																		
	Copper	ug/L	Tier 1											38000			10	16	32
	Copper	ug/L	Tier 1											38000			1.6	2.0	3.9
	Lead	ug/L	Tier 1											190			1.06	9.4	19
	Manganese	ug/L	Tier 1											59000			1340	2890	5780
	Mercury - low level	ng/L	Tier 1											1.8	1.3		770	1400	2800
	Nickel	ug/L	Tier 1											210000			113	1017	2033
	Nickel	ug/L	Tier 1											210000			109	982	1964

Notes:

AMV - Aquatic maximum value
B = inorganic - The analyte has been detected between the method detection limit and the reporting limit
dup = duplicate
EQB = equipment blank
FAV - Final acute value
FCV - Final chronic value
HCV - Human cancer value
HNV - Human noncancer value
J = Concentration was detected equal to or greater than the method detection limit but less than the reporting limit
< = All the analyte was not detected at or above the reporting limit
ng/L = nanograms/liter
ug/l = micrograms/liter
U = The analyte was not detected at or above the reporting limit
WV - Wildlife value

Prepared by: ECB/SVF'
Checked by: JSL

Table 5-4
2006-2007 Sediment Results-Exceedances

Event Date	Parameter	Units	DataLevel	GSI Protection	GSI Protection Code	EBR-001	HMP-001	HMP-004	HMP-005	HMP-005	HMP-006	HMP-007	HMP-009	HPL-004	HPL-004	HTP-001	HTP-002	LKL-001	LKL-002	MBR-001	MER-001	MER-002	MER-002	MER-003	WBR-001	WBR-002	WBR-003	WLD-001	WLD-003	WLD-003
						EBRD-001	HMPD-001	HMPD-004	DUPD-002	HMPD-005	HMPD-006	HMPD-007	HMPD-009	PSED-1	PSED-1D	HTPD-001	HTPD-002	LKLD-001	LKLD-002	MBRD-001	MERD-001	DUPD-001	MERD-002	MERD-003	WBRD-001	WBRD-002	WBRD-003	WLDD-001	DUPD-001	WLDD-003
3-Aug-06	**Metal**																													
	Arsenic	mg/kg	Tier 1	70	X	56.9	**165**									8.8	19.4	16	33.4	16.8	20.9	9.6	7.7	10.2	2	11.2	8.6	11.5	4.1	4.6
	Cobalt	mg/kg	Tier 1	2		**10.7**	**74.6**									**3.3**	**3.7**	**15.4**	**10.8**	**8**	**5.9**	**3.9**	**4.8**	**3**	1.1	**4**	**4.8**	**3.1**	**3.8**	**4.6**
	Copper	mg/kg	Tier 1	29	G	27.5	**491**									11.5	4.8	**42.9**	23.9	**33.6**	12.5	24.3	18.1	5.2	3.4	9.1	16.2	26.5	9.8	11.2
	Lithium	mg/kg	Tier 1	1.9		**5.6**	**22.8**									**4.9**	**5.4**	**29.5**	**20.7**	**3.9**	**11.2**	**5**	**9.6**	**8.6**	**2.4**	**6.2**	**11.6**	1.5	**6.4**	**7.2**
	Manganese	mg/kg	Tier 1	21	G,X	**1030**	**610**									**264**	**367**	**1190**	**1260**	**1570**	**321**	**385**	**433**	**246**	**59.6**	**164**	**186**	**2190**	**352**	**397**
	Mercury	mg/kg	Tier 1	0.05	M	**0.3**	0.02 J									**0.059**	**0.14**	**0.34**	**0.41**	<0.022	<0.019	<0.021	<0.022	<0.019	0.03	<0.021	<0.024	<0.12	**0.13**	**0.13**
	Molybdenum	mg/kg	Tier 1	16	X	5.2	**107**									3.8	4.9	7.1	10.8	1.7	0.33	2.9	1.1	0.52	0.29	0.84	1.1	3.6	1.1	1.2
	Nickel	mg/kg	Tier 1	30	G	**46.4**	**615**									11.2	24.4	**59.5**	**54.1**	14.1	21.7	28.9	16.5	9.4	4.7	13.7	19.8	11.3	9.2	10.3
	Selenium	mg/kg	Tier 1	0.4		**3.6**	**1.5**									<0.86	<0.66	<6	<7.7	<0.54	<0.54	<0.58	<0.51	<0.58	<0.98	<0.46	<0.5	<4.9	<1.9	<2.2
	Silver	mg/kg	Tier 1	0.1	M	**5.8**	**3.2**									**0.99**	**0.28**	**2.4**	**0.97**	<0.22 P	0.18 J	<0.23 P	<0.2 P	0.22 J	**0.33**	**0.11**	**0.1**	1 J	**2.2**	**0.76**
	Zinc	mg/kg	Tier 1	65	G	**103**	**230**									10.9	9.6	46.4 J	46.1 J	15.4	46	21.7	15.8	19	12.7	17.3	40.6	**73.8**	53.3	60.6
30-May-07	**Metal**																													
	Cobalt	mg/kg	Tier 1	2				**3.8**	**11**	**9.9**	1.7 B	**4.7**	**10**	**26**	**26**															
	Copper	mg/kg	Tier 1	29	G			**92**	**29**	18	10 B	18 B	**52**	**58**	**59**															
	Lithium	mg/kg	Tier 1	1.9				**2.4**	**5**	**3.8**	**12**	**5.5**	**4.7**	**22**	**21**															
	Manganese	mg/kg	Tier 1	21	G,X			**30**	**260**	**240**	**52**	**150**	**640**	**440**	**440**															
	Mercury	mg/kg	Tier 1	0.05	M			**0.093**	0.0074 B	0.0056 B	**0.11**	0.039	0.032	0.012 B	0.010 B															
	Molybdenum	mg/kg	Tier 1	16	X			11 B	0.92 B	0.86 B	<0.53 U	<0.69 U	3.3 B	**24**	**24**															
	Nickel	mg/kg	Tier 1	30	G			**130**	23	22	12 B	10 B	**71**	**220**	**220**															
	Selenium	mg/kg	Tier 1	0.4				**1.1**	0.23	0.14 B	**0.58**	**0.88**	**0.53**	<0.046 U	<0.045 U															
	Silver	mg/kg	Tier 1	0.1	M			**0.24**	**0.2**	**0.11**	**0.11**	<0.037 U	**0.18**	**1.2**	**1.1**															
	Zinc	mg/kg	Tier 1	65	G			21	26	22	39	27	15	**97**	**92**															

Notes:

< = All the analyte was not detected at or above the reporting limit

mg/kg = milligrams/kilograms

B = Inorganic - The analyte has been detected between the method detection limit and the reporting limit.

P = Analyte not detected above the method detection limit. The detection limit is above the criteria due to sample dilution

U = The analyte was not detected at or above the reporting limit

M = Calculated criterion is below the analytical target detection limit, therefore, the criterion defaults to the target detection limit.

Dup = duplicate

G = GSI criterion depends on the pH or water hardness, or both, ot the receiving surface water. The final chronic value for the protection of aquatic life shall be calculated based on the pH or hardness of the receiving surface water.

X = The GSI criterion shown in the generic cleanup criteria tables is not protective for surface water that is used as a drinking water source. For a groundwater discharge to the Great Lakes and their connecting waters or discharge in close proximity to a water supply intake in inland surface waters, the generic GSI criterion shall be the surface water human drinking water value (HDV) listed in the table in this footnote, except for those HDV indicated with an asterisk.

Results were compared to the MDEQ drinking water protection criteria. Exceedances are highlighted.

Prepared by: ECB/SVF
Checked by: JSL

Table 5-5

Groundwater Results Exceedances Compared to GSI

Event Date	Parameter	Units	Data Level	Location	Equipment Blank	Equipment Blank	Field Blank	Field Blank	Field Blank	HW-1	HW-1A	HW-2	HW-6	HW-6	HW-6A	HYG-1	KMW-3	KMW-3	KMW-4	KMW-7	KMW-7	KMW-9
				Field ID	EQB-001	EQB-002	FB-001	FB-002	Field Blank	HW-1	HW-1A	HW-2	HW-6	Dup	HW-6A	HYG-1	KMW-3	Dup	KMW-4	KMW-7	Dup	KMW-9
6/22/06	**Metal**																					
	Barium, total	ug/L	Tier 1																			
	Beryllium	ug/L	Tier 1		**41**																	
	Beryllium, total	ug/L	Tier 1			**37.6**																
	Manganese, total	ug/L	Tier 1																			
11/2/2006	**Metal**																					
	Barium	ug/L	Tier 1														110	110	65	60	60	130
	Cobalt	ug/L	Tier 1														1.8	1.7	3.3	**120**	**120**	11
	Manganese	ug/L	Tier 1														**5700**	**5600**	**4900**	**21000**	**22000**	**8700**
	Mercury - Low Level - Dissolved	ng/L	Tier 1														0.46 B	0.5	0.6	0.29 B	<0.18 U	0.47 B
	Nickel	ug/L	Tier 1														0.66 B	0.69 B	4.7	**84**	**85**	13
	Vanadium	ug/L	Tier 1														0.66 B	0.65 B	0.45 B	4.8	4.9	1.8
3/5/07	**Metal**																					
	Barium	ug/L	Tier 1														74		51	57		65
	Cobalt	ug/L	Tier 1														1.5		2.5	**110**		6.3
	Manganese	ug/L	Tier 1														**4700**		**4500**	**21000**		**6600**
	Mercury - Low Level - Dissolved	ng/L	Tier 1														0.86		**1.32**	0.507		0.603
	Nickel	ug/L	Tier 1														0.83 B		3.6	**79**		12
	Vanadium	ug/L	Tier 1														0.75 B		0.57 B	4.6		2.2
	Zinc	ug/L	Tier 1														<0.98 U		<0.98 U	5.8 B		**180**
6/5/07	**Metal**																					
	Barium	ug/L	Tier 1						0.41 B	16	48	16	36	35	37	55	75	79	57	63		78
	Beryllium	ug/L	Tier 1						0.11 B	<0.070 U	<0.070 U	<0.070 U	<0.070 U	<0.070 U	<0.070 U	<0.070 U	0.11 B	0.090 B	0.090 B	0.26 B		0.080 B
	Cobalt	ug/L	Tier 1						<0.059 U	1.9	2.5	2	0.42 B	0.43 B	0.64 B	3.5	3.7	4	3.7	**130**		7.8
	Copper	ug/L	Tier 1						1.6	0.71 B	3.9	0.78 B	<0.12 U	<0.12 U	0.59 B	1.4	3.9	3.9	**9.7**	3.3		**14**
	Lead	ug/L	Tier 1						0.20 B	<0.044 U	0.55 B	0.15 B	<0.044 U	<0.044 U	<0.044 U	<0.044 U	1.2	1.2	1.6	0.58 B		0.52 B
	Manganese	ug/L	Tier 1						1	330	29	290	350	330	27	26	**4400**	**4700**	**4600**	**23000**		**11000**
	Mercury - low level	ng/L	Tier 1						0.212	0.639	1.01	**1.41**	0.257 B	0.378 B	0.578	0.994	0.613	0.84	**2.83**			0.515
	Nickel	ug/L	Tier 1						0.27 B	3.3	0.76 B	0.94 B	0.72 B	0.72 B	<0.075 U	0.71 B	3	3.1	8.2	**120**		13
	Vanadium	ug/L	Tier 1						<0.41 U	<0.41 U	<0.41 U	<0.41 U	<0.41 U	<0.41 U	<0.41 U	0.55 B	3.9	3.8	4	9.2		1.8
	Zinc	ug/L	Tier 1						2.8 B	4.0 B	<2.1 U	<2.1 U	<2.1 U	<2.1 U	<2.1 U	<2.1 U	9.0 B	4.4 B	12	7.4 B		25

Prepared By: ECB/SVF
Checked By: JSL

Table 5-5

Groundwater Results Exceedances Compared to GSI

Event Date	Parameter	Units	Data Level	Location	KMW-9P	KMW-9P	MW-11	MW-11	MW-12	MW-12	MW-604	MW-604	MW-605	P-604	P-605	GSI Criteria	GSI Criteria Code
				Field ID	KMW-9P	Dup	MW-11	Dup	MW-12	Dup	MW-604	Dup	MW-605	P-604	P-605		
6/22/06	**Metal**																
	Barium, total	ug/L	Tier 1				**582**	**583**								**210**	G,X
	Beryllium	ug/L	Tier 1						**4.8**							**0.41**	G
	Beryllium, total	ug/L	Tier 1				**2.6**	**2.6**								**0.41**	G
	Manganese, total	ug/L	Tier 1				**21200**	**26600**								**1050**	G,X
11/2/2006	**Metal**																
	Barium	ug/L	Tier 1		55		**490**		32	33	74		29	26	34	**210**	G,X
	Cobalt	ug/L	Tier 1		17		12		0.27 B	0.27 B	2.2		2.2	3.4	0.45 B	**100**	
	Manganese	ug/L	Tier 1		**27000**		**19000**		970	940	**2800**		**4900**	390	**3500**	**1050**	G,X
	Mercury - Low Level - Dissolved	ng/L	Tier 1		0.20 B		**1.55**		0.366 B	0.360 B	0.33 B		0.43 B	0.43 B	0.31 B	**1.3**	
	Nickel	ug/L	Tier 1		1.5		2.4		0.4 B	<0.32 U	1.2		6.1	0.85 B	1.7	**28.9**	G
	Vanadium	ug/L	Tier 1		1.2		**16**		1.2	0.97 B	1.1		0.67 B	0.61 B	0.89 B	**12**	
3/5/07	**Metal**																
	Barium	ug/L	Tier 1		42	44	**440**	**440**	30		39		33	12	31	**210**	G,X
	Cobalt	ug/L	Tier 1		13	14	9.4	9.6	0.24 B		0.95 B		1.9	1.8	0.39 B	**100**	
	Manganese	ug/L	Tier 1		**25000**	**25000**	**17000**	**21000**	890		**2300**		**4400**	80	**3300**	**1050**	G,X
	Mercury - Low Level - Dissolved	ng/L	Tier 1		0.698	0.651	1.07	1.04	0.708		0.496 B		0.72	**1.63**	0.474 B	**1.3**	
	Nickel	ug/L	Tier 1		1.7	2.1	2.4	2.3	0.63 B		0.70 B		4.2	1.2	0.67 B	**28.9**	G
	Vanadium	ug/L	Tier 1		1.2	1.4	**14**	**15**	0.80 B		0.82 B		0.42 B	0.39 B	0.69 B	**12**	
	Zinc	ug/L	Tier 1		50	51	6.9 B	8.2 B	11		<0.98 U		<0.98 U	<0.98 U	<0.98 U	**66**	G
6/5/07	**Metal**																
	Barium	ug/L	Tier 1		42		**420**		30		34	34		16		**210**	G,X
	Beryllium	ug/L	Tier 1		<0.070 U		**5**		<0.070 U		<0.070 U	<0.070 U		0.65 B		**0.41**	G
	Cobalt	ug/L	Tier 1		13		10		0.21 B		1.1	1.1		2.3		**100**	
	Copper	ug/L	Tier 1		2.8		**640**		<0.12 U		1.4	1.2		**200**		**5.0**	G
	Lead	ug/L	Tier 1		2.1		**9**		<0.044 U		0.13 B	0.17 B		**6.3**		**4.8**	G,X
	Manganese	ug/L	Tier 1		**28000**		**18000**		1000		**1600**	**1600**		37		**1050**	G,X
	Mercury - low level	ng/L	Tier 1		0.474 B		**3.22**		0.386 B		0.737	0.725		**3.27**		**1.3**	
	Nickel	ug/L	Tier 1		1.2		2.4		0.12 B		1.4	1.3		3.9		**28.9**	G
	Vanadium	ug/L	Tier 1		1.2		**14**		<0.41 U		<0.41 U	<0.41 U		2.4		**12**	
	Zinc	ug/L	Tier 1		14		**400**		<2.1 U		3.2 B	3.5 B		**72**		**66**	G

Notes:

GSI = Groundwater Surface Water Interface

ng/L = nanograms/liter

ug/L = micrograms/liter

B = Inorganic - The analyte has been detected between the method detection limit and the reporting limit.

G = GSI criterion depends on the pH or water hardness, or both, ot the receiving surface water. The final chronic value for the protection of aquatic life shall be calculated based on the pH or hardness of the receiving surface water.

U = The analyte was not detected at or above the reporting limit.

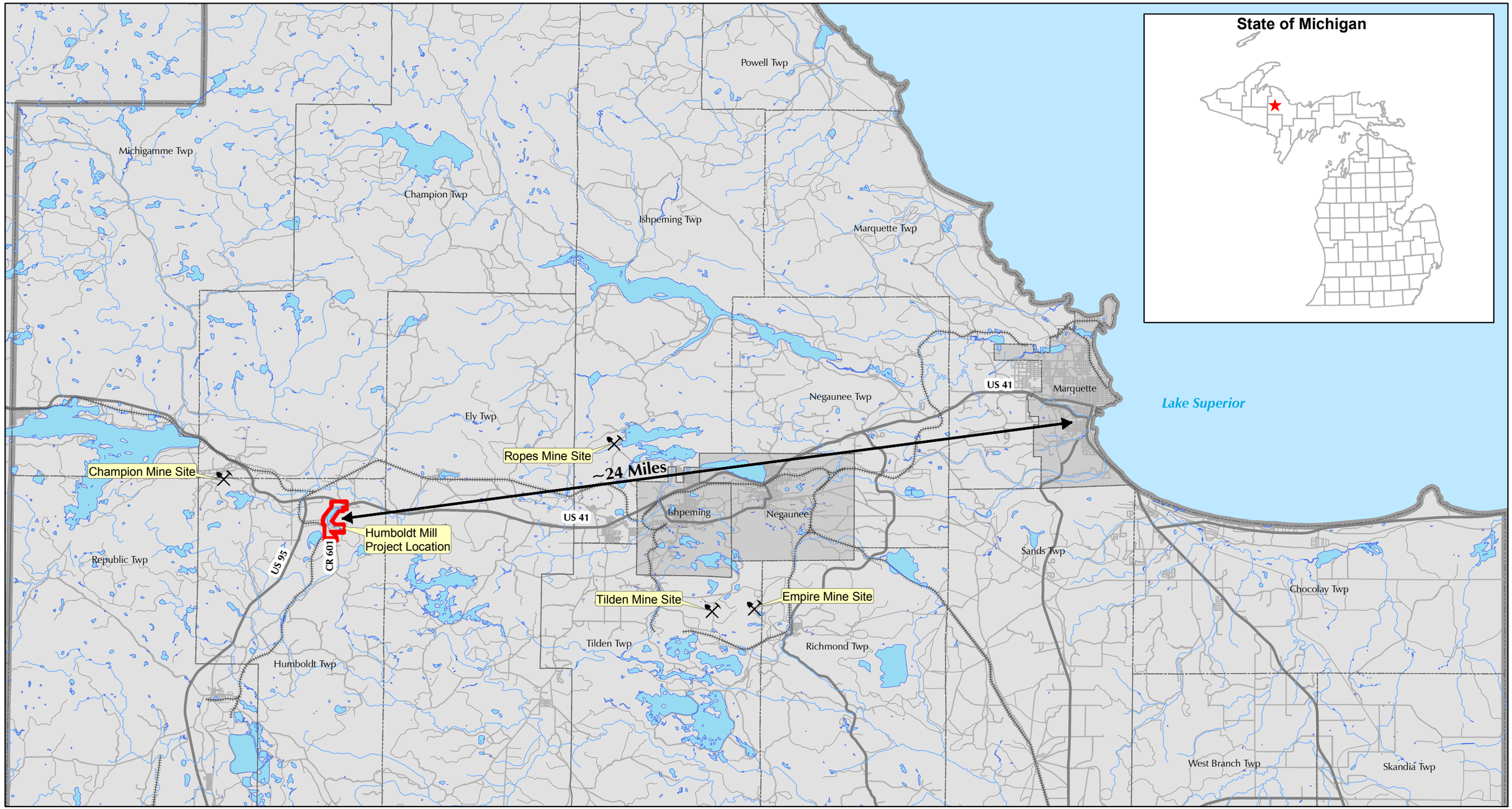
X = The GSI criterion shown in the generic cleanup criteria tables is not protective for surface water that is used as a drinking water source.

< = All the analyte was not detected at or above the reporting limit

Residential Commercial I drinking water criteria source = MDEQ Part 201 generic cleanup criteria and screening levels

Results were compared to the MDEQ GSI criteria. Exceedances are highlighted.

Figures



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
Foth Infrastructure & Environment, LLC

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

Kennecott Eagle Minerals

FIGURE 1-1

HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
PROJECT LOCATION

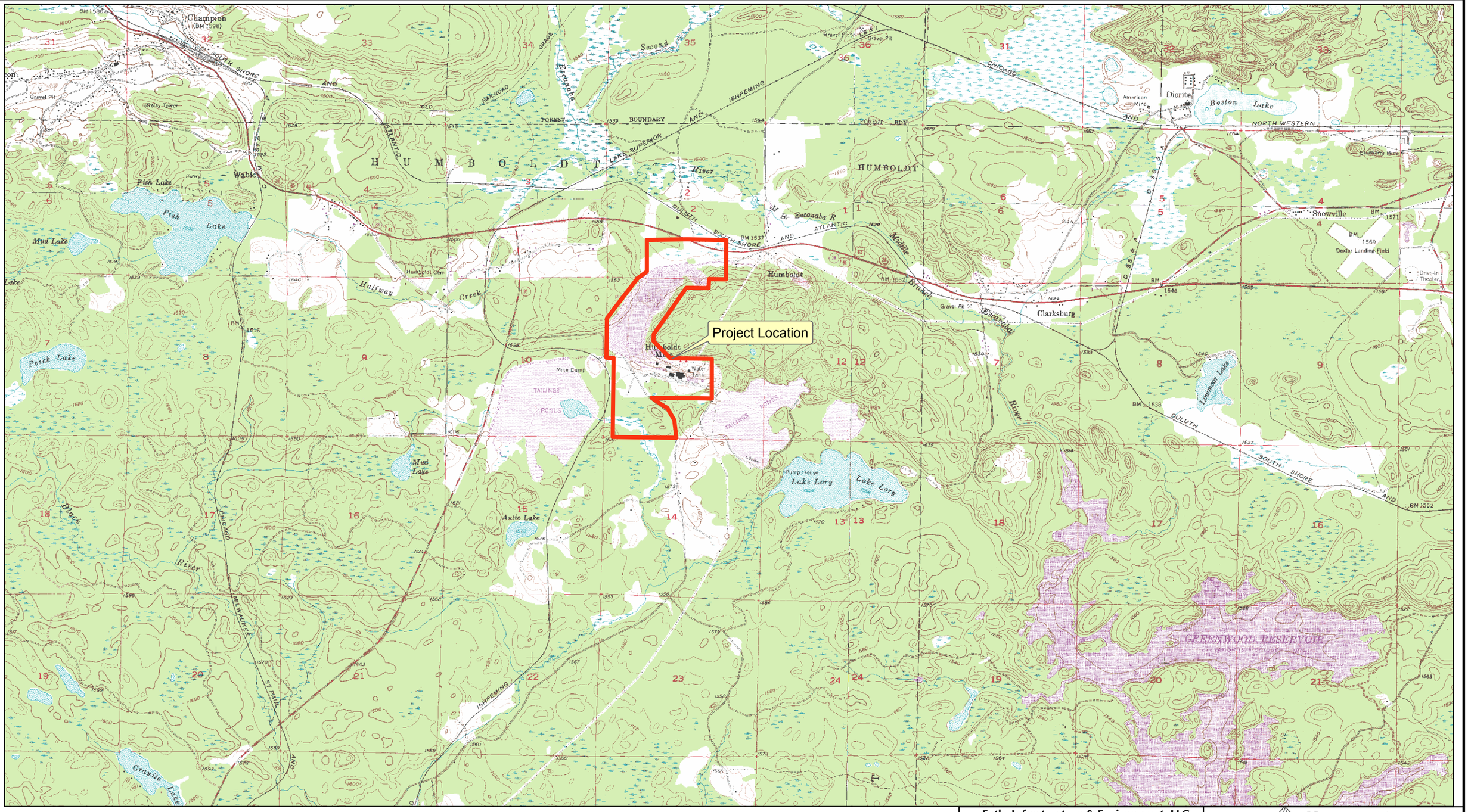
Scale: 0 1.5 3 Miles

Date: AUGUST 2007

Prepared by: DAT

Project No: 06W003

M:\06w003\mxd\HGR\kmc_humboldt_ProjectLocation_Fig1-1_11x17.mxd September 25, 2007



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 83/96. 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.

LEGEND

KEMC Project Location

N

Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	JOS1	DATE: AUG '07
APPROVED BY:	SVD1	DATE: AUG '07
APPROVED BY:		DATE:

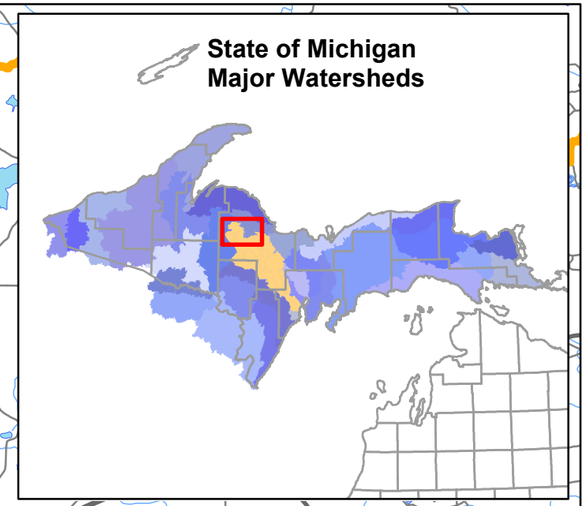
Kennecott
Eagle Minerals

FIGURE 1-2
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
SITE LOCATION

Scale: 0 1,500 3,000 Feet | Date: AUGUST 2007

Prepared by: DAT | Project No: 06W003

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Middle Branch Escanaba River

DEAD-KELSEY

ESCANABA RIVER

MICHIGAMME RIVER

Black River

Schweitzer Creek

East Branch Escanaba River

Goose Lake Outlet

Green Creek

Dead River Storage Basin

Lake Michigamme

Deer Lake

Teal Lake

Boston Lake

Middle Branch Escanaba River

Mud Lake

Fish Lake

Perch Lake

Humboldt Tailings Disposal Facility

Heron Rookery Pond

West Tailings Pond

Lowmoor Lake

US41

Goose Lake

Mud Lake

CR601

US95

Autio Lake

Lake Lory

Black River Main Branch

Greenwood Reservoir

Granite Lake

Tower Lake

Black River

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 83/96. 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.

LEGEND

- KEMC Project Location
- Major Watershed Boundary
- Sub-Watershed Boundary
- Lakes and Rivers
- Highways
- Major Roads
- Minor Roads

N

Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	JSL	DATE: SEP. '07
APPROVED BY:	SVD1	DATE: SEP. '07
APPROVED BY:		DATE:

Kennecott
Eagle Minerals

FIGURE 1-3
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
WATERSHED BOUNDARIES

Scale: 0 4,500 9,000 Feet | Date: SEPTEMBER 2007

Prepared by: DAT | Project No: 06W003

M:\06w003\mxd\HGR\kmc_humboldt_Watershed_Fig1-3_11x17.mxd September 24, 2007

26,017,000 E | 26,018,000 E | 26,019,000 E | 26,020,000 E | 26,021,000 E | 26,022,000 E | 26,023,000 E | 26,024,000 E

627,000 N | 626,000 N | 625,000 N | 624,000 N | 623,000 N | 622,000 N | 621,000 N | 620,000 N | 619,000 N | 618,000 N

LEAN ORE AND WASTE ROCK

HUMBOLDT TAILINGS DISPOSAL FACILITY

MILL ENTRANCE

OLD CRUSHER BUILDING

CRUSHER PLANT

FORMER SECONDARY CRUSHER BUILDING

ELECTRICAL SUBSTATION

FACILITY WATER TOWER

MAIN MILL

FORMER PELLET PLANT

CONCRETE FOUNDATIONS

OFFICE/ MAINTENANCE BUILDING

TRAILER

LEAN ORE AND WASTE ROCK

IRON ORE TAILINGS BASIN WEST

WEST BRANCH OF BLACK RIVER

IRON ORE TAILINGS BASIN NORTH

APPROXIMATE LOCATION OF TAILINGS SEEP AND SURFACE STAINING

WEIR

EFFLUENT DISCHARGE PIPE

GAS MAIN PRESSURE RELIEF STATION

IRON ORE TAILINGS BASIN SOUTH

DECANT WATER EFFLUENT RISER PIPE

PUMP HOUSE FOUNDATION

APPROXIMATE LOCATION OF TAILINGS SEEP AND SURFACE STAINING

LAKE LORY

MIDDLE BRANCH ESCANABA RIVER

ATHLETIC FIELD

BILLBOARD

SIGN

TAILINGS POND

FOUNDATION

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

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 2 AND 11, T47N, R29W, HUMBOLDT TOWNSHIP, MARQUETTE COUNTY, MICHIGAN.
4. CONTOUR INTERVAL SHOWN IS 10 FOOT.

0 300' 600'

Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	JOS1	DATE:	OCT. '07
APPROVED BY:	SVD1	DATE:	OCT. '07
APPROVED BY:		DATE:	

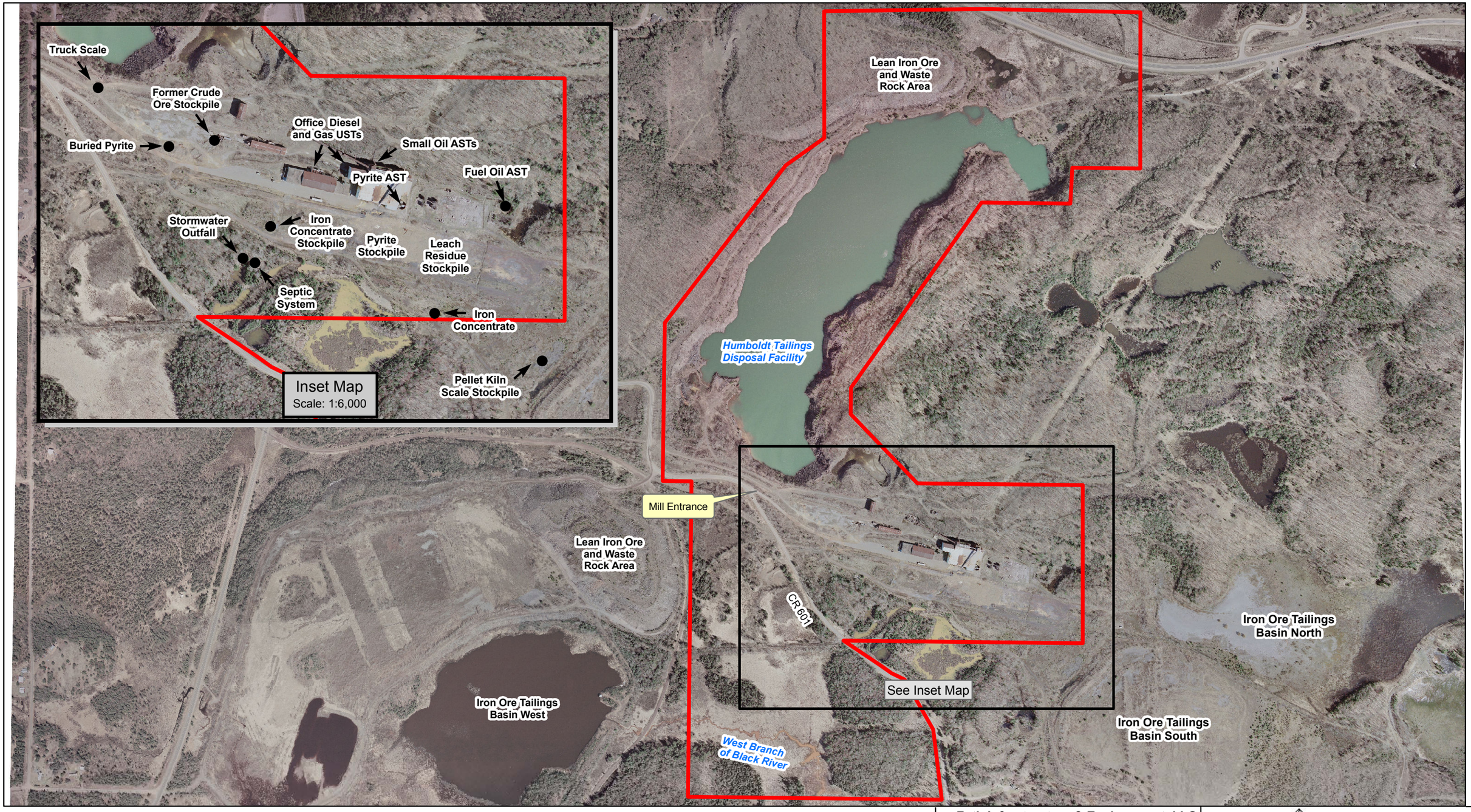
Kennecott Eagle Minerals

FIGURE 1-4

HUMBOLDT MILL
HYDROGEOLOGICAL REPORT
EXISTING CONDITIONS AND STRUCTURES

Scale:	AS SHOWN	Date:	OCTOBER, 2007
Prepared By:	JOW	Project No.	06W003

L:\06w003\HGR\hgr_existing_site.3d
12/10/2007 jow



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.

LEGEND

KEMC Project Location

N

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M:\06w003\mxd\HGR\kmc_humboldt_Areas_of_Investigation_Fig1-5_SPN_11x17.mxd October 1, 2007

Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

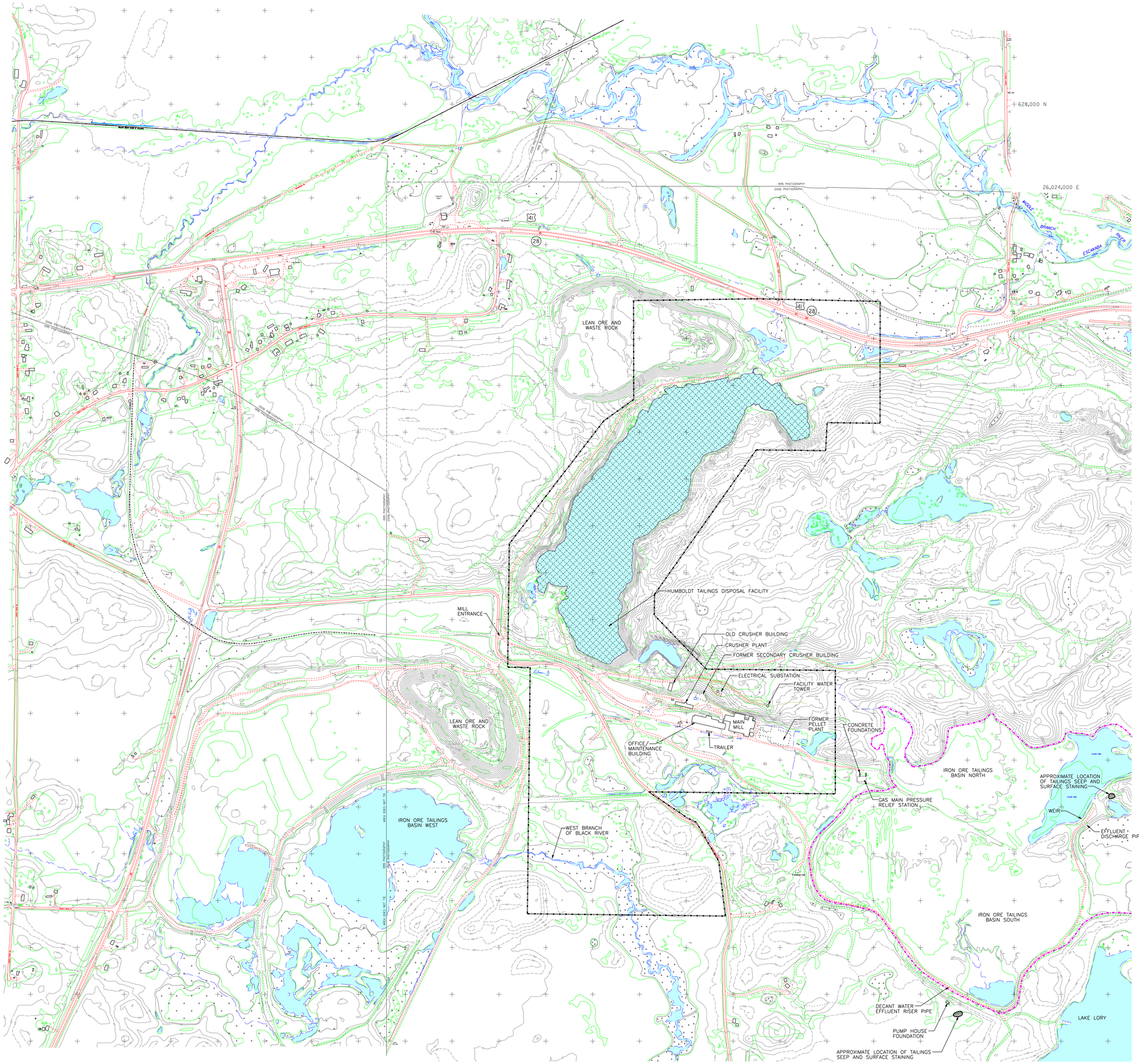
CHECKED BY:	AKM	DATE: AUG. '07
APPROVED BY:	SVD1	DATE: AUG. '07
APPROVED BY:		DATE:

Kennecott
Eagle Minerals

FIGURE 1-5

HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
AREAS OF INVESTIGATION

Scale: 0 400 800 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003



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
- EXISTING RAIL LINE

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 10 FOOT.

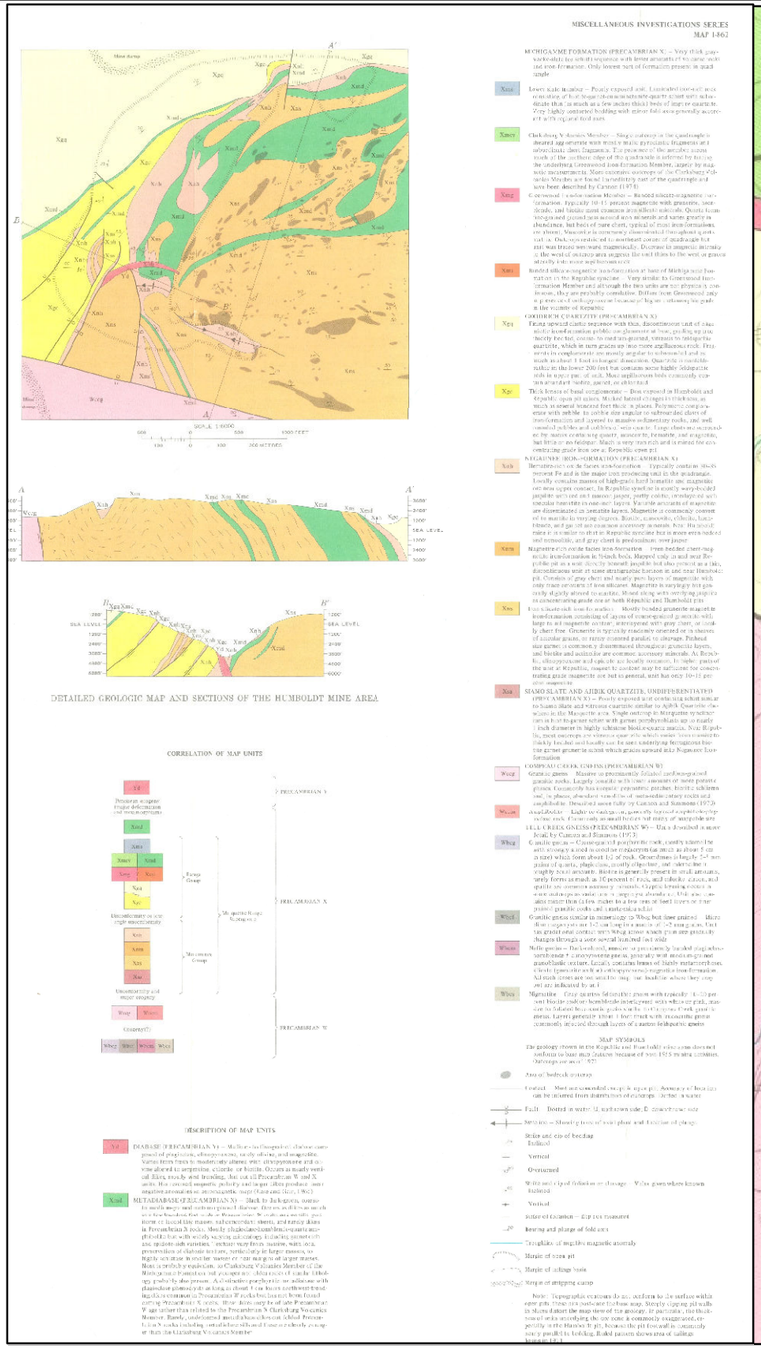
Foth Infrastructure & Environment, LLC				
REVISED	DATE	BY	DESCRIPTION	
CHECKED BY:	JOS1		DATE:	JAN, '08
APPROVED BY:	SVD1		DATE:	JAN, '08
APPROVED BY:			DATE:	

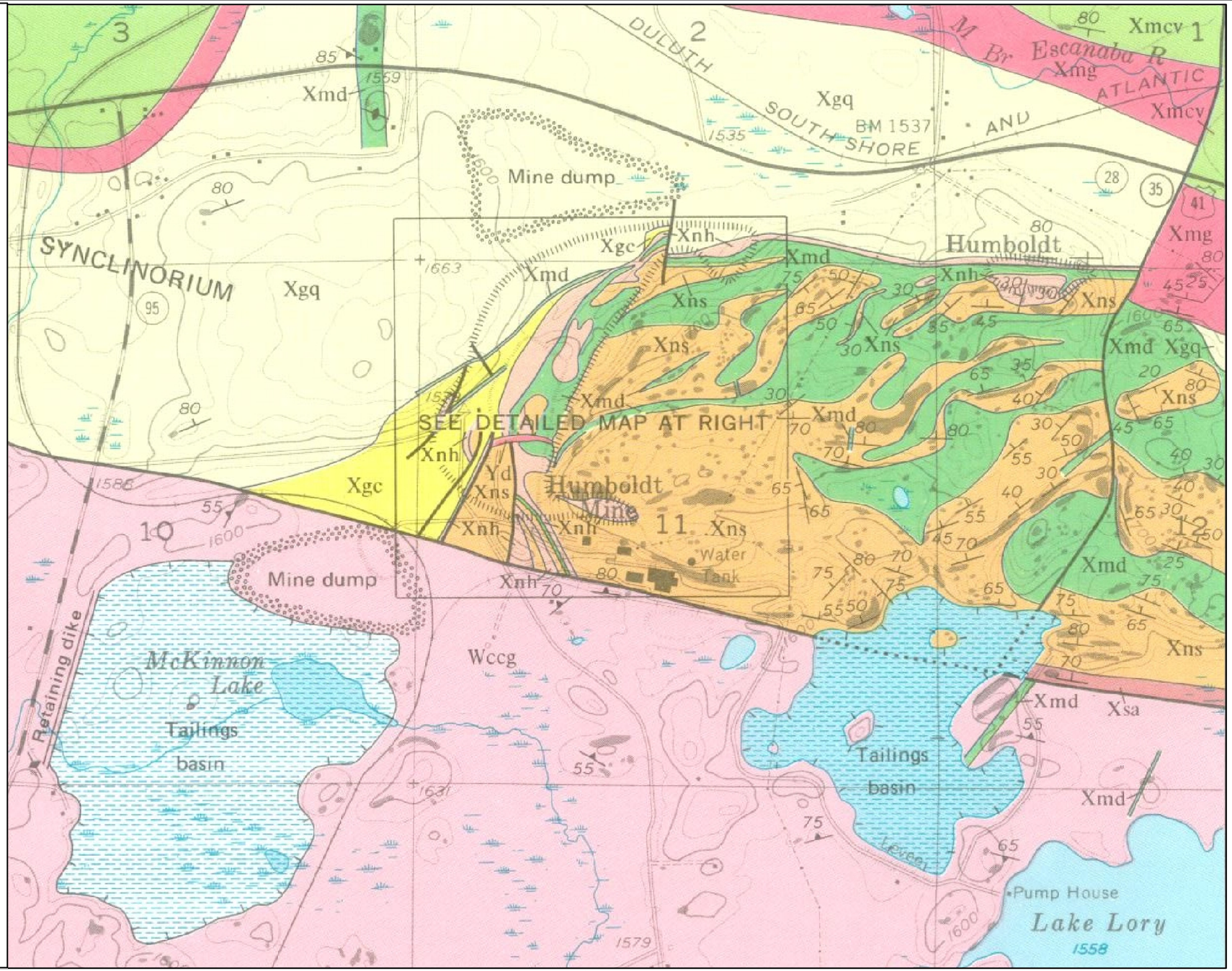
Kennecott Eagle Minerals

FIGURE 2-1
HUMBOLDT MILL
HYDROGEOLOGICAL REPORT
REGIONAL AREA EXISTING CONDITIONS

Scale: 0 200 400
Date: JANUARY, 2008
Prepared By: JOW
Project No. 06W003

L:\06w003\HGR\hgr_regional_exist_condition.3d
3/12/2008 dgt





NOTES

1. Bedrock Geologic Map of the Republic Qudarangle, Marquette County, Michigan by William F. Cannon, 1975.
2. Site Location - Project Site within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.

N

Foth
Foth Infrastructure & Environment, LLC

Foth Infrastructure & Environment, LLC			
REVISED	DATE	BY	DESCRIPTION

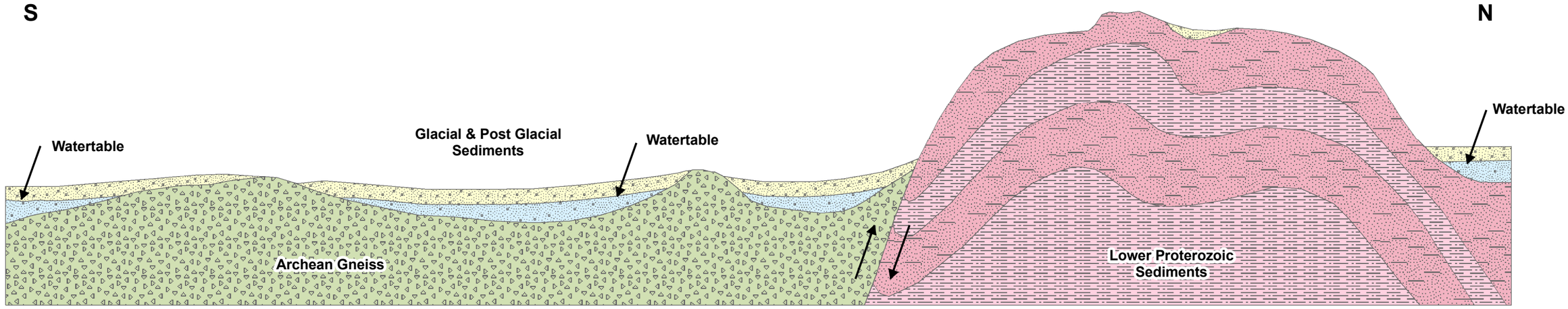
CHECKED BY:	JOS1	DATE: AUG. '07	
APPROVED BY:	SVD1	DATE: AUG. '07	
APPROVED BY:		DATE:	

Kennecott
Eagle Minerals

FIGURE 2-2
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
BEDROCK GEOLOGY

Scale:	NOT TO SCALE	Date:	AUGUST 2007
Prepared by:	DAT	Project No:	06W003

M:\06w003\mxd\HGR\kmc_humboldt_BedrockGeology_Fig2-2_11x17.mxd August 23, 2007



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

Foth Infrastructure & Environment, LLC

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Eagle Minerals

FIGURE 2-3
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
GENERALIZED GEOLOGIC CROSS-SECTION

Scale:	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

M:\06w003\mxd\HGR\kmc_GeoCross_Section_Fig2-3_11x17.mxd August 23, 2007

26,018,000 E
26,019,000 E
26,020,000 E
26,021,000 E
26,022,000 E

626,000 N
625,000 N
624,000 N
623,000 N
622,000 N

FORMER SECONDARY CRUSHER BUILDING
ELECTRICAL SUBSTATION
FACILITY WATER TOWER
MILL ENTRANCE
OLD CRUSHER BUILDING
CR 601
CRUSHER PLANT
FORMER PELLET PLANT
MAIN MILL
OFFICE / MAINTENANCE BUILDING

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
- KEMC PROJECT LOCATION
- WATERSHED BOUNDARY
- APPROXIMATE LIMITS OF PRE-EXISTING IRON ORE TAILINGS DISPOSAL FACILITY
- HUMBOLDT TAILINGS DISPOSAL FACILITY (HTDF)

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.

Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

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

Kennecott Eagle Minerals

FIGURE 2-4
HUMBOLDT MILL
HYDROGEOLOGICAL REPORT
HTDF WATERSHED

Scale: 0 250' 500'
Date: OCTOBER, 2007
Prepared By: JOW
Project No. 06W003

L:\06w003\HGR\hgr_htdf_watershed_figure.3d
12/10/2007 jow



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.

LEGEND

Soil Sample Location

(Note: TP-1 through TP-35 were completed primarily for visual characterization. Chemical analyses were completed only on TP-17 and TP-43.)

N

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REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	JSL	DATE:	AUG '07
APPROVED BY:	SVD1	DATE:	AUG '07
APPROVED BY:		DATE:	

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Eagle Minerals

FIGURE 3-1
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HISTORICAL SOIL SAMPLE LOCATIONS

Scale: 0 150 300 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

M:\06w003\mxd\HGR\kmc_humboldt_Sampling_Soil_Historical_Fig3-1_11x17.mxd August 23, 2007



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.

LEGEND

- Soil Sample Location - Not Sampled for Parameter
- Soil Sample Location - Sample Below Drinking Water Protection Criteria (< 2,100 ug/kg)
- Soil Sample Location - Sample Above Drinking Water Protection Criteria (> 2,100 ug/kg)

N

Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	JSL	DATE:	AUG '07
APPROVED BY:	SVD1	DATE:	AUG '07
APPROVED BY:		DATE:	

Kennecott Eagle Minerals

FIGURE 3-2
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HISTORICAL SOIL SAMPLE LOCATIONS
1, 2, 4 - TRIMETHYLBENZENE IN SOIL

Scale: 0 150 300 Feet | Date: AUGUST 2007

Prepared by: DAT | Project No: 06W003

M:\06w003\mxd\HGR\kmc_humboldt_Sampling_Soil_Historical_124Trimethylbenzene_Fig3-2_11x17.mxd August 23, 2007



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.

LEGEND

- Soil Sample Location - Not Sampled for Parameter
- Soil Sample Location - Sample Below Drinking Water Protection Criteria (< 41,000 ug/kg)
- Soil Sample Location - Sample Above Drinking Water Protection Criteria (> 41,000 ug/kg)

N

Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	JSL	DATE: AUG '07	
APPROVED BY:	SVD1	DATE: AUG '07	
APPROVED BY:		DATE:	

Kennecott Eagle Minerals

FIGURE 3-3
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HISTORICAL SOIL SAMPLE LOCATIONS
ANTHRACENE IN SOIL

Scale: 0 150 300 Feet | Date: AUGUST 2007

Prepared by: DAT | Project No: 06W003

M:\06w003\mxd\hgr\kmc_humboldt_Sampling_Soil_Historical_Anthracene_Fig3-3_11x17.mxd October 2, 2007



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.

LEGEND

- Soil Sample Location - Not Sampled for Parameter
- Soil Sample Location - Sample Below Drinking Water Protection Criteria (< 56,000 ug/kg)
- Soil Sample Location - Sample Above Drinking Water Protection Criteria (> 56,000 ug/kg)

N

Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	JSL	DATE: AUG. '07	
APPROVED BY:	SVD1	DATE: AUG. '07	
APPROVED BY:		DATE:	

Kennecott Eagle Minerals

FIGURE 3-4
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HISTORICAL SOIL SAMPLE LOCATIONS
PHENANTHRENE IN SOIL

Scale: 0 150 300 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

M:\06w003\mxd\HGR\kmc_humboldt_Sampling_Soil_Historical_Phenanthrene_Fig3-4_11x17.mxd August 23, 2007



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.

LEGEND

- Soil Sample Location - Not Sampled for Parameter
- Soil Sample Location - Sample Below Drinking Water Protection Criteria (< 4 mg/kg)
- Soil Sample Location - Sample Above Drinking Water Protection Criteria (> 4 mg/kg)

N

Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	JSL	DATE: AUG. '07	
APPROVED BY:	SVD1	DATE: AUG. '07	
APPROVED BY:		DATE:	

Kennecott Eagle Minerals

FIGURE 3-5
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HISTORICAL SOIL SAMPLE LOCATIONS
CYANIDE IN SOIL

Scale: 0 150 300 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

M:\06w003\mxd\HGR\kmc_humboldt_Sampling_Soil_Historical_Cyanide_Fig3-5_11x17.mxd August 23, 2007



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.

LEGEND

- Soil Sample Location - Not Sampled for Parameter
- Soil Sample Location - Sample Below Drinking Water Protection Criteria (< 4.3 mg/kg)
- Soil Sample Location - Sample Above Drinking Water Protection Criteria (> 4.3 mg/kg)

N

Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	JSL	DATE: AUG. '07	
APPROVED BY:	SVD1	DATE: AUG. '07	
APPROVED BY:		DATE:	

Kennecott Eagle Minerals

FIGURE 3-6
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HISTORICAL SOIL SAMPLE LOCATIONS
ANTIMONY IN SOIL

Scale: 0 150 300 Feet | Date: AUGUST 2007

Prepared by: DAT | Project No: 06W003

M:\06w003\mxd\HGR\kmc_humboldt_Sampling_Soil_Historical_Antimony_Fig3-6_11x17.mxd August 23, 2007



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.

LEGEND

- Soil Sample Location - Not Sampled for Parameter
- Soil Sample Location - Sample Below Drinking Water Protection Criteria (< 4.6 mg/kg)
- Soil Sample Location - Sample Above Drinking Water Protection Criteria (> 4.6 mg/kg)

N

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Foth Infrastructure & Environment, LLC

M:\06w003\mxd\HGR\kmc_humboldt_Sampling_Soil_Historical_Arsenic_Fig3-7_11x17.mxd August 23, 2007

Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	JSL	DATE: AUG. '07	
APPROVED BY:	SVD1	DATE: AUG. '07	
APPROVED BY:		DATE:	

Kennecott
Eagle Minerals

FIGURE 3-7
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HISTORICAL SOIL SAMPLE LOCATIONS
ARSENIC IN SOIL

Scale: 0 150 300 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

Scale #1
PCB-1
PCB-2
PCB-3
PCB-4
Inset 1
Inset 2
TP-35
TP-30
TP-32
TP-25
TP-34
TP-27
TP-20
TP-29
TP-22
TP-15
TP-31
TP-24
TP-17
TP-10
TP-33
TP-26
TP-19
TP-12
TP-5
TP-28
TP-21
TP-14
TP-7
TP-23
TP-16
TP-9
TP-2
TP-18
TP-11
TP-4
TP-13
TP-6
TP-8
TP-1
TP-3

PL-2
PL-3
PL-4
PL-5
PL-6
PL-7
PL-8
PL-9
PL-10
PL-11
PL-12
PL-1
SB-5
SB-4
WO-104
WO-100
WO-105
MW-106
WO-101
D.W.1
D.E.
H.O.W.
WO-102
SB-1
SB-2
SB-3
Inset 2
0 50 100 Feet

T-23
T-22
T-21
T-20
T-19
T-17
T-18
T-13
T-14
T-15
T-16
SB-10"
SB-9"
SB-4"
SB-3"
SB-5"
SB-2"
SB-6"
SB-7"
SB-1"
SB-8"
T-11
T-1
T-10
T-2
T-12
T-3
T-4
Inset 1
0 50 100 Feet

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.

LEGEND

- Soil Sample Location - Not Sampled for Parameter
- Soil Sample Location - Sample Below Drinking Water Protection Criteria (< 6 mg/kg)
- Soil Sample Location - Sample Above Drinking Water Protection Criteria (> 6 mg/kg)

N

Foth
Foth Infrastructure & Environment, LLC

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Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	JSL	DATE: AUG. '07	
APPROVED BY:	SVD1	DATE: AUG. '07	
APPROVED BY:		DATE:	

Kennecott
Eagle Minerals

FIGURE 3-8
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HISTORICAL SOIL SAMPLE LOCATIONS
IRON IN SOIL

Scale: 0 150 300 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

Scale #1
PCB-1
PCB-2
PCB-3
PCB-4
Inset 1
Inset 2
TP-35
TP-30
TP-32
TP-25
TP-34
TP-27
TP-20
TP-29
TP-22
TP-15
TP-31
TP-24
TP-17
TP-10
TP-33
TP-26
TP-19
TP-12
TP-5
TP-28
TP-21
TP-14
TP-7
TP-23
TP-16
TP-9
TP-2
TP-18
TP-11
TP-4
TP-13
TP-6
TP-8
TP-1
TP-3

PL-2
PL-3
PL-4
PL-5
PL-6
PL-7
PL-8
PL-9
PL-10
PL-11
PL-12
PL-1
SB-5
SB-4
WO-104
WO-100
WO-105
MW-106
WO-101
WO-102
D.W.1
D.E.
H.O.W.
SB-1
SB-2
SB-3
Inset 2
0 50 100 Feet

T-23
T-22
T-21
T-20
T-19
T-17
T-18
T-13
T-14
T-15
T-16
SB-10"
SB-9"
SB-4"
SB-3"
SB-5"
SB-2"
SB-6"
SB-7"
SB-1"
T-12
T-11
T-1
T-10
T-2
T-3
T-4
SB-8"
Inset 1
0 50 100 Feet

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.

LEGEND

- Soil Sample Location - Not Sampled for Parameter
- Soil Sample Location - Sample Below Drinking Water Protection Criteria (< 1 mg/kg)
- Soil Sample Location - Sample Above Drinking Water Protection Criteria (> 1 mg/kg)

N

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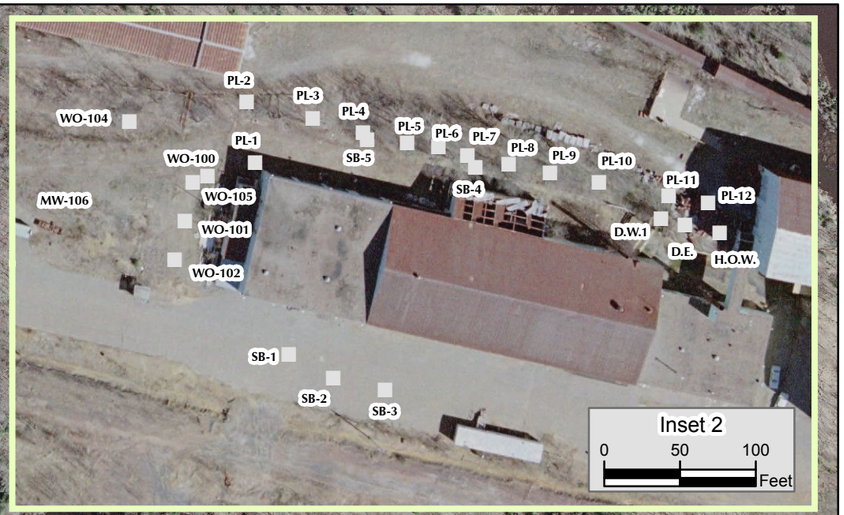
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APPROVED BY:	SVD1	DATE: AUG. '07	
APPROVED BY:		DATE:	

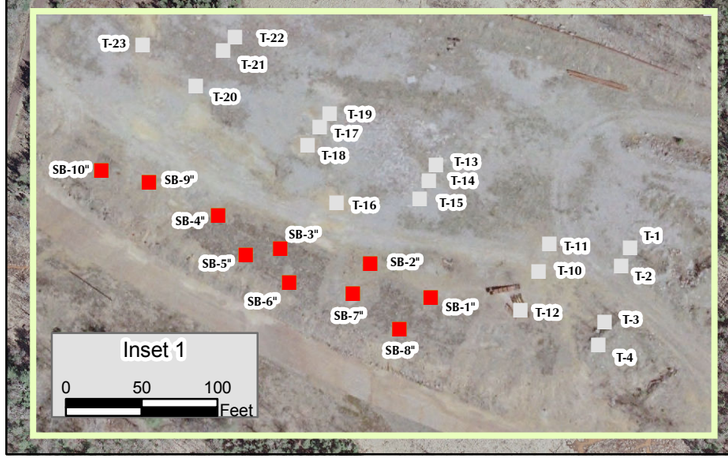
Kennecott
Eagle Minerals

FIGURE 3-9
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HISTORICAL SOIL SAMPLE LOCATIONS
MANGANESE IN SOIL

Scale: 0 150 300 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

Scale #1
PCB-1
PCB-2
PCB-3
PCB-4
Inset 1
Inset 2
TP-35
TP-30
TP-32
TP-25
TP-34
TP-27
TP-20
TP-29
TP-22
TP-15
TP-31
TP-24
TP-17
TP-10
TP-33
TP-26
TP-19
TP-12
TP-5
TP-28
TP-21
TP-14
TP-7
TP-2
TP-23
TP-16
TP-9
TP-18
TP-11
TP-4
TP-13
TP-6
TP-8
TP-1
TP-3





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.

LEGEND

- Soil Sample Location - Not Sampled for Parameter
- Soil Sample Location - Sample Below Drinking Water Protection Criteria (< 100 mg/kg)
- Soil Sample Location - Sample Above Drinking Water Protection Criteria (> 100 mg/kg)

N

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Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

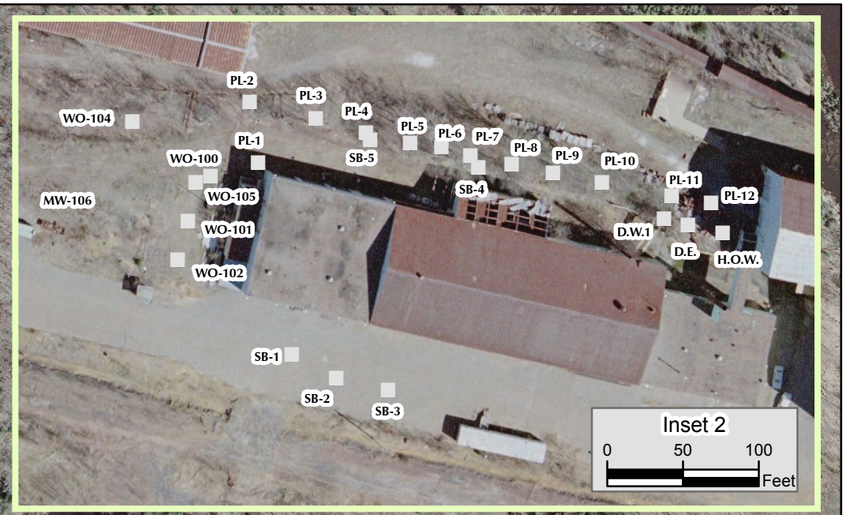
CHECKED BY:	JSL	DATE:	AUG '07
APPROVED BY:	SVD1	DATE:	AUG '07
APPROVED BY:		DATE:	

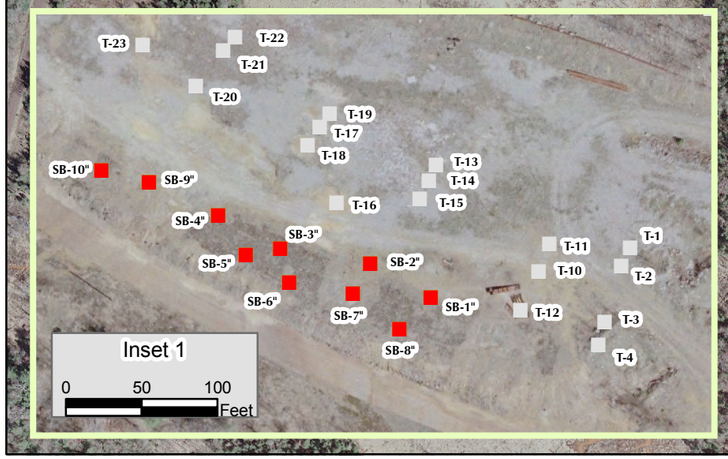
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Eagle Minerals

FIGURE 3-10
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HISTORICAL SOIL SAMPLE LOCATIONS
NICKEL IN SOIL

Scale: 0 150 300 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

Scale #1
PCB-1
PCB-2
PCB-3
PCB-4
Inset 1
Inset 2
TP-35
TP-30
TP-32
TP-25
TP-34
TP-27
TP-20
TP-29
TP-22
TP-15
TP-31
TP-24
TP-17
TP-10
TP-33
TP-26
TP-19
TP-12
TP-5
TP-28
TP-21
TP-14
TP-7
TP-23
TP-16
TP-9
TP-2
TP-18
TP-13
TP-11
TP-4
TP-6
TP-8
TP-1
TP-3





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.

LEGEND

- Soil Sample Location - Not Sampled for Parameter
- Soil Sample Location - Sample Below Drinking Water Protection Criteria (< 4.5 mg/kg)
- Soil Sample Location - Sample Above Drinking Water Protection Criteria (> 4.5 mg/kg)

N

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APPROVED BY:		DATE:	

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FIGURE 3-11
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HISTORICAL SOIL SAMPLE LOCATIONS
SILVER IN SOIL

Scale: 0 150 300 Feet	Date: AUGUST 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.

LEGEND

- Soil Sample Location - Not Sampled for Parameter
- Soil Sample Location - Sample Below Drinking Water Protection Criteria (< 30 mg/kg)
- Soil Sample Location - Sample Above Drinking Water Protection Criteria (> 30 mg/kg)

N

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APPROVED BY:		DATE:	

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FIGURE 3-12
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HISTORICAL SOIL SAMPLE LOCATIONS
CHROMIUM IN SOIL

Scale: 0 150 300 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

M:\06w003\mxd\HGR\kmc_humboldt_Sampling_Soil_Historical_Chromium_Fig3-12_11x17.mxd August 23, 2007



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.

LEGEND

- Soil Sample Location - Not Sampled for Parameter
- Soil Sample Location - Sample Below Direct Contact Criteria (< 400 mg/kg)
- Soil Sample Location - Sample Above Direct Contact Criteria (> 400 mg/kg)

N

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CHECKED BY:	JSL	DATE: AUG '07	
APPROVED BY:	SVD1	DATE: AUG '07	
APPROVED BY:		DATE:	

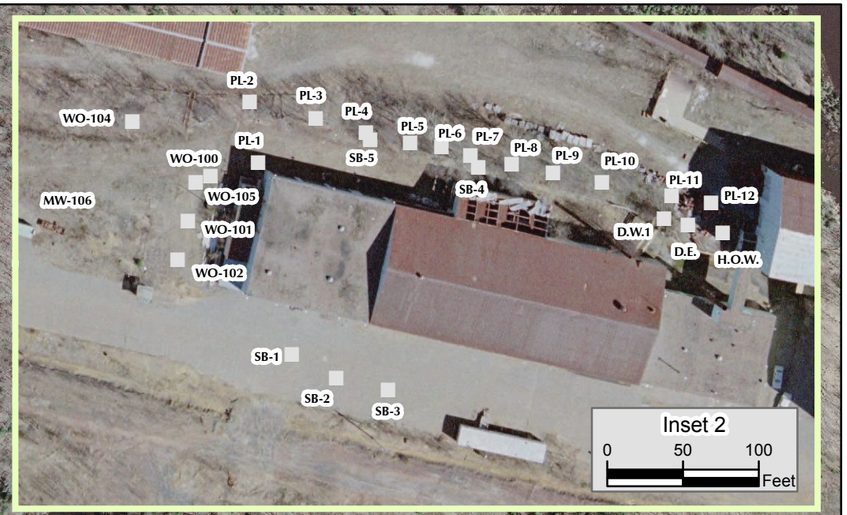
Kennecott Eagle Minerals

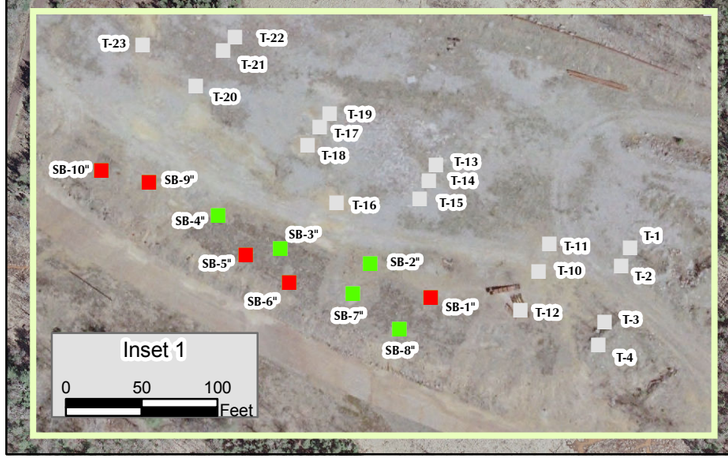
FIGURE 3-13
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HISTORICAL SOIL SAMPLE LOCATIONS
LEAD IN SOIL

Scale: 0 150 300 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

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Scale #1
PCB-1
PCB-2
PCB-3
PCB-4
Inset 1
Inset 2
TP-35
TP-30
TP-32
TP-25
TP-34
TP-27
TP-20
TP-29
TP-22
TP-15
TP-31
TP-24
TP-17
TP-10
TP-33
TP-26
TP-19
TP-12
TP-5
TP-28
TP-21
TP-14
TP-7
TP-23
TP-16
TP-9
TP-2
TP-18
TP-11
TP-4
TP-13
TP-6
TP-8
TP-1
TP-3





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.

LEGEND

- Soil Sample Location - Not Sampled for Parameter
- Soil Sample Location - Sample Below Drinking Water Protection Criteria (< 8,000 mg/kg)
- Soil Sample Location - Sample Above Drinking Water Protection Criteria (> 8,000 mg/kg)

N

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APPROVED BY:		DATE:	

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FIGURE 3-14
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HISTORICAL SOIL SAMPLE LOCATIONS
MAGNESIUM IN SOIL

Scale: 0 150 300 Feet | Date: AUGUST 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.

LEGEND

⊕ Groundwater Monitoring Well

N

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APPROVED BY:		DATE:

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FIGURE 3-15

HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HISTORICAL GROUNDWATER SAMPLING

Scale: 0 100 200 Feet	Date: AUGUST 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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 5 ug/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 5 ug/L)

N

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APPROVED BY:	SVD1	DATE: AUG. '07
APPROVED BY:		DATE:

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FIGURE 3-16
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HISTORICAL GROUNDWATER SAMPLING
BENZENE

Scale: 0 100 200 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

M:\06w003\mxd\HGR\kmc_humboldt_Sampling_GW_Historical_Benzene_Fig3-16_11x17.mxd August 23, 2007



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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 74 ug/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 74 ug/L)

N

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APPROVED BY:		DATE:	

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FIGURE 3-17
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HISTORICAL GROUNDWATER SAMPLING
ETHYLBENZENE

Scale: 0 100 200 Feet	Date: AUGUST 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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 280 ug/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 280 ug/L)

N

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FIGURE 3-18
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HISTORICAL GROUNDWATER SAMPLING
XYLENES

Scale: 0 100 200 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

M:\06w003\mxd\HGR\kmc_humboldt_Sampling_GW_Historical_Xylenes_Fig3-18_11x17.mxd August 23, 2007



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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 260 ug/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 260 ug/L)

N

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FIGURE 3-19
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HISTORICAL GROUNDWATER SAMPLING
2-METHYLNAPHTHALENE

Scale: 0 100 200 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

M:\06w003\mxd\HGR\kmc_humboldt_Sampling_GW_Historical_2-MethylnaphthaleneFig3-19_11x17.mxd August 23, 2007



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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 52 ug/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 52 ug/L)

N

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APPROVED BY:	SVD1	DATE: AUG. '07
APPROVED BY:		DATE:

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FIGURE 3-20
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HISTORICAL GROUNDWATER SAMPLING
ACENAPTHYLENE

Scale: 0 100 200 Feet

Date: AUGUST 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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 520 ug/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 520 ug/L)

N

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CHECKED BY:	JSL	DATE: AUG. '07
APPROVED BY:	SVD1	DATE: AUG. '07
APPROVED BY:		DATE:

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FIGURE 3-21
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HISTORICAL GROUNDWATER SAMPLING
NAPHTHALENE

Scale: 0 100 200 Feet	Date: AUGUST2007
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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 52 ug/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 52 ug/L)

N

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CHECKED BY:	JSL	DATE: AUG. '07
APPROVED BY:	SVD1	DATE: AUG. '07
APPROVED BY:		DATE:

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FIGURE 3-22
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HISTORICAL GROUNDWATER SAMPLING
PHENANTHRENE

Scale: 0 100 200 Feet

Date: AUGUST 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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 10 mg/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 10 mg/L)

N

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REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	JSL	DATE: AUG. '07
APPROVED BY:	SVD1	DATE: AUG. '07
APPROVED BY:		DATE:

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FIGURE 3-23
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HISTORICAL GROUNDWATER SAMPLING
NITROGEN/AMMONIA

Scale: 0 100 200 Feet	Date: AUGUST 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 83/96. 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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 250 mg/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 250 mg/L)

N

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APPROVED BY:		DATE:

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FIGURE 3-24
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HISTORICAL GROUNDWATER SAMPLING
SULFATE

Scale: 0 100 200 Feet	Date: AUGUST 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 83/96. 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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 10 ug/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 10 ug/L)

N

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APPROVED BY:	SVD1	DATE: AUG. '07
APPROVED BY:		DATE:

Kennecott Eagle Minerals

FIGURE 3-25
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HISTORICAL GROUNDWATER SAMPLING
ARSENIC

Scale: 0 100 200 Feet

Date: AUGUST 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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 300 ug/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 300 ug/L)

N

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CHECKED BY:	JSL	DATE: AUG. '07
APPROVED BY:	SVD1	DATE: AUG. '07
APPROVED BY:		DATE:

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Eagle Minerals

FIGURE 3-26
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HISTORICAL GROUNDWATER SAMPLING
IRON

Scale: 0 100 200 Feet

Date: AUGUST 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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 4 ug/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 4 ug/L)

N

Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	JSL	DATE: AYG. '07
APPROVED BY:	SVD1	DATE: AUG. '07
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FIGURE 3-27
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HISTORICAL GROUNDWATER SAMPLING
LEAD

Scale: 0 100 200 Feet

Date: AUGUST 2007

Prepared by: DAT

Project No: 06W003

M:\06w003\mxd\HGR\kmc_humboldt_Sampling_GW_Historical_Lead_Fig3-27_11x17.mxd August 23, 2007



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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 50 ug/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 50 ug/L)

N

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APPROVED BY:		DATE:	

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FIGURE 3-28
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HISTORICAL GROUNDWATER SAMPLING
MANGANESE

Scale: 0 100 200 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

M:\06w003\mxd\HGR\kmc_humboldt_Sampling_GW_Historical_Manganese_Fig3-28_11x17.mxd August 23, 2007



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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 5 ug/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 5 ug/L)

N

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REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	JSL	DATE:	AUG. '07
APPROVED BY:	SVD1	DATE:	AUG. '07
APPROVED BY:		DATE:	

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Eagle Minerals

FIGURE 3-29
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HISTORICAL GROUNDWATER SAMPLING
CADMIUM

Scale: 0 100 200 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

M:\06w003\mxd\HGR\kmc_humboldt_Sampling_GW_Historical_Cadmium_Fig3-29_11x17.mxd August 23, 2007



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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 100 ug/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 100 ug/L)

N

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CHECKED BY:	JSL	DATE: AUG. '07
APPROVED BY:	SVD1	DATE: AUG. '07
APPROVED BY:		DATE:

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FIGURE 3-30
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HISTORICAL GROUNDWATER SAMPLING
NICKEL

Scale: 0 100 200 Feet

Date: AUGUST 2007

Prepared by: DAT

Project No: 06W003

M:\06w003\mxd\HGR\kmc_humboldt_Sampling_GW_Historical_Nickel_Fig3-30_11x17.mxd August 23, 2007



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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 100 ug/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 100 ug/L)

N

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APPROVED BY:	SVD1	DATE: AUG. '07
APPROVED BY:		DATE:

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FIGURE 3-31
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HISTORICAL GROUNDWATER SAMPLING
CHROMIUM

Scale: 0 100 200 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

M:\06w003\mxd\HGR\kmc_humboldt_Sampling_GW_Historical_Chromium_Fig3-31_11x17.mxd August 23, 2007



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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 120,000 ug/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 120,000 ug/L)

N

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CHECKED BY:	JSL	DATE: AUG. '07
APPROVED BY:	SVD1	DATE: AUG. '07
APPROVED BY:		DATE:

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FIGURE 3-32
HUMBOLDT MILL PROJECT - PHASE II ESA
HISTORICAL GROUNDWATER SAMPLING
SODIUM

Scale: 0 100 200 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

M:\06w003\mxd\HGR\kmc_humboldt_Sampling_GW_Historical_Sodium_Fig3-32_11x17.mxd August 23, 2007



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.

LEGEND

- Surface Water Sample - Not Sampled for Parameter
- Surface Water Sample - Sample Below Rule 57 Water Quality Criteria - Final Chronic Value (< 150 ug/L)
- Surface Water Sample - Sample Above Rule 57 Water Quality Criteria - Final Chronic Value (> 150 ug/L)

N

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M:\06w003\mxd\HGR\kmc_humboldt_Sampling_SW_Historical_Arsenic_Fig3-33_11x17.mxd August 24, 2007

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CHECKED BY:	JSL	DATE: AUG. '07	
APPROVED BY:	SVD1	DATE: AUG. '07	
APPROVED BY:		DATE:	

Kennecott
Eagle Minerals

FIGURE 3-33
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HISTORICAL SURFACE WATER
SAMPLING - ARSENIC

Scale: 0 100 200 Feet	Date: AUGUST 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 83/96. 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.

LEGEND

- Surface Water Sample - Not Sampled for Parameter
- Surface Water Sample - Sample Below Rule 57 Water Quality Criteria - Wildlife Value (< 0.0013 ug/L)
- Surface Water Sample - Sample Above Rule 57 Water Quality Criteria - Wildlife Value (> 0.0013 ug/L)

N

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M:\06w003\mxd\HGR\kmc_humboldt_Sampling_SW_Historical_Mercury_Fig3-34_11x17.mxd August 24, 2007

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APPROVED BY:	SVD1	DATE: AUG. '07	
APPROVED BY:		DATE:	

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Eagle Minerals

FIGURE 3-34
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HISTORICAL SURFACE WATER
SAMPLING - MERCURY

Scale: 0 100 200 Feet	Date: AUGUST 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 83/96. 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.

LEGEND

- Surface Water Sample - Not Sampled for Parameter
- Surface Water Sample - Sample Below Rule 57 Water Quality Criteria - Final Chronic Value (< 0.06 ug/L)
- Surface Water Sample - Sample Above Rule 57 Water Quality Criteria - Final Chronic Value (> 0.06 ug/L)

N

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CHECKED BY:	JSL	DATE: AUG. '07	
APPROVED BY:	SVD1	DATE: AUG. '07	
APPROVED BY:		DATE:	

Kennecott Eagle Minerals

FIGURE 3-35
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HISTORICAL SURFACE WATER SAMPLING - SILVER

Scale: 0 100 200 Feet	Date: AUGUST 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.

LEGEND

- Surface Water Sample - Not Sampled for Parameter
- Surface Water Sample - Sample Below Rule 57 Water Quality Criteria - Human Noncancer Value (< 16000 ug/L)
- Surface Water Sample - Sample Above Rule 57 Water Quality Criteria - Human Noncancer Value (> 16000 ug/L)

N

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CHECKED BY:	JSL	DATE: AUG. '07	
APPROVED BY:	SVD1	DATE: AUG. '07	
APPROVED BY:		DATE:	

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FIGURE 3-36
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HISTORICAL SURFACE WATER SAMPLING - ZINC

Scale: 0 100 200 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

M:\06w003\mxd\HGR\kmc_humboldt_Sampling_SW_Historical_Zinc_Fig3-36_11x17.mxd August 24, 2007



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.

LEGEND

⊕ Groundwater Monitoring Well

N

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FIGURE 3-37
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HTDF HISTORICAL GROUNDWATER SAMPLING LOCATIONS

Scale: 0 200 400 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

HW-6
HW-6A
HW-1
HW-1A
HYG-1
HW-5
HW-5A
HW-2
HW-3
HW-4

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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 300 ug/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 300 ug/L)

N

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M:\06w003\mxd\HGR\kmc_humboldt_Sampling_GW_Historical_Iron_HTDF_Fig3-38_11x17.mxd August 27, 2007

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APPROVED BY:		DATE:	

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FIGURE 3-38
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HTDF HISTORICAL GROUNDWATER SAMPLING
IRON

Scale: 0 200 400 Feet	Date: AUGUST 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 83/96. 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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 4 ug/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 4 ug/L)

N

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M:\06w003\mxd\HGR\kmc_humboldt_Sampling_GW_Historical_Lead_HTDF_Fig3-39_11x17.mxd August 27, 2007

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APPROVED BY:	SVD1	DATE: AUG. '07	
APPROVED BY:		DATE:	

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FIGURE 3-39
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HTDF HISTORICAL GROUNDWATER SAMPLING
LEAD

Scale: 0 200 400 Feet	Date: AUGUST 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 83/96. 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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 100 ug/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 100 ug/L)

N

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M:\06w003\mxd\HGR\kmc_humboldt_Sampling_GW_Historical_Nickel_HTDF_Fig3-40_11x17.mxd August 27, 2007

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APPROVED BY:		DATE:	

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FIGURE 3-40
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HTDF HISTORICAL GROUNDWATER SAMPLING
NICKEL

Scale: 0 200 400 Feet	Date: AUGUST 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 83/96. 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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 34 ug/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 34 ug/L)

N

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REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	JSL	DATE: AUG. '07	
APPROVED BY:	SVD1	DATE: AUG. '07	
APPROVED BY:		DATE:	

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FIGURE 3-41
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HTDF HISTORICAL GROUNDWATER SAMPLING
SILVER

Scale: 0 200 400 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

M:\06w003\mxd\HGR\kmc_humboldt_Sampling_GW_Historical_Silver_HTDF_Fig3-41_11x17.mxd August 27, 2007



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.

LEGEND

Surface Water Sampling Location

N

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CHECKED BY:	JSL	DATE: AUG. '07	
APPROVED BY:	SVD1	DATE: AUG. '07	
APPROVED BY:		DATE:	

Kennecott Eagle Minerals

FIGURE 3-42
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HTDF HISTORICAL SURFACE WATER SAMPLING LOCATIONS

Scale: 0 200 400 Feet | Date: AUGUST 2007

Prepared by: DAT | Project No: 06W003

M:\06w003\mxd\HGR\kmc_humboldt_Sampling_SW_Historical_All_HTDF_Fig3-42_11x17.mxd October 2, 2007



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.

LEGEND

- Surface Water Sample - Not Sampled for Parameter
- Surface Water Sample - Sample Below Final Chronic Value
- Surface Water Sample - Sample Above Final Chronic Value

N

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REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	JSL	DATE: AUG. '07	
APPROVED BY:	SVD1	DATE: AUG. '07	
APPROVED BY:		DATE:	

Kennecott Eagle Minerals

FIGURE 3-43
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HTDF HISTORICAL SURFACE WATER SAMPLING
CADMIUM

Scale: 0 200 400 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

M:\06w003\mxd\HGR\kmc_humboldt_Sampling_SW_Historical_Cadmium_HTDF_Fig3-43_11x17.mxd October 2, 2007



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.

LEGEND

- Surface Water Sample - Not Sampled for Parameter
- Surface Water Sample - Sample Below Final Chronic Value
- Surface Water Sample - Sample Above Final Chronic Value

N

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CHECKED BY:	JSL	DATE: AUG. '07	
APPROVED BY:	SVD1	DATE: AUG. '07	
APPROVED BY:		DATE:	

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FIGURE 3-44
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HTDF HISTORICAL SURFACE WATER SAMPLING
COPPER

Scale: 0 200 400 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

M:\06w003\mxd\HGR\kmc_humboldt_Sampling_SW_Historical_Cadmium_HTDF_Fig3-43_11x17.mxd August 27, 2007



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.

LEGEND

- Surface Water Sample - Not Sampled for Parameter
- Surface Water Sample - Sample Below Final Chronic Value
- Surface Water Sample - Sample Above Final Chronic Value

N

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M:\06w003\mxd\HGR\kkmc_humboldt_Sampling_SW_Historical_Cyanide_HTDF_Fig3-45_11x17.mxd August 27, 2007

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CHECKED BY:	JSL	DATE: AUG. '07	
APPROVED BY:	SVD1	DATE: AUG. '07	
APPROVED BY:		DATE:	

Kennecott
Eagle Minerals

FIGURE 3-45
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HTDF HISTORICAL SURFACE WATER SAMPLING
CYANIDE

Scale: 0 200 400 Feet	Date: AUGUST 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 83/96. 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.

LEGEND

- Surface Water Sample - Not Sampled for Parameter
- Surface Water Sample - Sample Below Final Chronic Value
- Surface Water Sample - Sample Above Final Chronic Value

N

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REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	JSL	DATE: AUG. '07	
APPROVED BY:	SVD1	DATE: AUG. '07	
APPROVED BY:		DATE:	

Kennecott Eagle Minerals

FIGURE 3-46
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HTDF HISTORICAL SURFACE WATER SAMPLING
LEAD

Scale: 0 200 400 Feet | Date: AUGUST 2007

Prepared by: DAT | Project No: 06W003

M:\06w003\mxd\HGR\kmc_humboldt_Sampling_SW_Historical_Lead_HTDF_Fig3-46_11x17.mxd August 27, 2007



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.

LEGEND

- Surface Water Sample - Not Sampled for Parameter
- Surface Water Sample - Sample Below Final Chronic Value
- Surface Water Sample - Sample Above Final Chronic Value

N

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REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	JSL	DATE: AUG. '07	
APPROVED BY:	SVD1	DATE: AUG. '07	
APPROVED BY:		DATE:	

Kennecott Eagle Minerals

FIGURE 3-47
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HTDF HISTORICAL SURFACE WATER SAMPLING
NICKEL

Scale: 0 200 400 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

M:\06w003\mxd\HGR\kmc_humboldt_Sampling_SW_Historical_Nickel_HTDF_Fig3-47_11x17.mxd August 27, 2007



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.

LEGEND

- Surface Water Sample - Not Sampled for Parameter
- Surface Water Sample - Sample Below Final Chronic Value
- Surface Water Sample - Sample Above Final Chronic Value

N

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Foth Infrastructure & Environment, LLC

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CHECKED BY:	JSL	DATE: AUG. '07	
APPROVED BY:	SVD1	DATE: AUG. '07	
APPROVED BY:		DATE:	

Kennecott
Eagle Minerals

FIGURE 3-48
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HTDF HISTORICAL SURFACE WATER SAMPLING
SILVER

Scale: 0 200 400 Feet	Date: AUGUST 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 83/96. 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.

LEGEND

- Surface Water Sample - Not Sampled for Parameter
- Surface Water Sample - Sample Below Aquatic Maximum Value
- Surface Water Sample - Sample Above Aquatic Maximum Value

N

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M:\06w003\mxd\HGR\kmc_humboldt_Sampling_SW_Historical_Zinc_HTDF_Fig3-49_11x17.mxd August 27, 2007

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APPROVED BY:		DATE:	

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FIGURE 3-49
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HTDF HISTORICAL SURFACE WATER SAMPLING
ZINC

Scale: 0 200 400 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

26,018,000 E
26,020,000 E
26,022,000 E
26,024,000 E
626,000 N
625,000 N
624,000 N
623,000 N
622,000 N
621,000 N
620,000 N
619,000 N
618,000 N
N
0
300'
600'
41
28
MIDDLE BRANCH ESCANABA RIVER
LEAN ORE AND WASTE ROCK
HMP-004
HW-6A
HW-6
HYG-1
HW-1
HW-1A
HMP-009
HMP-002
HW-5A
HW-5
HMP-008
HW-2
HMP-001
HPL-005
HPL-004
HPL-007
HPL-006
HPL-003
HPL-002
HPL-001
HMP-006
HUMBOLDT TAILINGS DISPOSAL FACILITY
HMP-005
HW-3
MILL ENTRANCE
HW-4
HMP-007
OLD CRUSHER BUILDING
CRUSHER PLANT
FORMER SECONDARY CRUSHER BUILDING
ELECTRICAL SUBSTATION
FACILITY WATER TOWER
FORMER PELLET PLANT
CONCRETE FOUNDATIONS
GAS MAIN PRESSURE RELIEF STATION
MAIN MILL
OFFICE / MAINTENANCE BUILDING
STORMWATER OUTFALL
SEPTIC SYSTEM
HMS-001
HMS-002
HMS-003
HMS-004
HMS-005
HMS-006
HMS-007
IRON ORE TAILINGS BASIN NORTH
IRON ORE TAILINGS BASIN SOUTH
IRON ORE TAILINGS BASIN WEST
APPROXIMATE LOCATION OF TAILINGS SEEP AND SURFACE STAINING
TDP-002
WEIR
EFFLUENT DISCHARGE PIPE
TDP-001
DECANT WATER EFFLUENT RISER PIPE
PUMP HOUSE FOUNDATION
APPROXIMATE LOCATION OF TAILINGS SEEP AND SURFACE STAINING
LAKE LORY
WEST BRANCH BLACK RIVER

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 (HTDF)
- APPROXIMATE LIMITS OF PRE-EXISTING IRON ORE TAILINGS DISPOSAL FACILITY
- KEMC PROJECT LOCATION
- HW-1 — EXISTING MONITORING WELL NUMBER AND LOCATION
- KMW-10 / MW-605 — NEW MONITORING WELL NUMBER AND LOCATION
- HMS-007 — MILL SITE STAFF GAUGE NUMBER AND LOCATION
- HMP-006 — STAFF GUAGE OR PIEZOMETER NUMBER AND LOCATION
- HPL-001 — HTDF SAMPLING POINT NUMBER AND LOCATION
- SB-629 — NEW SOIL BORING NUMBER AND LOCATION
- HA-3BP — BURIED PYRITE STOCKPILE HAND AUGER BORING NUMBER AND LOCATION
- HA-2 — HAND AUGER 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. SITE LOCATION: PROJECT SITE WITHIN SECTIONS 2 AND 11, T47N, R29W, HUMBOLDT TOWNSHIP, MARQUETTE COUNTY, MICHIGAN.
4. CONTOUR INTERVAL SHOWN IS 10 FOOT.

Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	JSL	DATE:	OCT. '07
APPROVED BY:	SVD1	DATE:	OCT. '07
APPROVED BY:		DATE:	

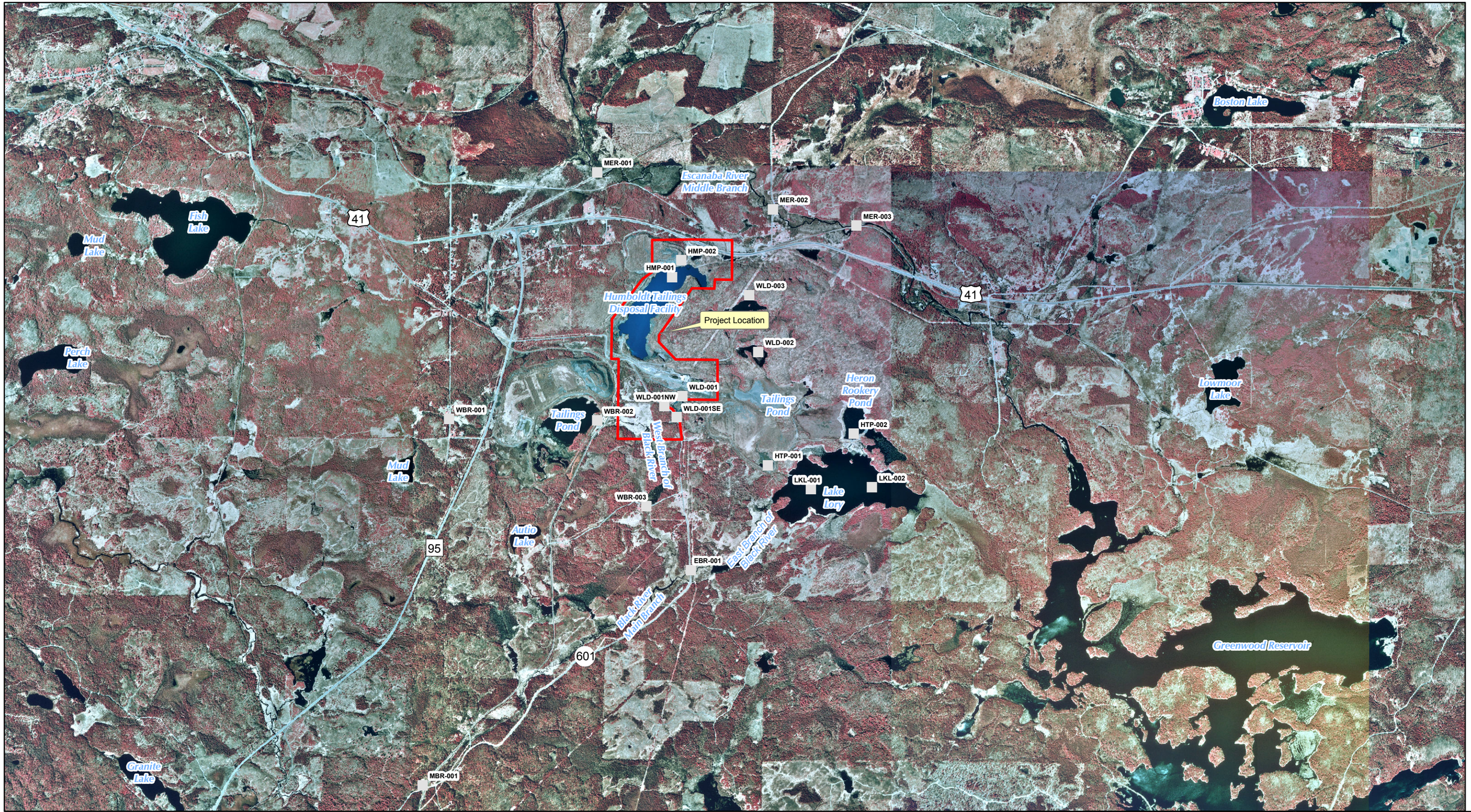
Kennecott Eagle Minerals

FIGURE 4-1

HUMBOLDT MILL HYDROGEOLOGICAL REPORT
SOIL BORING, MONITORING WELL AND STAFF GAUGE LOCATIONS

Scale:	AS SHOWN	Date:	OCT. 2007
Prepared By:	JOW	Project No.	06W003

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11/25/2008 jrb2



NOTES

1. 1998 Series USGS Digital Orthophoto Quadrangles supplied by Michigan Center of Geographic Information.
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.

LEGEND

- Surface Water Monitoring Location
- KEMC Project Location

N

Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	JSL	DATE: AUG. '07
APPROVED BY:	SVD1	DATE: AUG. '07
APPROVED BY:		DATE:

Kennecott Eagle Minerals

FIGURE 4-2

HUMBOLDT MILL - HYDROGEOLOGIC REPORT
REGIONAL SURFACE WATER
SAMPLING LOCATIONS

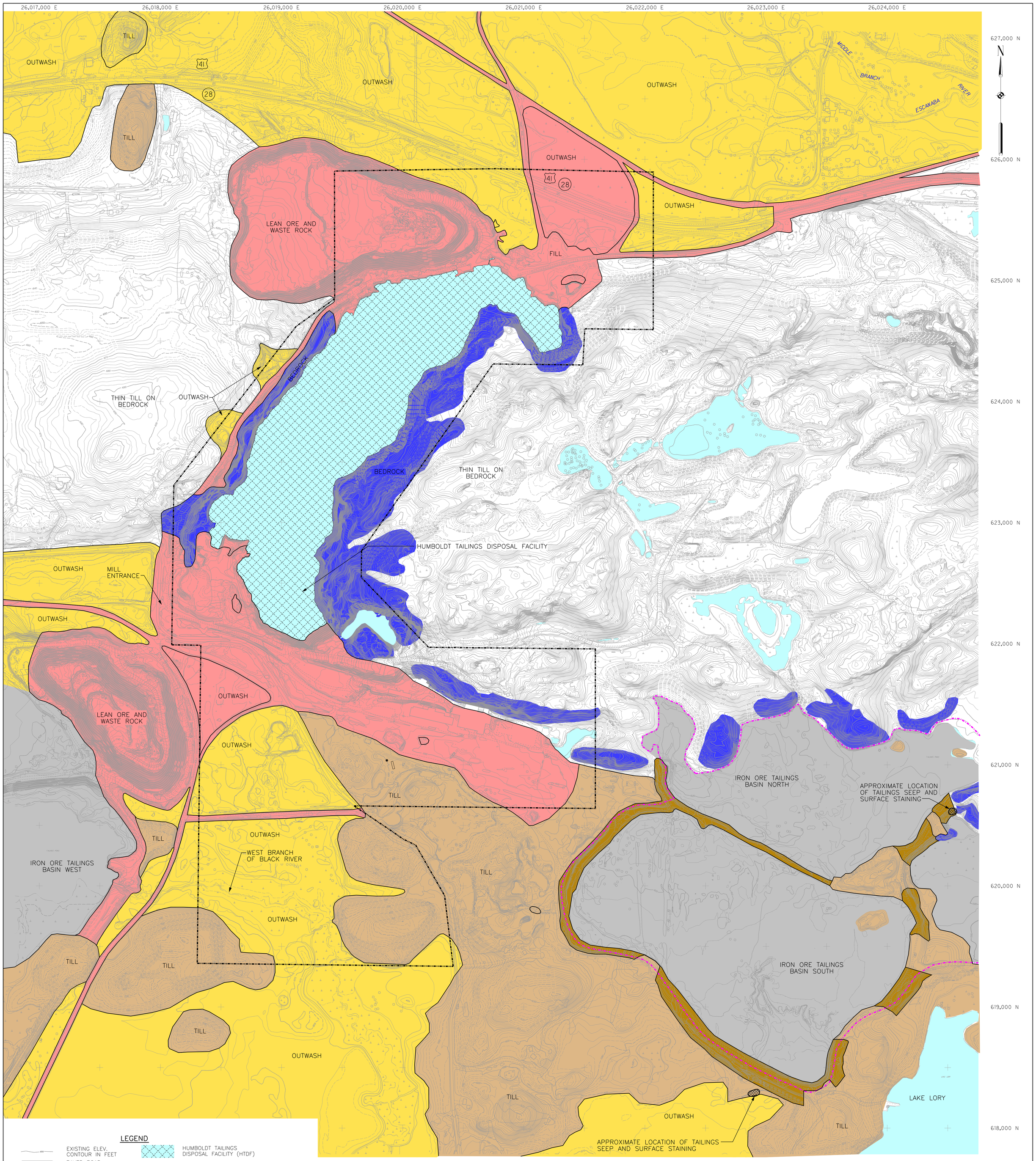
Scale: 0 1,500 3,000 Feet

Date: AUGUST, 2007

Prepared by: DAT

Project No: 06W003

M:\06w003\mxd\HGR\kmc_humboldt_Sampling_SurfaceWater_Fig4-2_11x17.mxd August 1, 2007



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 2 AND 11, T47N, R29W, HUMBOLDT TOWNSHIP, MARQUETTE COUNTY, MICHIGAN.
4. CONTOUR INTERVAL SHOWN IS 10 FOOT.

Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

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

Kennecott Eagle Minerals

FIGURE 5-1
HUMBOLDT MILL
HYDROGEOLOGICAL REPORT
SURFICIAL GEOLOGY

Scale: AS SHOWN	Date: OCTOBER, 2007
Prepared By: JOW	Project No. 06W003

L:\06w003\HGR\hgr_surf_geology_fig.3d
12/10/2007 jow

26,017,000 E | 26,018,000 E | 26,019,000 E | 26,020,000 E | 26,021,000 E | 26,022,000 E | 26,023,000 E | 26,024,000 E

627,000 N | 626,000 N | 625,000 N | 624,000 N | 623,000 N | 622,000 N | 621,000 N | 620,000 N | 619,000 N | 618,000 N

MIDDLE BRANCH ESCANABA RIVER
CONFLUENCE
WLR-1
WEIR #1
WEIR #2
HMP-004
HW-6A
HW-6
OUTFALL
HMP-009
HMP-002
HYG-1
HW-1
HW-3
HW-5A
HW-5
HMP-008
PIT
HW-2
HMP-001
HPL-005
HPL-004
PIT STATION #2
HPL-007
LOCATION A
HPL-006
HPL-003
HPL-002
PIT STATION #1
HPL-001
HMP-005
HMP-006
HUMBOLDT TAILINGS DISPOSAL FACILITY
HW-4
HMP-007
MILL ENTRANCE
LEAN ORE AND WASTE ROCK
OLD CRUSHER BUILDING
CRUSHER PLANT
FORMER SECONDARY CRUSHER BUILDING
ELECTRICAL SUBSTATION
FACILITY WATER TOWER
MAIN MILL
OFFICE/ MAINTENANCE BUILDING
CONCRETE FOUNDATIONS
IRON ORE TAILINGS BASIN NORTH
IRON ORE TAILINGS BASIN SOUTH
IRON ORE TAILINGS BASIN WEST
GAS MAIN PRESSURE RELIEF STATION
APPROXIMATE LOCATION OF TAILINGS SEEP AND SURFACE STAINING
TDP-002
WEIR
EFFLUENT DISCHARGE PIPE
TDP-001
DECANT WATER EFFLUENT RISER PIPE
PUMP HOUSE FOUNDATION
APPROXIMATE LOCATION OF TAILINGS SEEP AND SURFACE STAINING
LAKE LORY
WEST BRANCH BLACK RIVER

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 (HTDF)
- APPROXIMATE LIMITS OF PRE-EXISTING IRON ORE TAILINGS DISPOSAL FACILITY
- KEMC PROJECT LOCATION
- HW-1 EXISTING MONITORING WELL NUMBER AND LOCATION
- HMS-007 EXISTING STAFF GAUGE NUMBER AND LOCATION
- HMP-006 STAFF GUAGE OR PIEZOMETER NUMBER AND LOCATION
- HPL-001 HTDF SAMPLING POINT 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. SITE LOCATION: PROJECT SITE WITHIN SECTIONS 2 AND 11, T47N, R29W, HUMBOLDT TOWNSHIP, MARQUETTE COUNTY, MICHIGAN.
4. CONTOUR INTERVAL SHOWN IS 10 FOOT.

0 300' 600'

Foth Infrastructure & Environment, LLC			
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CHECKED BY:	JSL	DATE:	OCT. '07
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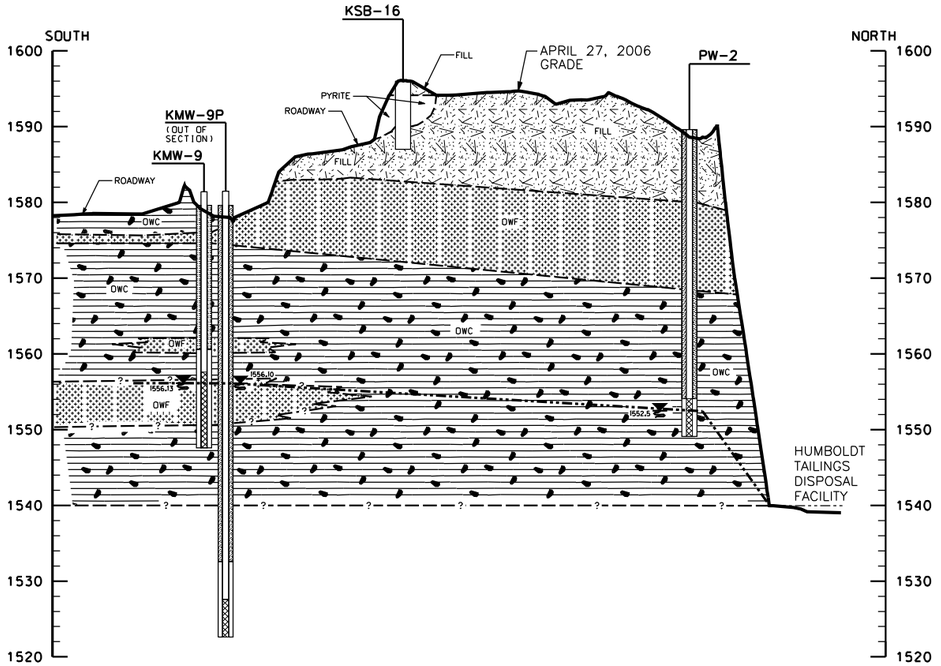
Kennecott Eagle Minerals

FIGURE 5-2
HUMBOLDT MILL
HYDROGEOLOGICAL REPORT
GEOLOGIC CROSS SECTION LOCATIONS

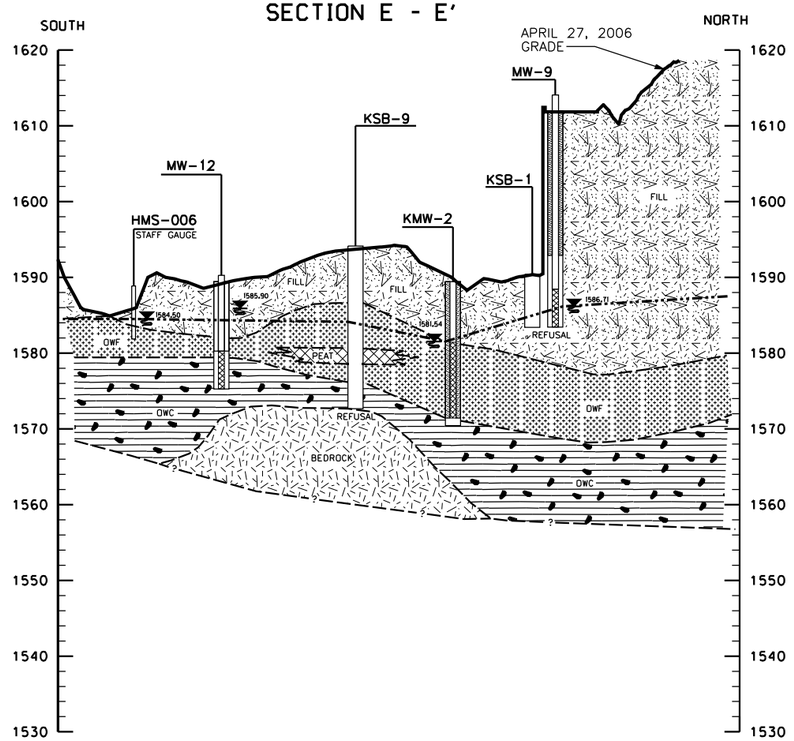
Scale:	AS SHOWN	Date:	OCTOBER, 2007
Prepared By:	JOW	Project No.	06W003

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12/10/2007 jow

SECTION A - A'

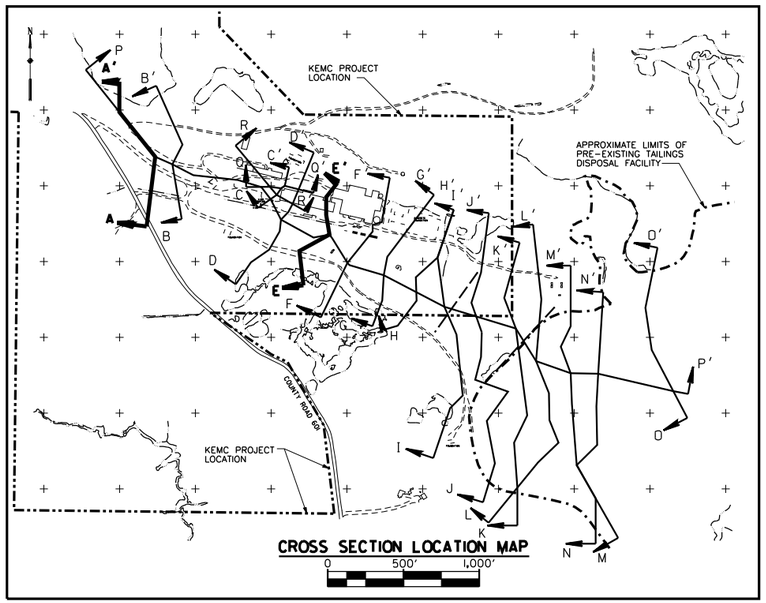


SECTION E - E'



LEGEND

- F FILL — SAND, GRAVEL AND MINE WASTE ROCK
- Owf FINE-GRAINED OUTWASH DEPOSITS — GLACIAL FLUVIAL STRATIFIED SAND AND SILT
- Owc COARSE-GRAINED OUTWASH DEPOSITS — GLACIAL FLUVIAL STRATIFIED SAND, GRAVEL, COBBLES AND BOULDERS
- P PEAT
- T IRON ORE TAILINGS
- IC ICE-CONTACT DEPOSITS — ABLATION TILL, FLOW TILL, GLACIO-FLUVIAL SILT, CLAY AND SAND
- PCu UNDIFFERENTIATED BEDROCK — LOWER PROTEROZOIC METASEDIMENTS AND INTRUSIVE ROCKS AND ARCHEAN GNEISS
- INFERRED GEOLOGIC CONTACT
- 1556.13 (KMW-9) WATER LEVEL ELEVATION (11/06)•

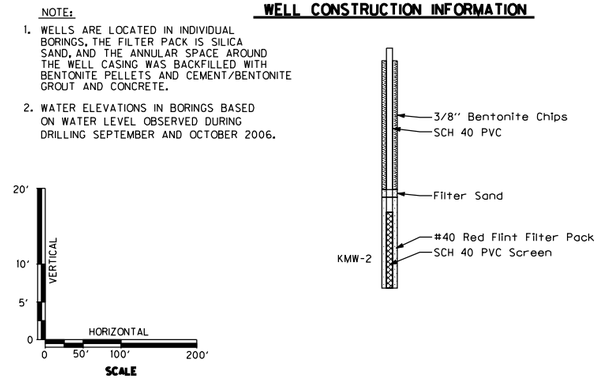


CROSS SECTION LOCATION MAP

NOTE:

1. WELLS ARE LOCATED IN INDIVIDUAL BORINGS, THE FILTER PACK IS SILICA SAND, AND THE ANNULAR SPACE AROUND THE WELL CASING WAS BACKFILLED WITH BENTONITE PELLETS AND CEMENT/BENTONITE GROUT AND CONCRETE.
2. WATER ELEVATIONS IN BORINGS BASED ON WATER LEVEL OBSERVED DURING DRILLING SEPTEMBER AND OCTOBER 2006.

WELL CONSTRUCTION INFORMATION



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

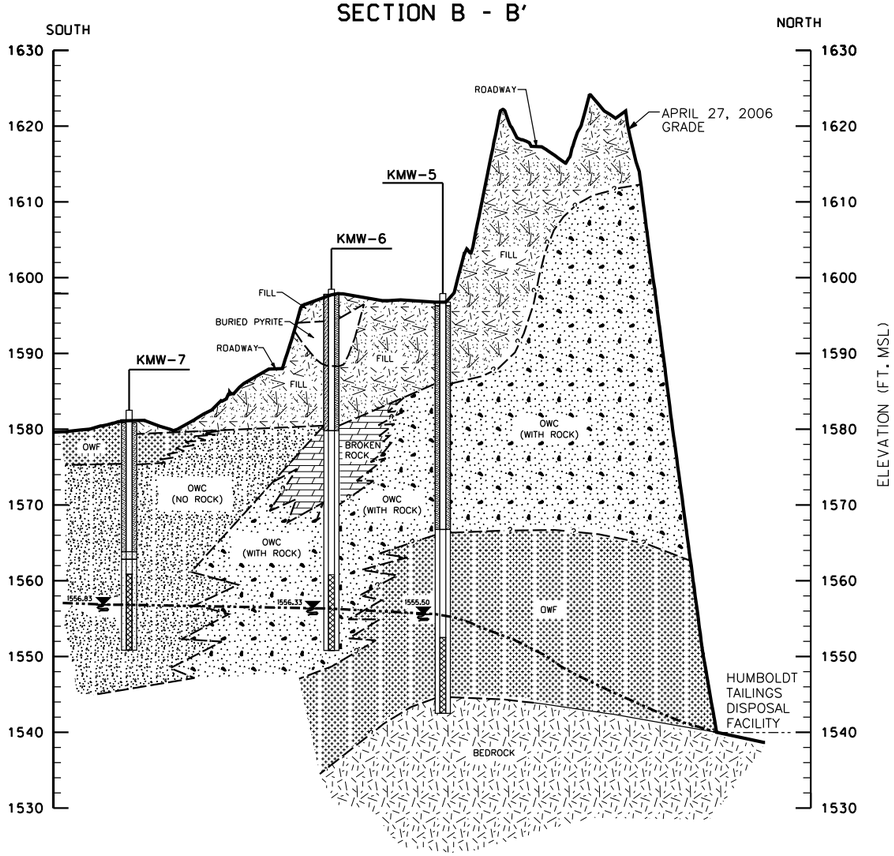
Kennecott Eagle Minerals

FIGURE 5-3
HUMBOLDT MILL
HYDROGEOLOGICAL REPORT
GEOLOGIC CROSS SECTIONS A-A' AND E-E'

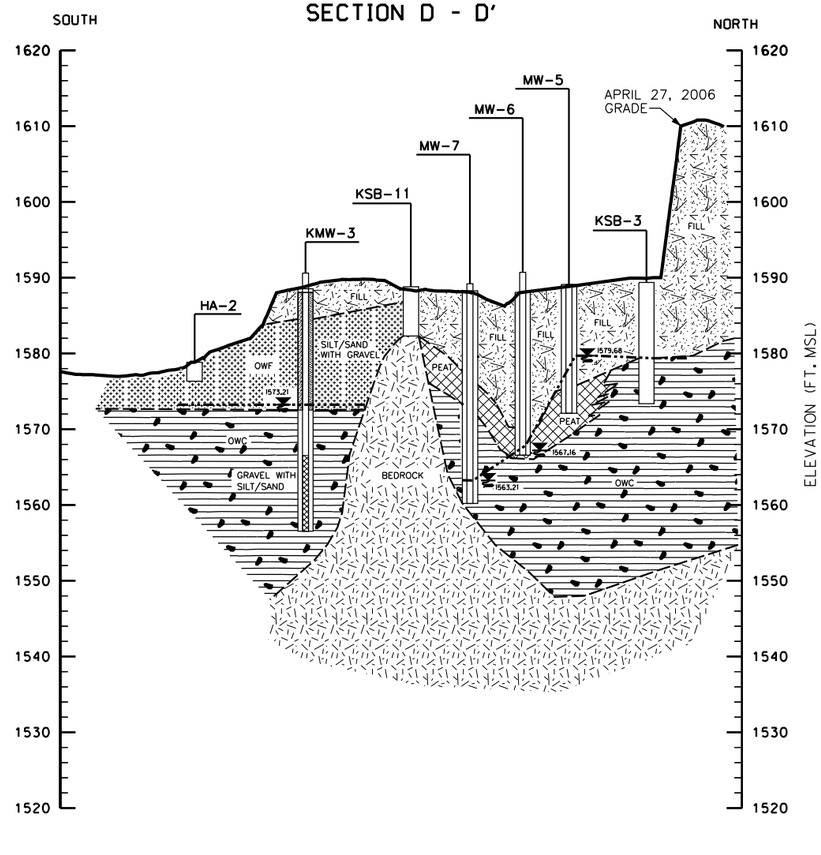
Scale: AS SHOWN	Date: NOVEMBER, 2007
Prepared By: JOW	Project No. 06W003

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12/11/2007 jow

SECTION B - B'



SECTION D - D'

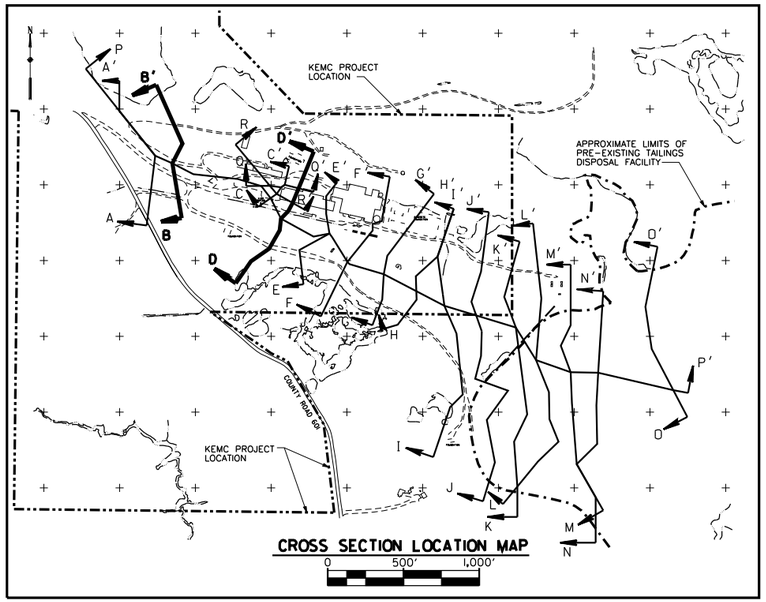


LEGEND

- F FILL — SAND, GRAVEL AND MINE WASTE ROCK
- Owf FINE-GRAINED OUTWASH DEPOSITS — GLACIAL FLUVIAL STRATIFIED SAND AND SILT
- Owc COARSE-GRAINED OUTWASH DEPOSITS — GLACIAL FLUVIAL STRATIFIED SAND, GRAVEL, COBBLES AND BOULDERS
- P PEAT
- T IRON ORE TAILINGS
- IC ICE-CONTACT DEPOSITS — ABLATION TILL, FLOW TILL, GLACIO-FLUVIAL SILT, CLAY AND SAND
- PCu UNDIFFERENTIATED BEDROCK — LOWER PROTEROZOIC METASEDIMENTS AND INTRUSIVE ROCKS AND ARCHEAN GNEISS

BEDROCK

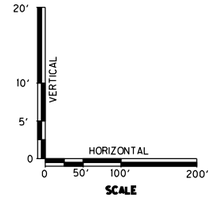
- INFERRED GEOLOGIC CONTACT
- 1556.83 (KMW-7) WATER LEVEL ELEVATION (11/06)*

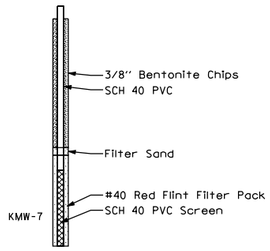


WELL CONSTRUCTION INFORMATION

NOTE:

1. WELLS ARE LOCATED IN INDIVIDUAL BORINGS, THE FILTER PACK IS SILICA SAND, AND THE ANNULAR SPACE AROUND THE WELL CASING WAS BACKFILLED WITH BENTONITE PELLETS AND CEMENT/BENTONITE GROUT AND CONCRETE.
2. WATER ELEVATIONS IN BORINGS BASED ON WATER LEVEL OBSERVED DURING DRILLING SEPTEMBER AND OCTOBER 2006.





Foth Infrastructure & Environment, LLC			
REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	JSL	DATE:	NOV. '07
APPROVED BY:	SVDI	DATE:	NOV. '07
APPROVED BY:		DATE:	

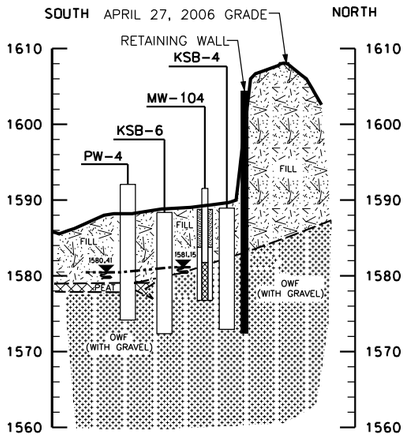
Kennecott Eagle Minerals

FIGURE 5-4
HUMBOLDT MILL
HYDROGEOLOGICAL REPORT
GEOLOGIC CROSS SECTIONS B-B' AND D-D'

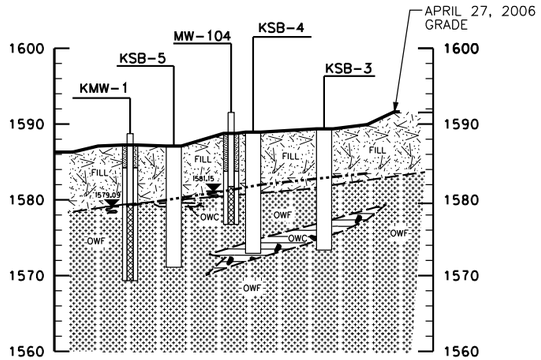
Scale:	AS SHOWN	Date:	NOVEMBER, 2007
Prepared By:	JOW	Project No.	06W003

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12/11/2007 jow

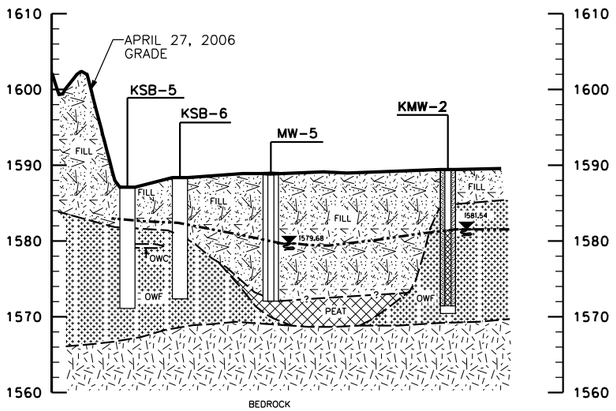
SECTION C - C'

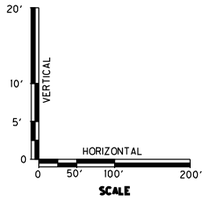


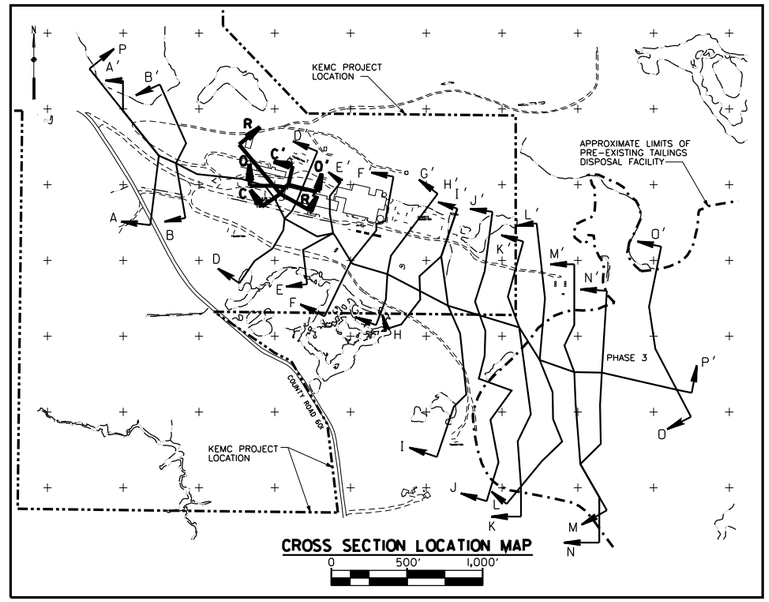
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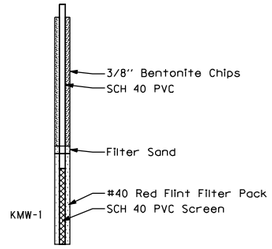
SECTION R - R'







WELL CONSTRUCTION INFORMATION



NOTE:

1. WELLS ARE LOCATED IN INDIVIDUAL BORINGS, THE FILTER PACK IS SILICA SAND, AND THE ANNULAR SPACE AROUND THE WELL CASING WAS BACKFILLED WITH BENTONITE PELLETS AND CEMENT/BENTONITE GROUT AND CONCRETE.
2. WATER ELEVATIONS IN BORINGS BASED ON WATER LEVEL OBSERVED DURING DRILLING SEPTEMBER AND OCTOBER 2006.

LEGEND

- F FILL — SAND, GRAVEL AND MINE WASTE ROCK
- Owf FINE-GRAINED OUTWASH DEPOSITS — GLACIAL FLUVIAL STRATIFIED SAND AND SILT
- Owc COARSE-GRAINED OUTWASH DEPOSITS — GLACIAL FLUVIAL STRATIFIED SAND, GRAVEL, COBBLES AND BOULDERS
- P PEAT
- T IRON ORE TAILINGS
- IC ICE-CONTACT DEPOSITS — ABLATION TILL, FLOW TILL, GLACIO-FLUVIAL SILT, CLAY AND SAND
- PCu UNDIFFERENTIATED BEDROCK — LOWER PROTEROZOIC METASEDIMENTS AND INTRUSIVE ROCKS AND ARCHEAN GNEISS
- INFERRED GEOLOGIC CONTACT
- 1579.09 (KMW-1) (11/06) WATER LEVEL ELEVATION (11/06)*

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

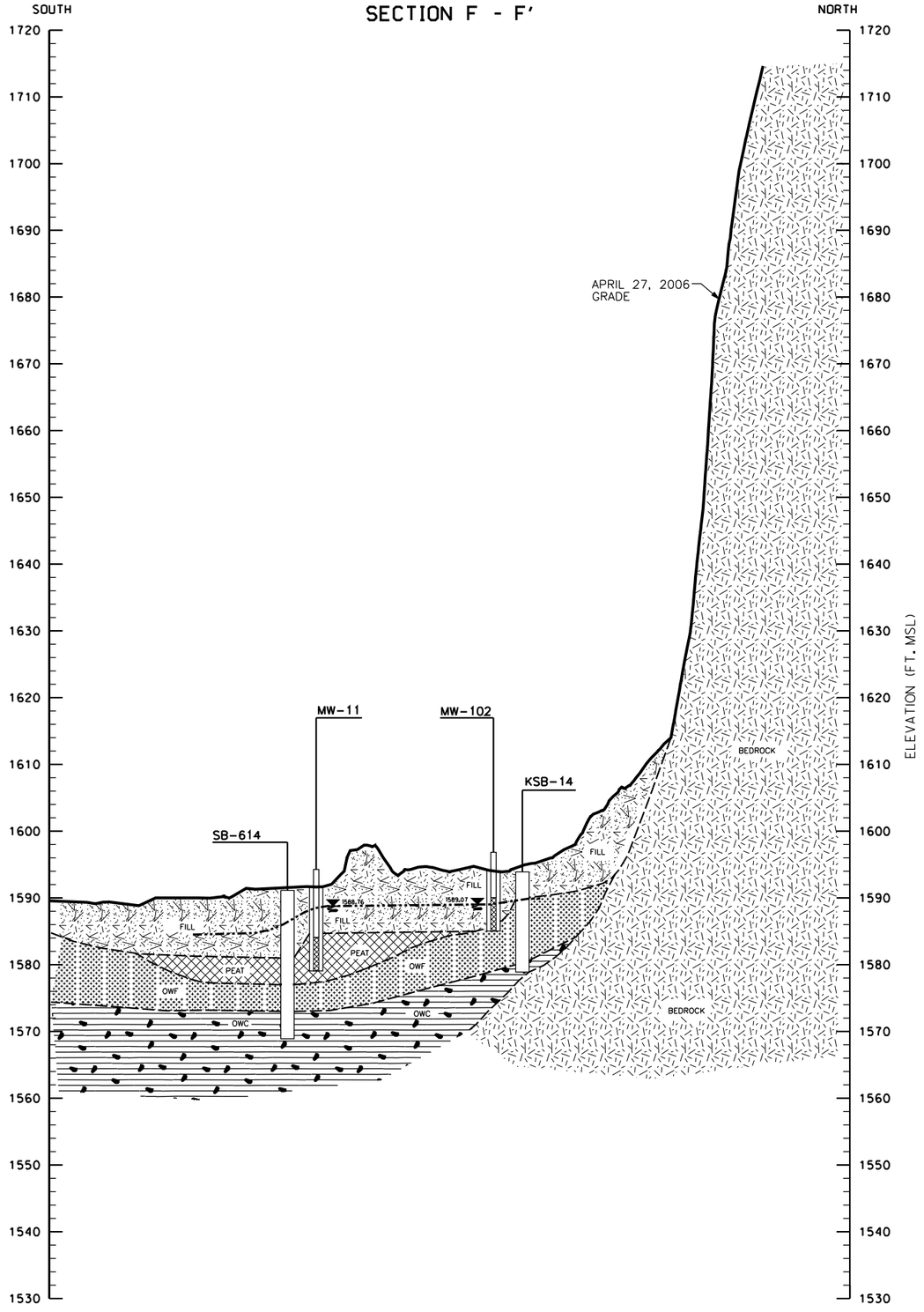
Kennecott Eagle Minerals

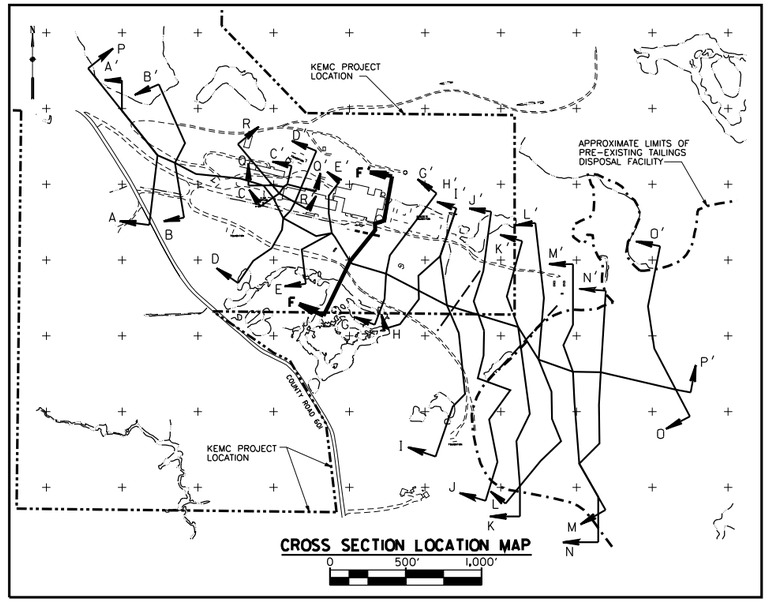
FIGURE 5-5
HUMBOLDT MILL
HYDROGEOLOGICAL REPORT
GEOLOGIC CROSS SECTIONS C-C', Q-Q' AND R-R'

Scale: AS SHOWN	Date: NOVEMBER, 2007
Prepared By: JOW	Project No. 06W003

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12/11/2007 jow

SECTION F - F'





LEGEND

- F FILL — SAND, GRAVEL AND MINE WASTE ROCK
- Owf FINE-GRAINED OUTWASH DEPOSITS — GLACIAL FLUVIAL STRATIFIED SAND AND SILT
- Owc COARSE-GRAINED OUTWASH DEPOSITS — GLACIAL FLUVIAL STRATIFIED SAND, GRAVEL, COBBLES AND BOULDERS
- P PEAT
- T IRON ORE TAILINGS
- IC ICE-CONTACT DEPOSITS — ABLATION TILL, FLOW TILL, GLACIO-FLUVIAL SILT, CLAY AND SAND
- PCu UNDIFFERENTIATED BEDROCK — LOWER PROTEROZOIC METASEDIMENTS AND INTRUSIVE ROCKS AND ARCHEAN GNEISS

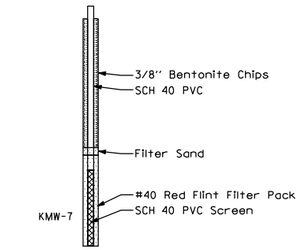
BEDROCK

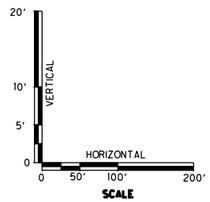
- INFERRED GEOLOGIC CONTACT
- 1588.76 (MW-11) WATER LEVEL ELEVATION (11/06)•

WELL CONSTRUCTION INFORMATION

NOTE:

1. WELLS ARE LOCATED IN INDIVIDUAL BORINGS, THE FILTER PACK IS SILICA SAND, AND THE ANNULAR SPACE AROUND THE WELL CASING WAS BACKFILLED WITH BENTONITE PELLETS AND CEMENT/BENTONITE GROUT AND CONCRETE.
2. WATER ELEVATIONS IN BORINGS BASED ON WATER LEVEL OBSERVED DURING DRILLING SEPTEMBER AND OCTOBER 2006.





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REVISED	DATE	BY	DESCRIPTION
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APPROVED BY:	SVD1	DATE: NOV. '07	
APPROVED BY:		DATE:	

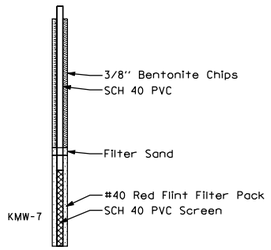
Kennecott Eagle Minerals

FIGURE 5-6
HUMBOLDT MILL
HYDORGEOLOGICAL REPORT
GEOLOGIC CROSS SECTION F-F'

Scale: AS SHOWN	Date: NOVEMBER, 2007
Prepared By: JOW	Project No. 06W003

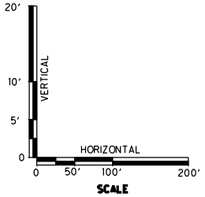
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12/11/2007 jow

WELL CONSTRUCTION INFORMATION

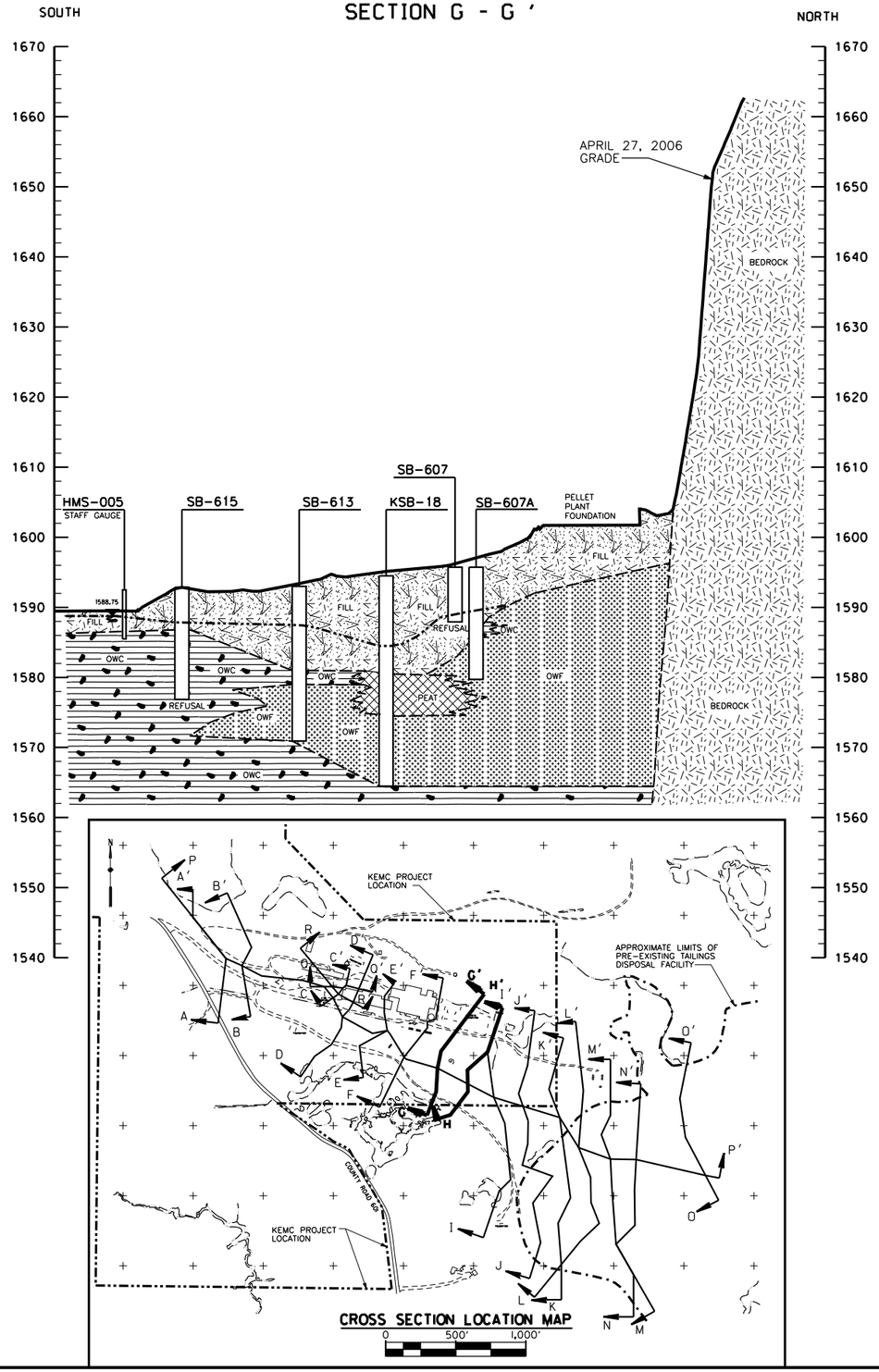


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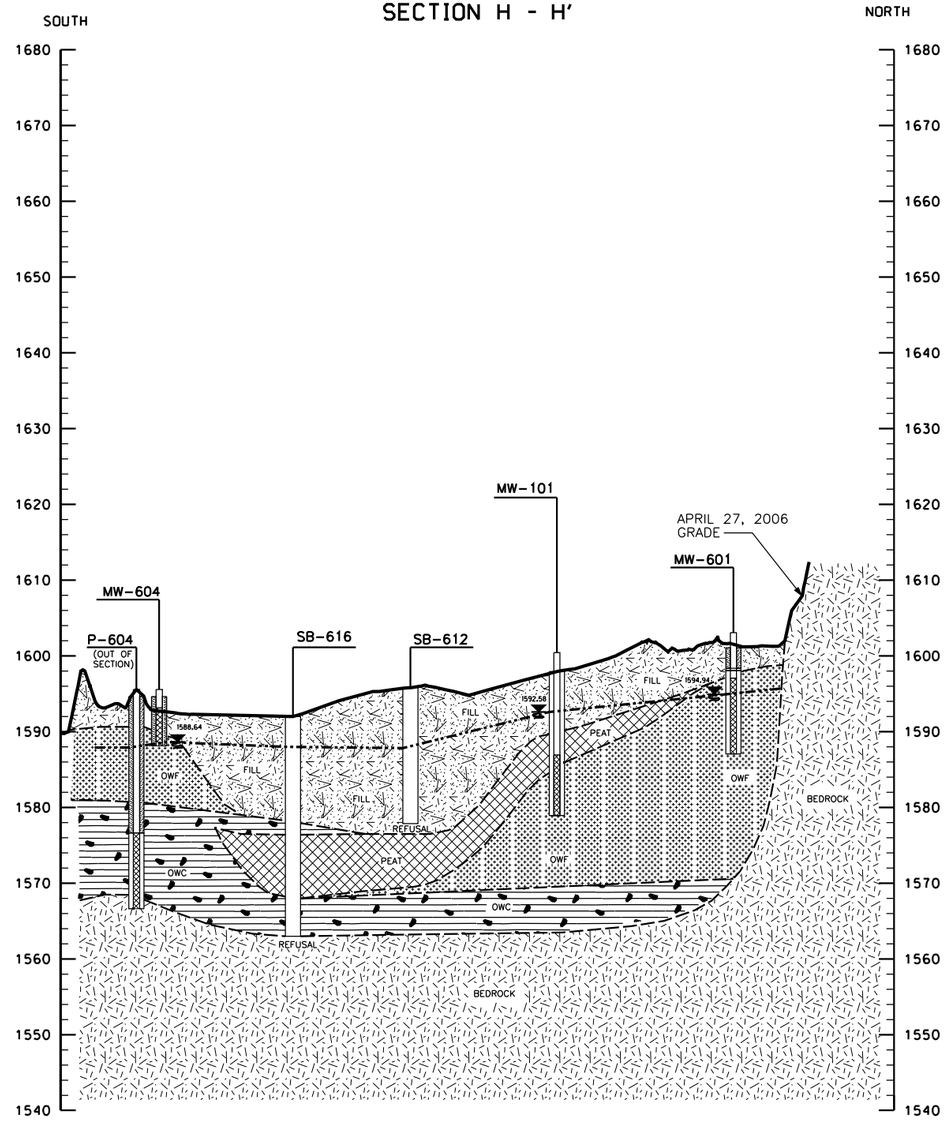
1. WELLS ARE LOCATED IN INDIVIDUAL BORINGS. THE FILTER PACK IS SILICA SAND, AND THE ANNULAR SPACE AROUND THE WELL CASING WAS BACKFILLED WITH BENTONITE PELLETS AND CEMENT/BENTONITE GROUT AND CONCRETE.
2. WATER ELEVATIONS IN BORINGS BASED ON WATER LEVEL OBSERVED DURING DRILLING SEPTEMBER AND OCTOBER 2006.



SECTION G - G '



SECTION H - H'



LEGEND

- F FILL — SAND, GRAVEL AND MINE WASTE ROCK
- Owf FINE-GRAINED OUTWASH DEPOSITS — GLACIAL FLUVIAL STRATIFIED SAND AND SILT
- Owc COARSE-GRAINED OUTWASH DEPOSITS — GLACIAL FLUVIAL STRATIFIED SAND, GRAVEL, COBBLES AND BOULDERS
- P PEAT
- T IRON ORE TAILINGS
- IC ICE-CONTACT DEPOSITS — ABLATION TILL, FLOW TILL, GLACIO-FLUVIAL SILT, CLAY AND SAND
- PCu UNDIFFERENTIATED BEDROCK — LOWER PROTEROZOIC METASEDIMENTS AND INTRUSIVE ROCKS AND ARCHEAN GNEISS
- INFERRED GEOLOGIC CONTACT
- 1588.64 (MW-604) WATER LEVEL ELEVATION (11/06)*

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CHECKED BY:	JSL	DATE: NOV. '07	
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FIGURE 5-7
HUMBOLDT MILL
HYDROGEOLOGICAL REPORT
GEOLOGIC CROSS SECTIONS G-G' AND H-H'

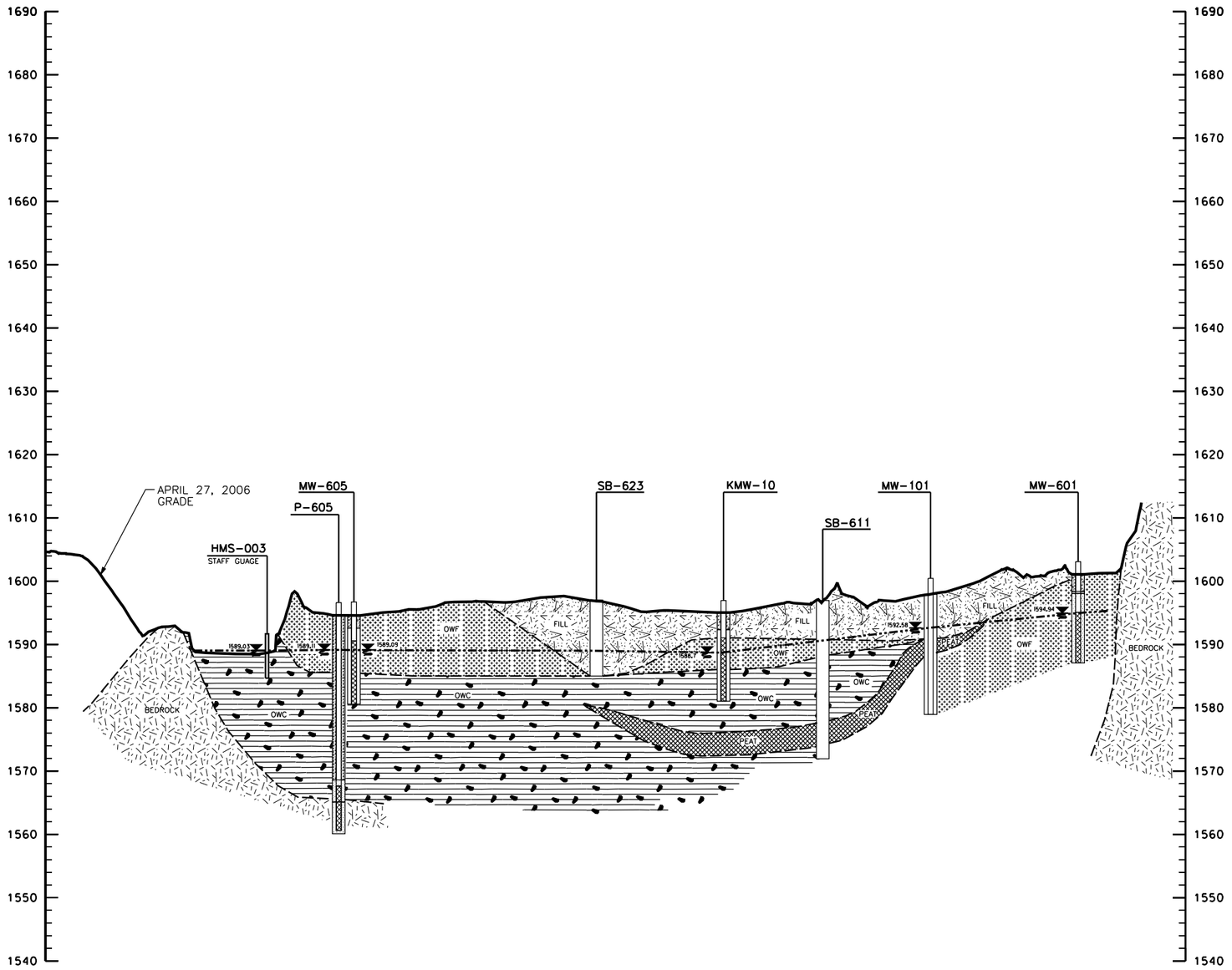
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Prepared By:	JOW	Project No.	06W003

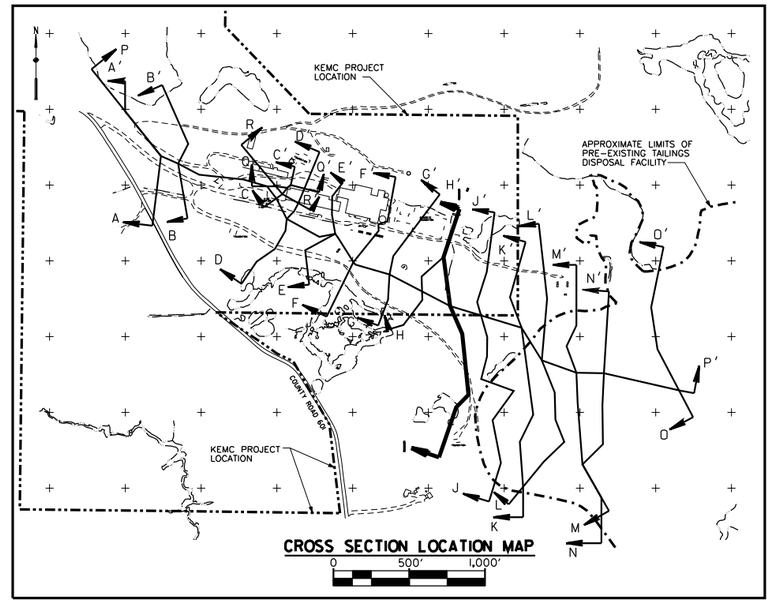
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12/11/2007 jow

SECTION I - I'

SOUTH

NORTH

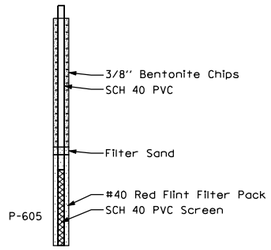




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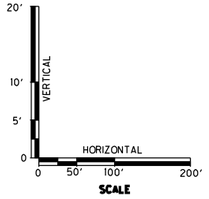
- F FILL — SAND, GRAVEL AND MINE WASTE ROCK
- Owf FINE-GRAINED OUTWASH DEPOSITS — GLACIAL FLUVIAL STRATIFIED SAND AND SILT
- Owc COARSE-GRAINED OUTWASH DEPOSITS — GLACIAL FLUVIAL STRATIFIED SAND, GRAVEL, COBBLES AND BOULDERS
- P PEAT
- T IRON ORE TAILINGS
- IC ICE-CONTACT DEPOSITS — ABLATION TILL, FLOW TILL, GLACIO-FLUVIAL SILT, CLAY AND SAND
- PCu BEDROCK — UNDIFFERENTIATED BEDROCK, LOWER PROTEROZOIC METASEDIMENTS AND INTRUSIVE ROCKS AND ARCHEAN GNEISS
- INFERRED GEOLOGIC CONTACT
- 1589.09 (MW-605) WATER LEVEL ELEVATION (11/06)*

WELL CONSTRUCTION INFORMATION



NOTE:

1. WELLS ARE LOCATED IN INDIVIDUAL BORINGS. THE FILTER PACK IS SILICA SAND, AND THE ANNULAR SPACE AROUND THE WELL CASING WAS BACKFILLED WITH BENTONITE PELLETS AND CEMENT/BENTONITE GROUT AND CONCRETE.
2. WATER ELEVATIONS IN BORINGS BASED ON WATER LEVEL OBSERVED DURING DRILLING SEPTEMBER AND OCTOBER 2006.



Foth Infrastructure & Environment, LLC			
REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	JSL	DATE:	NOV. '07
APPROVED BY:	SVD1	DATE:	NOV. '07
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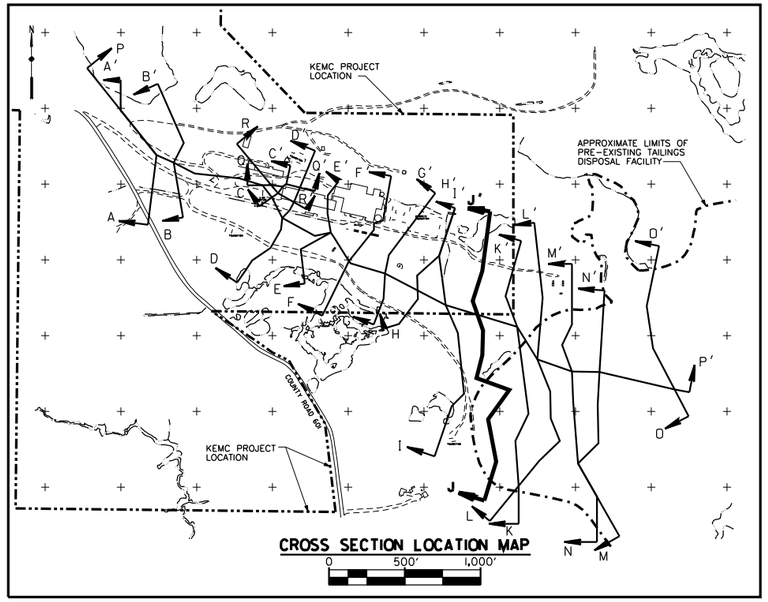
Kennecott Eagle Minerals

FIGURE 5-8
HUMBOLDT MILL
HYDROGEOLOGICAL REPORT
GEOLOGIC CROSS SECTION I-I'

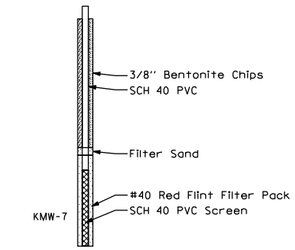
Scale:	AS SHOWN	Date:	NOVEMBER, 2007
Prepared By:	JOW	Project No.	06W003

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12/11/2007 jow

SECTION J - J'

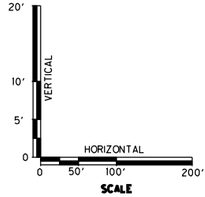


WELL CONSTRUCTION INFORMATION



NOTE:

1. WELLS ARE LOCATED IN INDIVIDUAL BORINGS, THE FILTER PACK IS SILICA SAND, AND THE ANNULAR SPACE AROUND THE WELL CASING WAS BACKFILLED WITH BENTONITE PELLETS AND CEMENT/BENTONITE GROUT AND CONCRETE.
2. WATER ELEVATIONS IN BORINGS BASED ON WATER LEVEL OBSERVED DURING DRILLING SEPTEMBER AND OCTOBER 2006.



LEGEND

- F FILL — SAND, GRAVEL AND MINE WASTE ROCK
- Owf FINE-GRAINED OUTWASH DEPOSITS — GLACIAL FLUVIAL STRATIFIED SAND AND SILT
- Owc COARSE-GRAINED OUTWASH DEPOSITS — GLACIAL FLUVIAL STRATIFIED SAND, GRAVEL, COBBLES AND BOULDERS
- T IRON ORE TAILINGS
- P PEAT
- IC ICE-CONTACT DEPOSITS — ABLATION TILL, FLOW TILL, GLACIO-FLUVIAL SILT, CLAY AND SAND
- BEDROCK PCu UNDIFFERENTIATED BEDROCK — LOWER PROTEROZOIC METASEDIMENTS AND INTRUSIVE ROCKS AND ARCHEAN GNEISS
- INFERRED GEOLOGIC CONTACT
- 1594.66 (SB-636) (11/06)• WATER LEVEL ELEVATION

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APPROVED BY:		DATE:

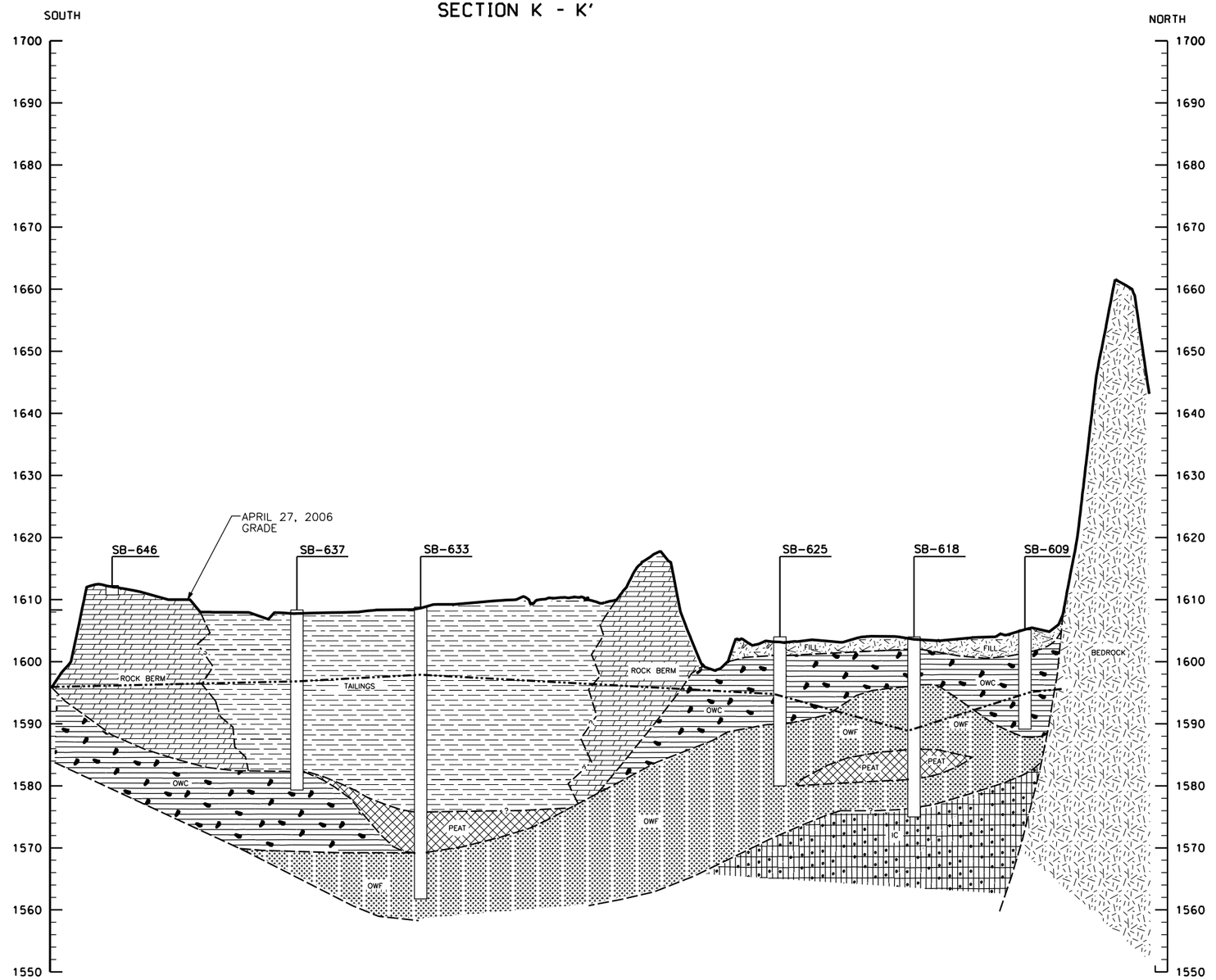
Kennecott Eagle Minerals

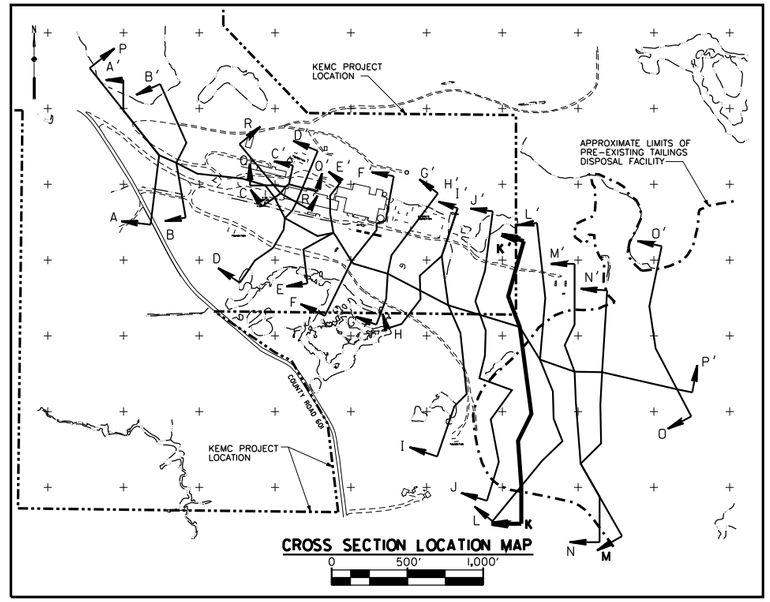
FIGURE 5-9
HUMBOLDT MILL
HYDROGEOLOGICAL REPORT
GEOLOGIC CROSS SECTION J-J'

Scale: AS SHOWN	Date: NOVEMBER, 2007
Prepared By: JOW	Project No. 06W003

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SECTION K - K'

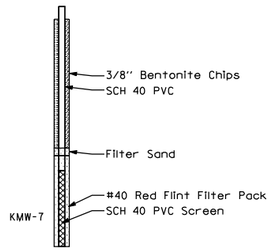




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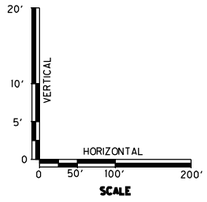
- F FILL — SAND, GRAVEL AND MINE WASTE ROCK
- Owf FINE-GRAINED OUTWASH DEPOSITS — GLACIAL FLUVIAL STRATIFIED SAND AND SILT
- Owc COARSE-GRAINED OUTWASH DEPOSITS — GLACIAL FLUVIAL STRATIFIED SAND, GRAVEL, COBBLES AND BOULDERS
- P PEAT
- T IRON ORE TAILINGS
- IC ICE-CONTACT DEPOSITS — ABLATION TILL, FLOW TILL, GLACIO-FLUVIAL SILT, CLAY AND SAND
- PCu UNDIFFERENTIATED BEDROCK — LOWER PROTEROZOIC METASEDIMENTS AND INTRUSIVE ROCKS AND ARCHEAN GNEISS
- INFERRED GEOLOGIC CONTACT
- 1584.79 (SB-633) WATER LEVEL ELEVATION (11/06)*

WELL CONSTRUCTION INFORMATION



NOTE:

1. WELLS ARE LOCATED IN INDIVIDUAL BORINGS. THE FILTER PACK IS SILICA SAND, AND THE ANNULAR SPACE AROUND THE WELL CASING WAS BACKFILLED WITH BENTONITE PELLETS AND CEMENT/BENTONITE GROUT AND CONCRETE.
2. WATER ELEVATIONS IN BORINGS BASED ON WATER LEVEL OBSERVED DURING DRILLING SEPTEMBER AND OCTOBER 2006.



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APPROVED BY:		DATE:

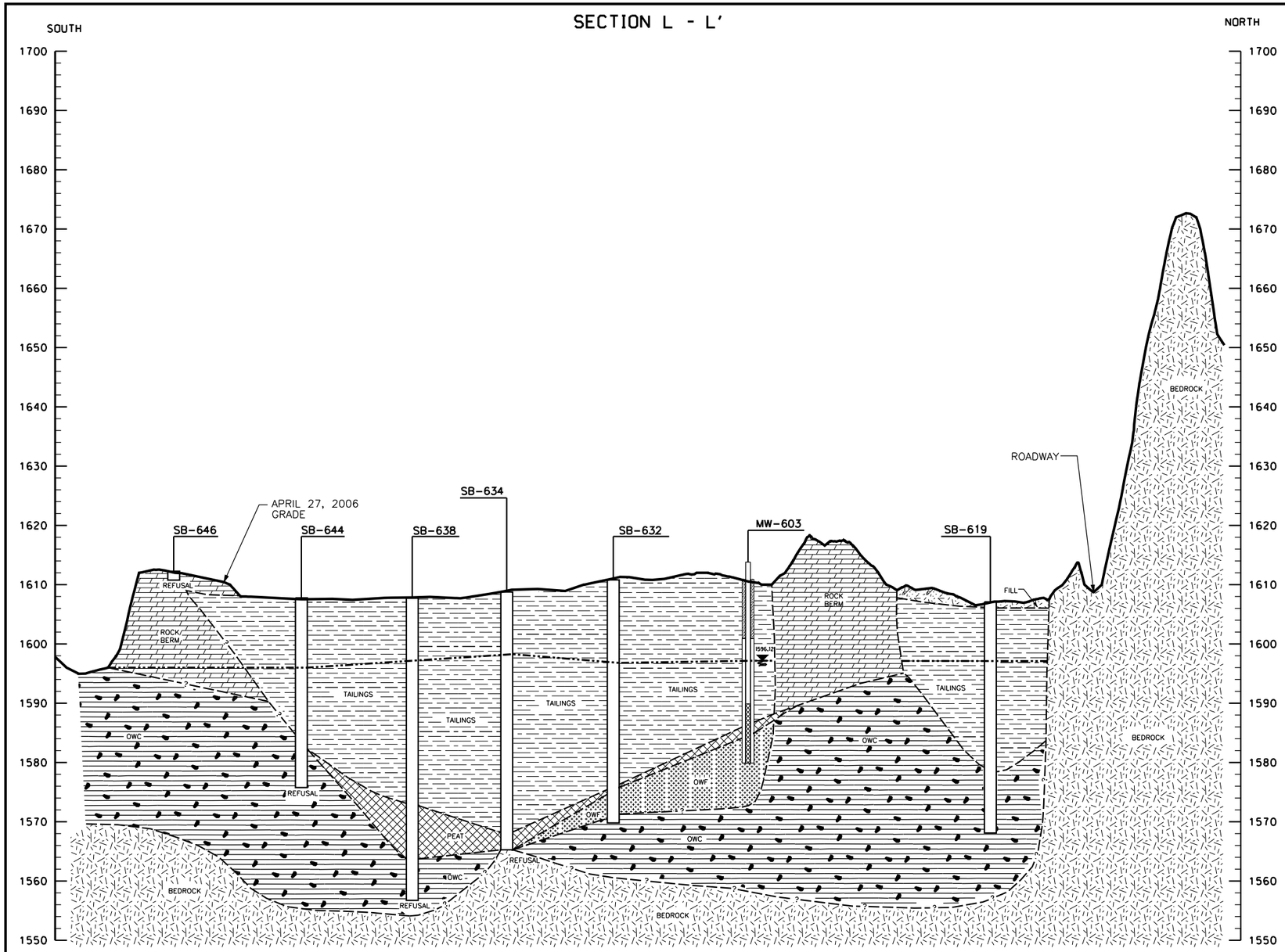
Kennecott Eagle Minerals

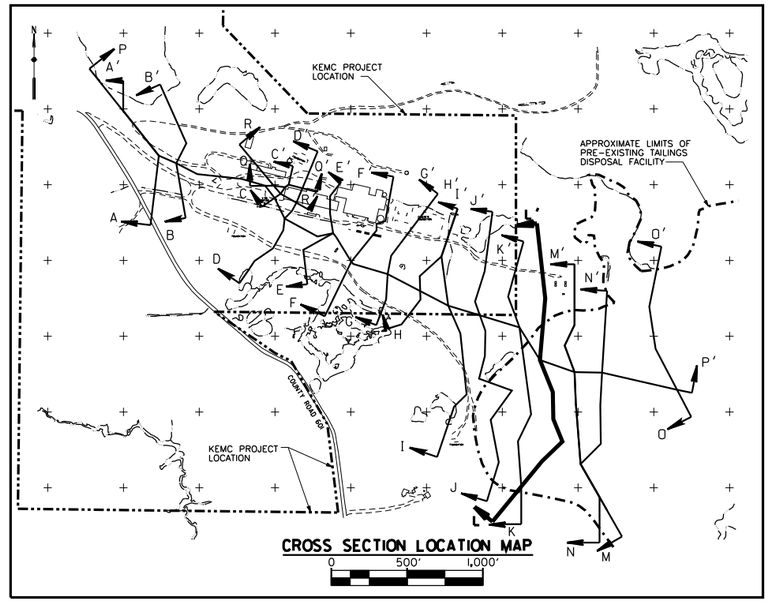
FIGURE 5-10
HUMBOLDT MILL
HYDROGEOLOGICAL REPORT
GEOLOGIC CROSS SECTION K-K'

Scale: AS SHOWN	Date: NOVEMBER, 2007
Prepared By: JOW	Project No. 06W003

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SECTION L - L'

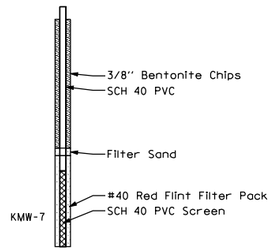




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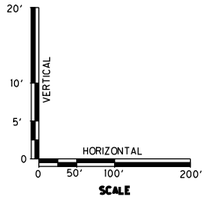
- F FILL — SAND, GRAVEL AND MINE WASTE ROCK
- Owf FINE-GRAINED OUTWASH DEPOSITS — GLACIAL FLUVIAL STRATIFIED SAND AND SILT
- Owc COARSE-GRAINED OUTWASH DEPOSITS — GLACIAL FLUVIAL STRATIFIED SAND, GRAVEL, COBBLES AND BOULDERS
- P PEAT
- T IRON ORE TAILINGS
- IC ICE-CONTACT DEPOSITS — ABLATION TILL, FLOW TILL, GLACIO-FLUVIAL SILT, CLAY AND SAND
- PCu UNDIFFERENTIATED BEDROCK — LOWER PROTEROZOIC METASEDIMENTS AND INTRUSIVE ROCKS AND ARCHEAN GNEISS
- INFERRED GEOLOGIC CONTACT
- 1556.83 (KMW-7) WATER LEVEL ELEVATION (11/06)•

WELL CONSTRUCTION INFORMATION



NOTE:

1. WELLS ARE LOCATED IN INDIVIDUAL BORINGS. THE FILTER PACK IS SILICA SAND, AND THE ANNULAR SPACE AROUND THE WELL CASING WAS BACKFILLED WITH BENTONITE PELLETS AND CEMENT/BENTONITE GROUT AND CONCRETE.
2. WATER ELEVATIONS IN BORINGS BASED ON WATER LEVEL OBSERVED DURING DRILLING SEPTEMBER AND OCTOBER 2006.



Foth Infrastructure & Environment, LLC			
REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	JSL	DATE: NOV. '07
APPROVED BY:	SVDI	DATE: NOV. '07
APPROVED BY:		DATE:

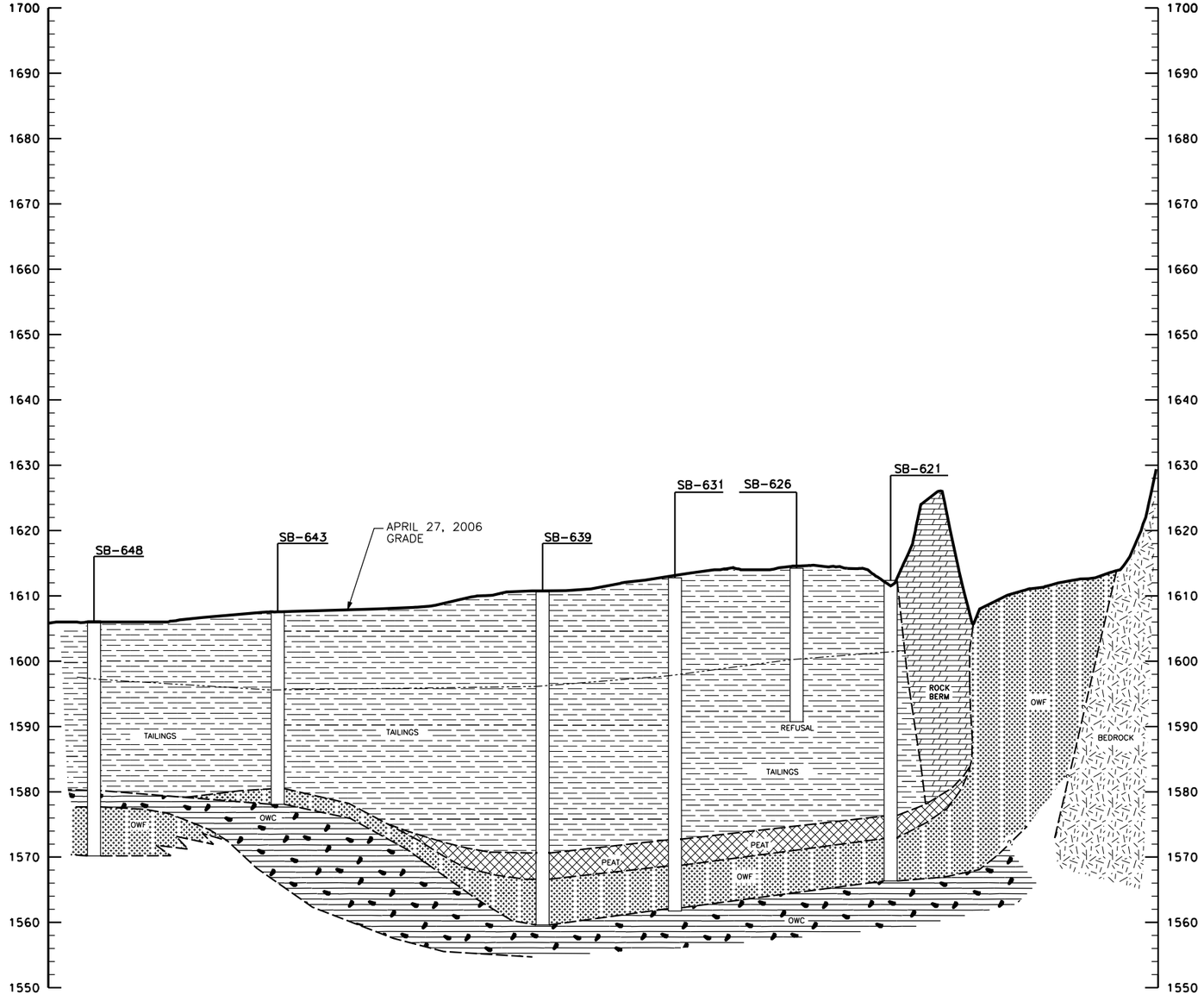
Kennecott Eagle Minerals

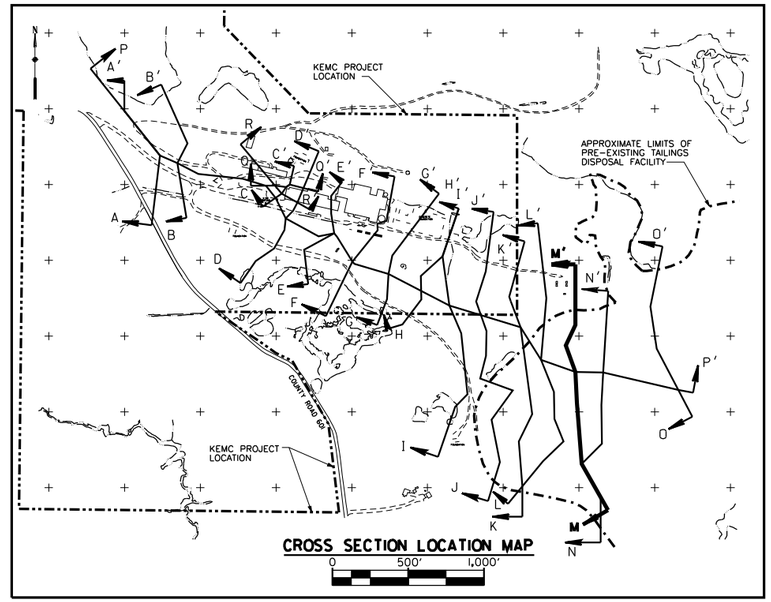
FIGURE 5-11
HUMBOLDT MILL
HYDROGEOLOGICAL REPORT
GEOLOGIC CROSS SECTION L-L'

Scale: AS SHOWN	Date: NOVEMBER, 2007
Prepared By: JOW	Project No. 06W003

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12/11/2007 jow

SECTION M - M'

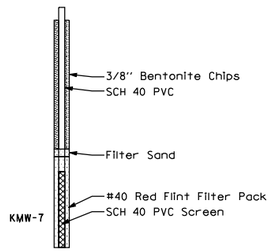




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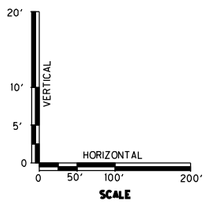
- F FILL — SAND, GRAVEL AND MINE WASTE ROCK
- Owf FINE-GRAINED OUTWASH DEPOSITS — GLACIAL FLUVIAL STRATIFIED SAND AND SILT
- Owc COARSE-GRAINED OUTWASH DEPOSITS — GLACIAL FLUVIAL STRATIFIED SAND, GRAVEL, COBBLES AND BOULDERS
- P PEAT
- T IRON ORE TAILINGS
- IC ICE-CONTACT DEPOSITS — ABLATION TILL, FLOW TILL, GLACIO-FLUVIAL SILT, CLAY AND SAND
- PCu UNDIFFERENTIATED BEDROCK — LOWER PROTEROZOIC METASEDIMENTS AND INTRUSIVE ROCKS AND ARCHEAN GNEISS
- INFERRED GEOLOGIC CONTACT
- 1597.18 (SB-648) WATER LEVEL ELEVATION (11/06)•

WELL CONSTRUCTION INFORMATION



NOTE:

1. WELLS ARE LOCATED IN INDIVIDUAL BORINGS. THE FILTER PACK IS SILICA SAND, AND THE ANNULAR SPACE AROUND THE WELL CASING WAS BACKFILLED WITH BENTONITE PELLETS AND CEMENT/BENTONITE GROUT AND CONCRETE.
2. WATER ELEVATIONS IN BORINGS BASED ON WATER LEVEL OBSERVED DURING DRILLING SEPTEMBER AND OCTOBER 2006.



Foth Infrastructure & Environment, LLC			
REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	JSL	DATE: NOV. '07	
APPROVED BY:	SVD1	DATE: NOV. '07	
APPROVED BY:		DATE:	

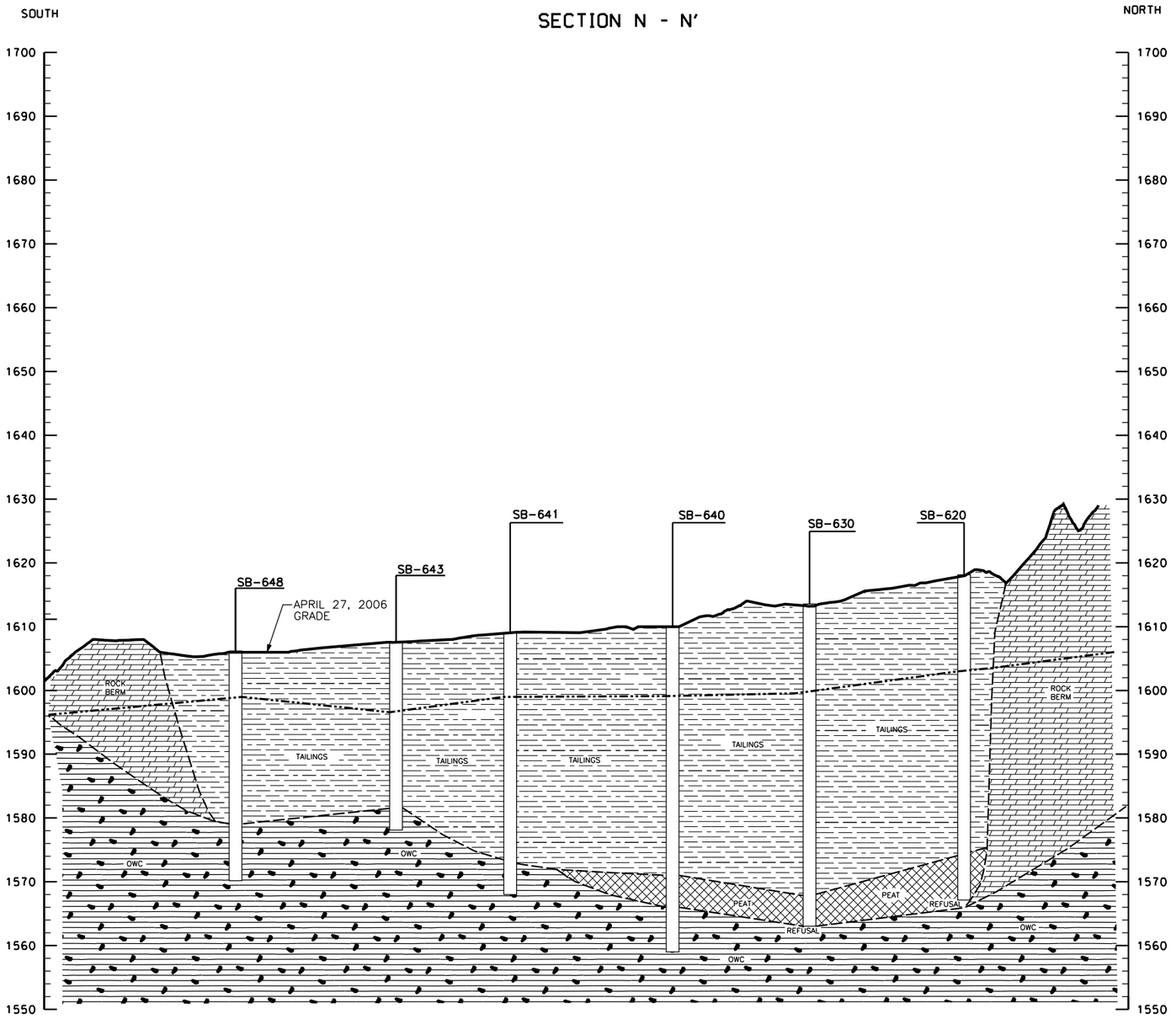
Kennecott Eagle Minerals

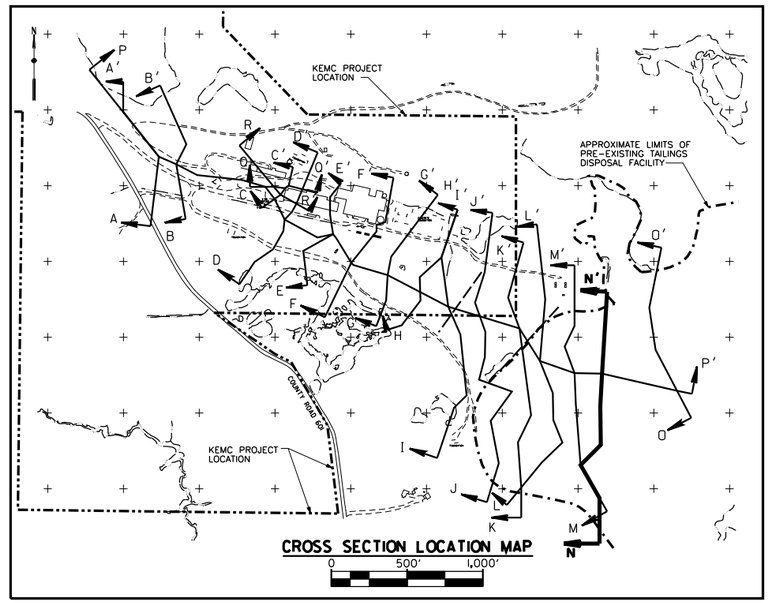
FIGURE 5-12
HUMBOLDT MILL
HYDROGEOLOGICAL REPORT
GEOLOGIC CROSS SECTION M-M'

Scale: AS SHOWN	Date: NOVEMBER, 2007
Prepared By: JOW	Project No. 06W003

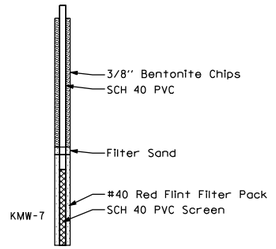
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SECTION N - N'





WELL CONSTRUCTION INFORMATION

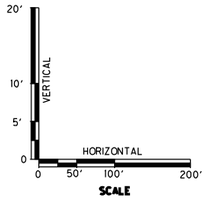


NOTE:

1. WELLS ARE LOCATED IN INDIVIDUAL BORINGS, THE FILTER PACK IS SILICA SAND, AND THE ANNULAR SPACE AROUND THE WELL CASING WAS BACKFILLED WITH BENTONITE PELLETS AND CEMENT/BENTONITE GROUT AND CONCRETE.
2. WATER ELEVATIONS IN BORINGS BASED ON WATER LEVEL OBSERVED DURING DRILLING SEPTEMBER AND OCTOBER 2006.

LEGEND

- F FILL — SAND, GRAVEL AND MINE WASTE ROCK
- Owf FINE-GRAINED OUTWASH DEPOSITS — GLACIAL FLUVIAL STRATIFIED SAND AND SILT
- Owc COARSE-GRAINED OUTWASH DEPOSITS — GLACIAL FLUVIAL STRATIFIED SAND, GRAVEL, COBBLES AND BOULDERS
- P PEAT
- T IRON ORE TAILINGS
- IC ICE-CONTACT DEPOSITS — ABLATION TILL, FLOW TILL, GLACIO-FLUVIAL SILT, CLAY AND SAND
- PCu UNDIFFERENTIATED BEDROCK — LOWER PROTEROZOIC METASEDIMENTS AND INTRUSIVE ROCKS AND ARCHEAN GNEISS (BEDROCK)
- INFERRED GEOLOGIC CONTACT
- 1556.63 (KMW-7) WATER LEVEL ELEVATION (11/06)*



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CHECKED BY:	JSL	DATE:	NOV. '07
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APPROVED BY:		DATE:	

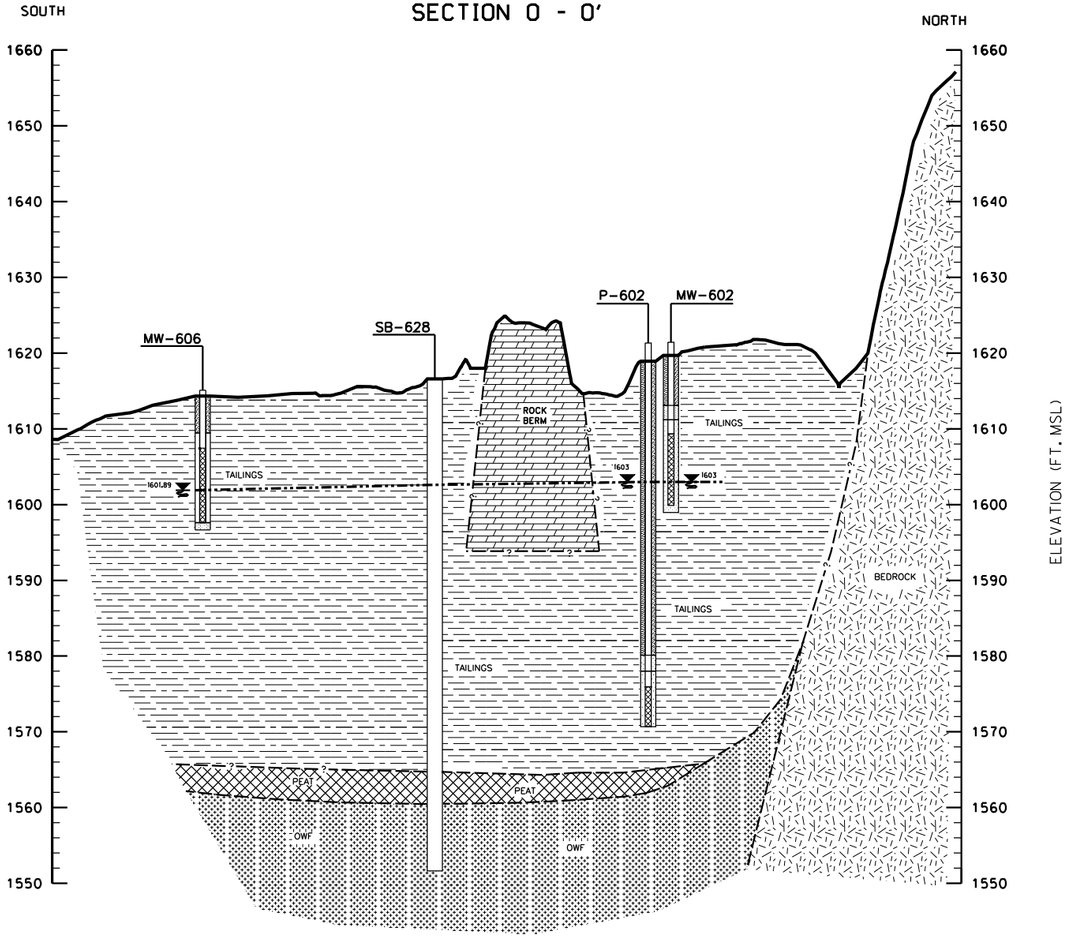
Kennecott Eagle Minerals

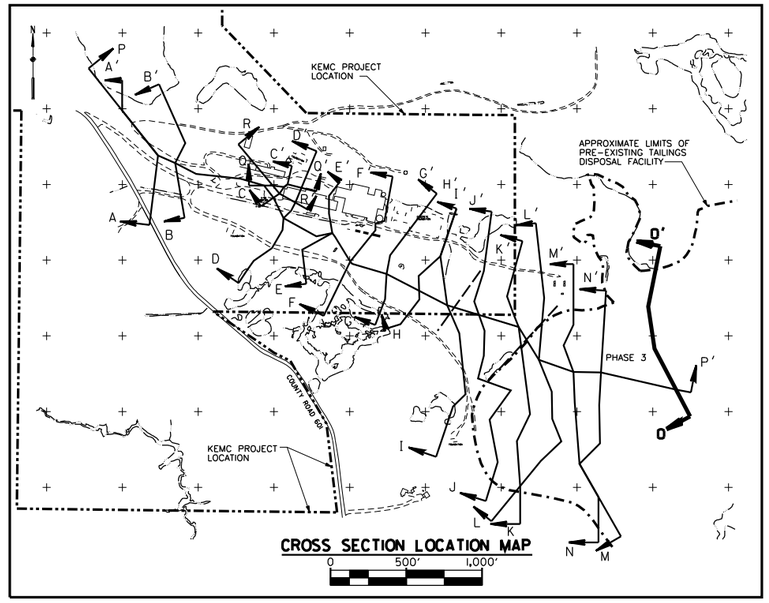
FIGURE 5-13
HUMBOLDT MILL
HYDROGEOLOGICAL REPORT
GEOLOGIC CROSS SECTION N-N'

Scale:	AS SHOWN	Date:	NOVEMBER, 2007
Prepared By:	JOW	Project No.	06W003

L:\06w003\HGR\hgr_geolx-section n-n'.3d
12/11/2007 jow

SECTION O - O'

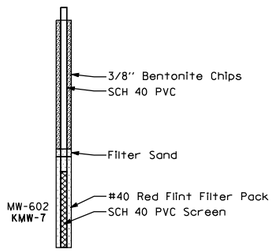




LEGEND

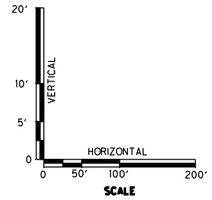
- F FILL — SAND, GRAVEL AND MINE WASTE ROCK
- Owf FINE-GRAINED OUTWASH DEPOSITS — GLACIAL FLUVIAL STRATIFIED SAND AND SILT
- Owc COARSE-GRAINED OUTWASH DEPOSITS — GLACIAL FLUVIAL STRATIFIED SAND, GRAVEL, COBBLES AND BOULDERS
- P PEAT
- T IRON ORE TAILINGS
- IC ICE-CONTACT DEPOSITS — ABLATION TILL, FLOW TILL, GLACIO-FLUVIAL SILT, CLAY AND SAND
- PCu UNDIFFERENTIATED BEDROCK — LOWER PROTEROZOIC METASEDIMENTS AND INTRUSIVE ROCKS AND ARCHEAN GNEISS (BEDROCK)
- INFERRED GEOLOGIC CONTACT
- 1601.89 (MW-606) WATER LEVEL ELEVATION (11/06)*

WELL CONSTRUCTION INFORMATION



NOTE:

1. WELLS ARE LOCATED IN INDIVIDUAL BORINGS. THE FILTER PACK IS SILICA SAND, AND THE ANNULAR SPACE AROUND THE WELL CASING WAS BACKFILLED WITH BENTONITE PELLETS AND CEMENT/BENTONITE GROUT AND CONCRETE.
2. WATER ELEVATIONS IN BORINGS BASED ON WATER LEVEL OBSERVED DURING DRILLING SEPTEMBER AND OCTOBER 2006.



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

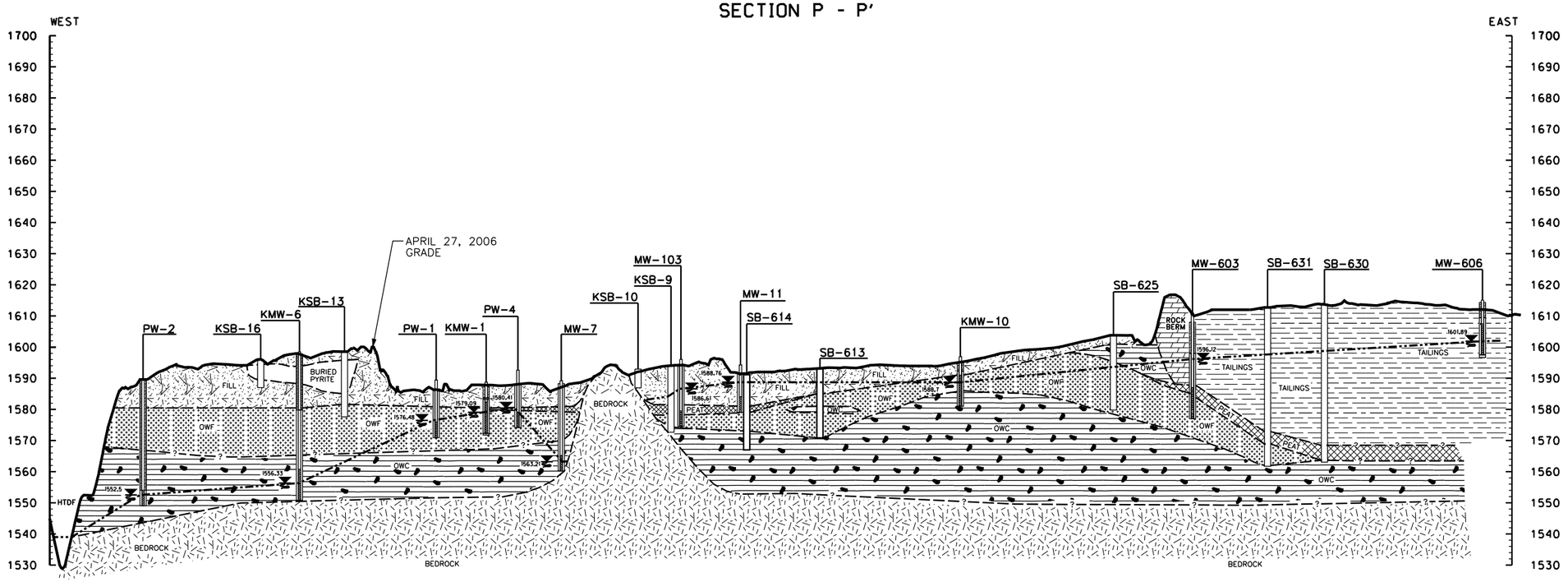
Kennecott Eagle Minerals

FIGURE 5-14
HUMBOLDT MILL HYDROGEOLOGICAL REPORT GEOLOGIC CROSS SECTION O-O'

Scale: AS SHOWN	Date: NOVEMBER, 2007
Prepared By: JOW	Project No. 06W003

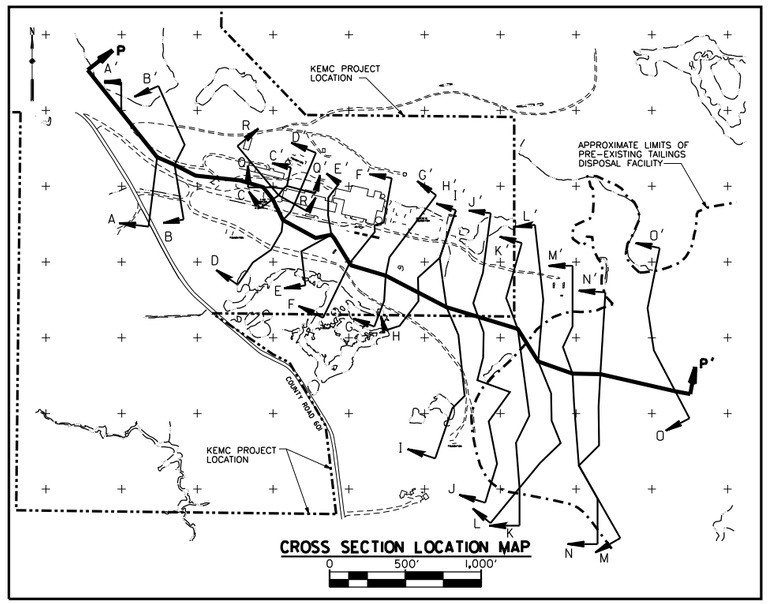
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12/11/2007 jow

SECTION P - P'



LEGEND

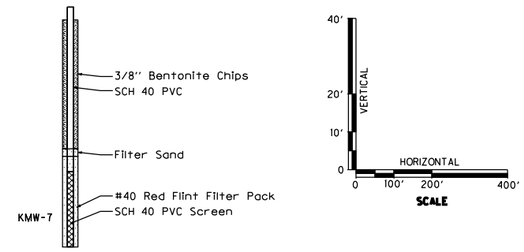
- F FILL — SAND, GRAVEL AND MINE WASTE ROCK
- Owf FINE-GRAINED OUTWASH DEPOSITS — GLACIAL FLUVIAL STRATIFIED SAND AND SILT
- Owc COARSE-GRAINED OUTWASH DEPOSITS — GLACIAL FLUVIAL STRATIFIED SAND, GRAVEL, COBBLES AND BOULDERS
- P PEAT
- T IRON ORE TAILINGS
- IC ICE-CONTACT DEPOSITS — ABLATION TILL, FLOW TILL, GLACIO-FLUVIAL SILT, CLAY AND SAND
- PCu UNDIFFERENTIATED BEDROCK — LOWER PROTEROZOIC METASEDIMENTS AND INTRUSIVE ROCKS AND ARCHEAN GNEISS
- INFERRED GEOLOGIC CONTACT
- WATER LEVEL ELEVATION (11/06)*



WELL CONSTRUCTION INFORMATION

NOTE:

1. WELLS ARE LOCATED IN INDIVIDUAL BORINGS. THE FILTER PACK IS SILICA SAND, AND THE ANNULAR SPACE AROUND THE WELL CASING WAS BACKFILLED WITH BENTONITE PELLETS AND CEMENT/BENTONITE GROUT AND CONCRETE.
2. WATER ELEVATIONS IN BORINGS BASED ON WATER LEVEL OBSERVED DURING DRILLING SEPTEMBER AND OCTOBER 2006.



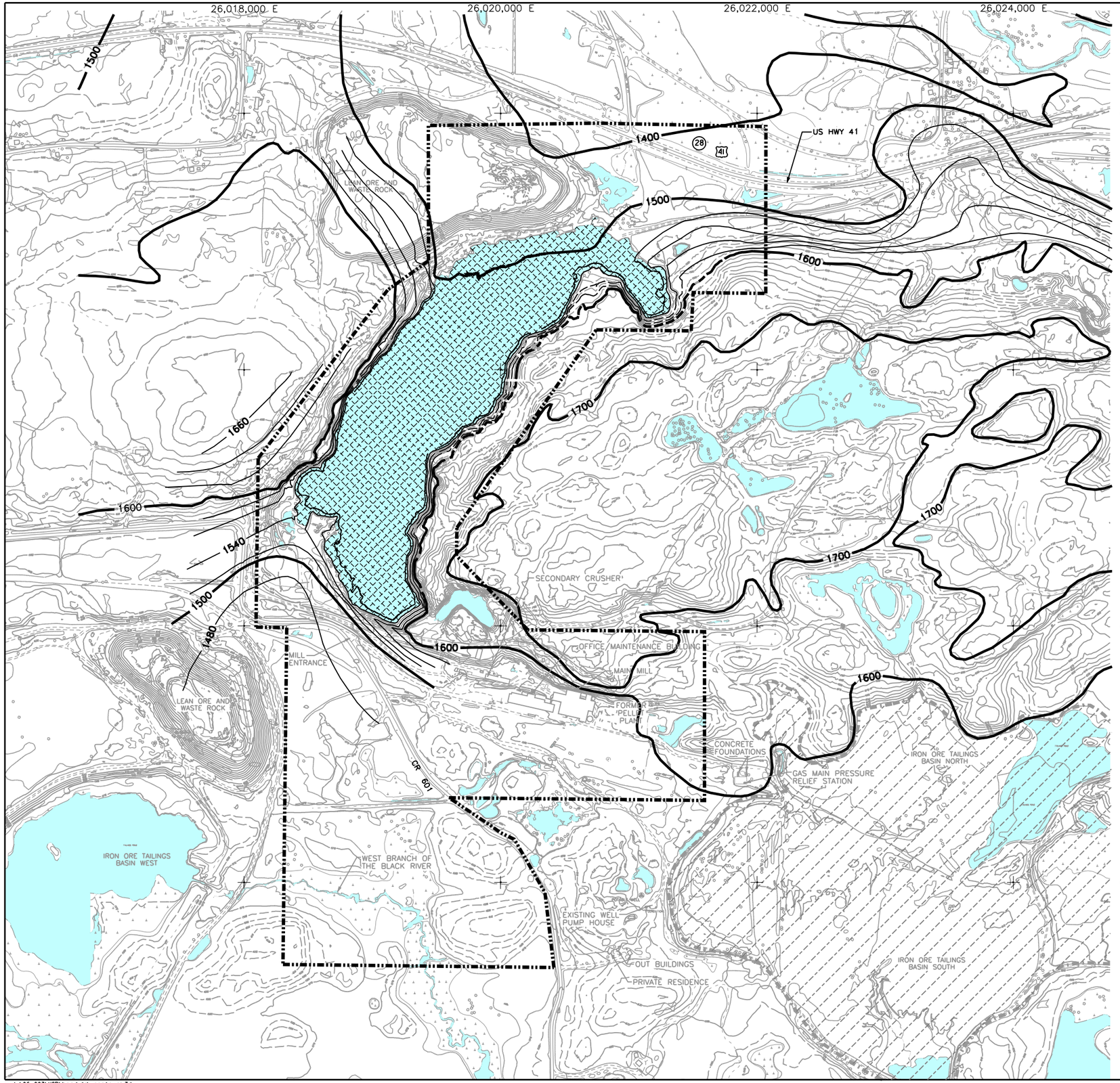
Foth Infrastructure & Environment, LLC				
REVISED	DATE	BY	DESCRIPTION	
CHECKED BY:		JSL		DATE: NOV. '07
APPROVED BY:		SVD1		DATE: NOV. '07
APPROVED BY:				DATE:

Kennecott Eagle Minerals

FIGURE 5-15
HUMBOLDT MILL
HYDROGEOLOGICAL REPORT
GEOLOGIC CROSS SECTION P-P'

Scale: AS SHOWN	Date: NOVEMBER, 2007
Prepared By: JOW	Project No. 06W003

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12/11/2007 jow



N

LEGEND

- EXISTING ELEV. CONTOUR IN FEET
- TREE
- TREE LINE
- BUILDING
- TRAIL
- PAVED ROAD
- UNPAVED ROAD
- STREAM/LAKE
- HUMBOLDT TAILINGS DISPOSAL FACILITY (TDF)
- PRE-EXISTING IRON ORE TAILINGS DISPOSAL FACILITY
- KEMC PROJECT LOCATION
- 1700 — BEDROCK CONTOUR MAP (TRAVERSE ENGINEERING SERVICES, NOVEMBER, 1984)

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. CONTOUR INTERVAL SHOWN IS 10 FOOT.
5. BEDROCK CONTOURS MODIFIED AFTER SUPINA (1984).

Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	JOSI	DATE: OCT. '07
APPROVED BY:	SVDI	DATE: OCT. '07
APPROVED BY:		DATE:

Kennecott Eagle Minerals

FIGURE 5-16
HUMBOLDT MILL
HYDROGEOLOGIC REPORT
BEDROCK CONTOUR ELEVATIONS

Scale: 0 200' 400'
Date: OCTOBER, 2007
Prepared By: JOW
Project No. 06W003

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12/11/2007 jow

SECTION S - S'

SOUTH

NORTH

KMW-9P (OUT OF SECTION)

KMW-9

PW-2

EXISTING GRADE

HW-1

HMP-009

HW-6

WATER ELEV.=1537.88
JUNE 5, 2007

1554.6 (KMW-9)

1556.27

1551.35

1535.66

1534.33

1533.39

WATER

FILL

ORGANIC MUCK

OWC W/CLAY

OWF W/CLAY

OWC

OWF

BEDROCK ELEVATION

GNEISS

BATHYMETRIC SURVEY

NEGAUNEE IRON FORMATION

ROPES MINE TAILINGS

BEDROCK SURFACE

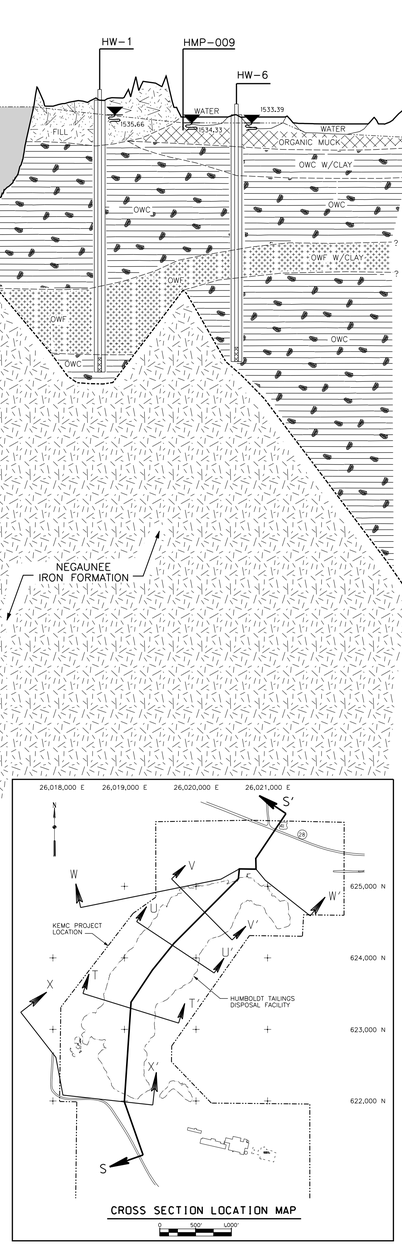
LEGEND

- F FILL — SAND, GRAVEL AND MINE WASTE ROCK
- Owf FINE-GRAINED OUTWASH DEPOSITS — GLACIAL FLUVIAL STRATIFIED SAND AND SILT
- Owc COARSE-GRAINED OUTWASH DEPOSITS — GLACIAL FLUVIAL STRATIFIED SAND, GRAVEL, COBBLES AND BOULDERS
- P PEAT
- T IRON ORE TAILINGS
- IC ICE-CONTACT DEPOSITS — ABLATION TILL, FLOW TILL, GLACIO-FLUVIAL SILT, CLAY AND SAND
- PCu UNDIFFERENTIATED BEDROCK — LOWER PROTEROZOIC METASEDIMENTS AND INTRUSIVE ROCKS AND ARCHEAN GNEISS

BEDROCK

INFERRED GEOLOGIC CONTACT

WATER LEVEL ELEVATION (6/5/07)



CROSS SECTION LOCATION MAP

0+00 2+00 4+00 6+00 8+00 10+00 12+00 14+00 16+00 18+00 20+00 22+00 24+00 26+00 28+00 30+00 32+00 34+00 36+00 38+00 40+00 42+00 44+00 46+00 48+00 50+00 52+00 54+00 56+00 58+00

1600 1590 1580 1570 1560 1550 1540 1530 1520 1510 1500 1490 1480 1470 1460 1450 1440 1430 1420 1410 1400 1390 1380 1370 1360 1350 1340 1330 1320 1310 1300 1290 1280 1270 1260 1250 1240 1230 1220 1210 1200 1190 1180 1170 1160

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

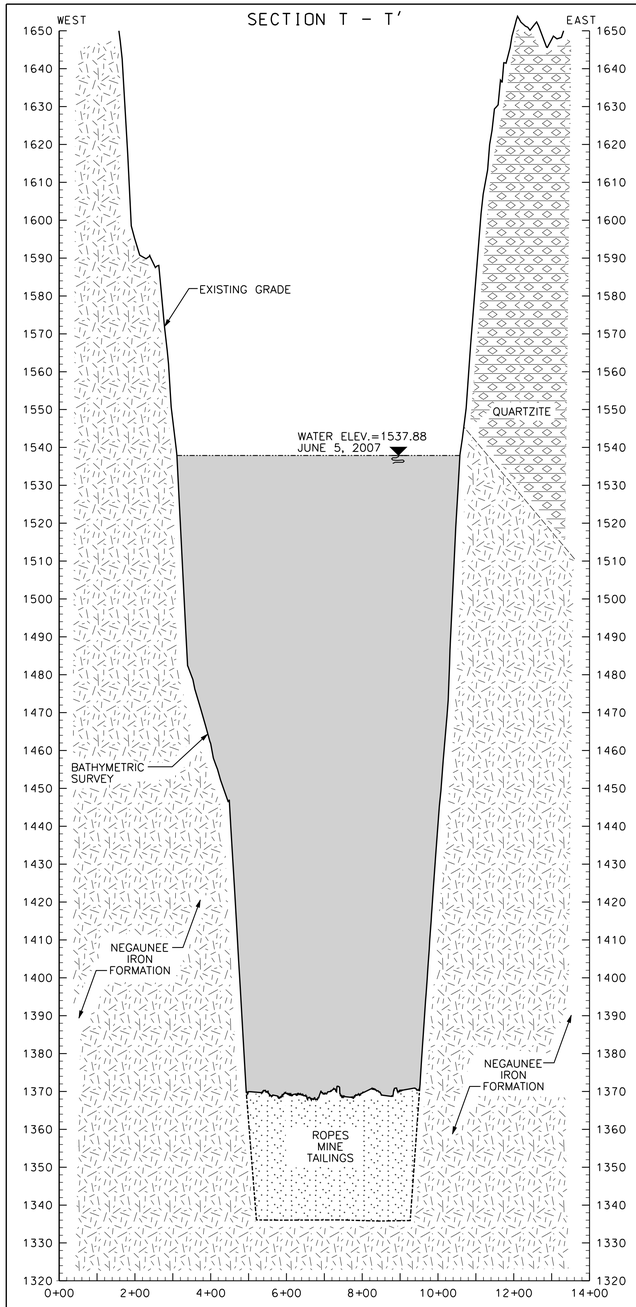
Kennecott Eagle Minerals

FIGURE 5-17
HUMBOLDT MILL
HYDROGEOLOGICAL REPORT
CROSS SECTION S-S'

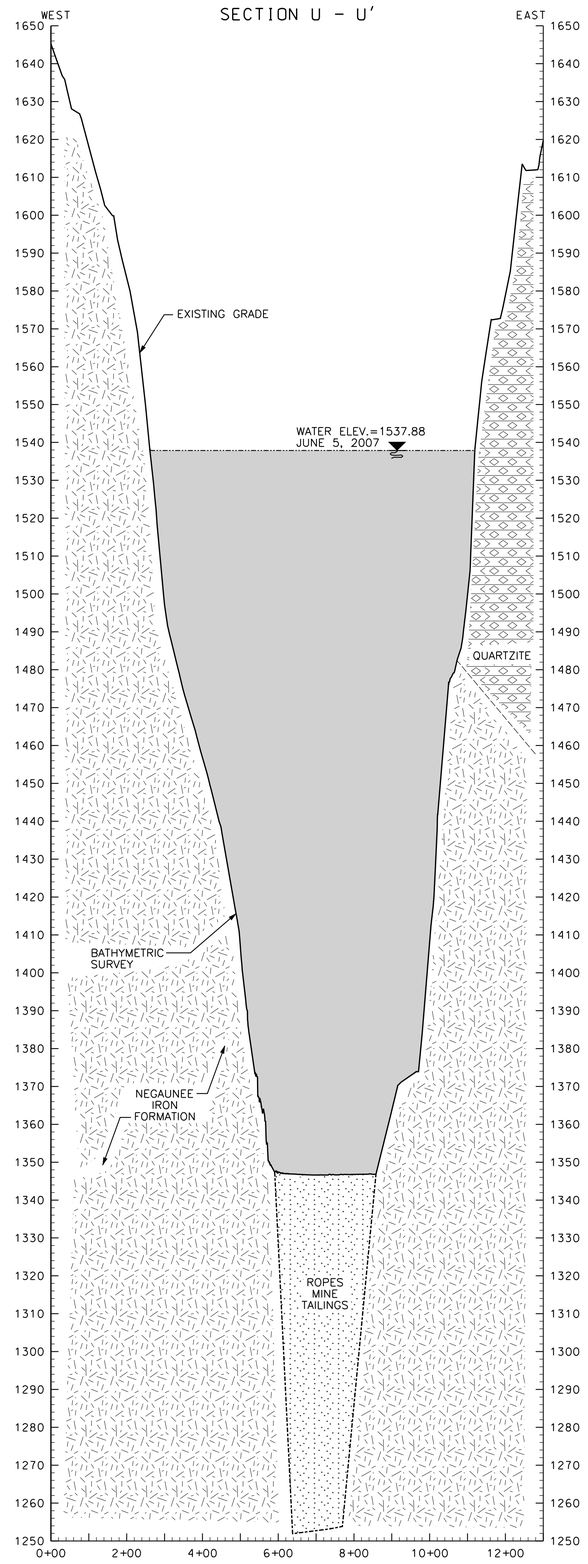
Scale: AS SHOWN | Date: OCTOBER, 2007
Prepared By: JOW | Project No. 06W003

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12/11/2007 jow

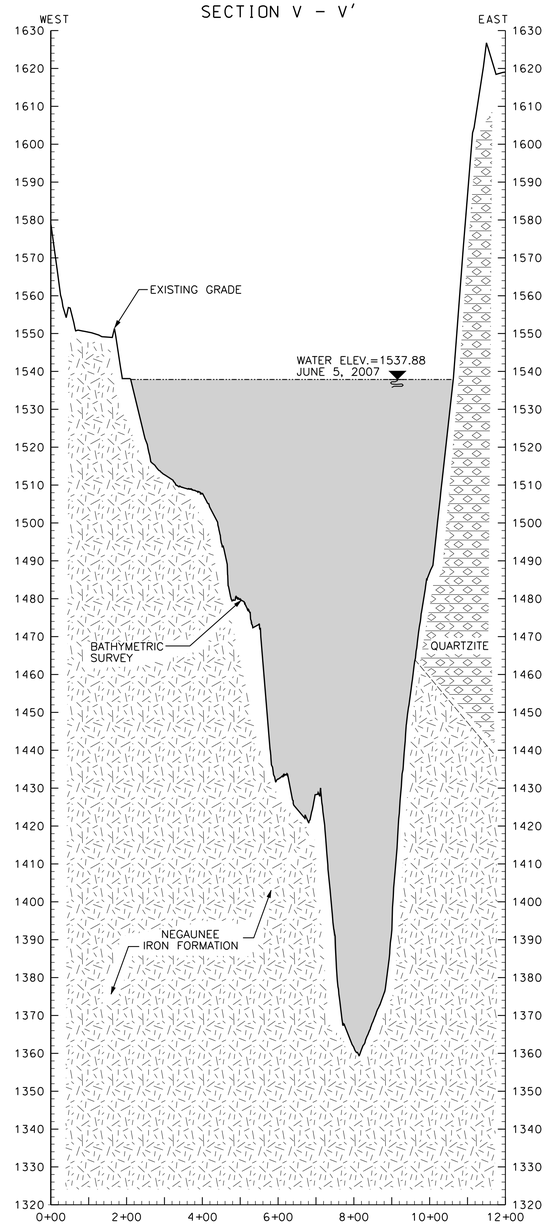
SECTION T - T'

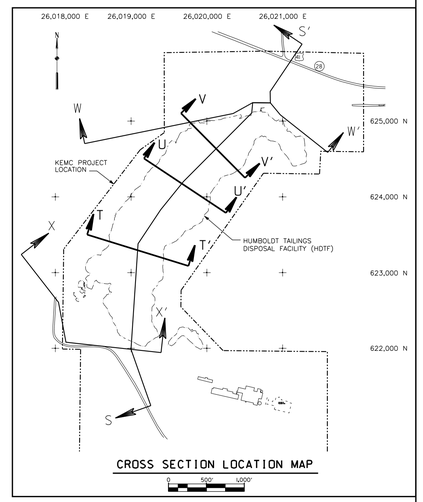


SECTION U - U'



SECTION V - V'



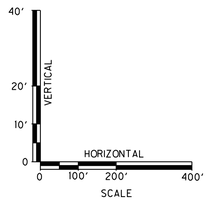


CROSS SECTION LOCATION MAP

0 500 1,000'

NOTES:

1. BATHYMETRY SURVEY CONDUCTED BY FOTH IE ON MAY 1, 2007.
2. TOP ELEVATION OF EAGLE TAILINGS MAY VARY BASED UPON MOUNDING DURING PLACEMENT. TOP ELEVATION WILL NOT EXCEED 1475 MSL.



LEGEND

- F FILL — SAND, GRAVEL AND MINE WASTE ROCK
- Owf FINE-GRAINED OUTWASH DEPOSITS — GLACIAL FLUVIAL STRATIFIED SAND AND SILT
- Owc COARSE-GRAINED OUTWASH DEPOSITS — GLACIAL FLUVIAL STRATIFIED SAND, GRAVEL, COBBLES AND BOULDERS
- P PEAT
- T IRON ORE TAILINGS
- IC ICE-CONTACT DEPOSITS — ABLATION TILL, FLOW TILL, GLACIO-FLUVIAL SILT, CLAY AND SAND
- PCu UNDIFFERENTIATED BEDROCK — LOWER PROTEROZOIC METASEDIMENTS AND INTRUSIVE ROCKS AND ARCHEAN GNEISS (BEDROCK)
- INFERRED GEOLOGIC CONTACT
- 1554.6 (KMW-9) WATER LEVEL ELEVATION (6/5/07)

Foth Infrastructure & Environment, LLC			
REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	JOS1	DATE: OCT. '07
APPROVED BY:	SVD1	DATE: OCT. '07
APPROVED BY:		DATE:

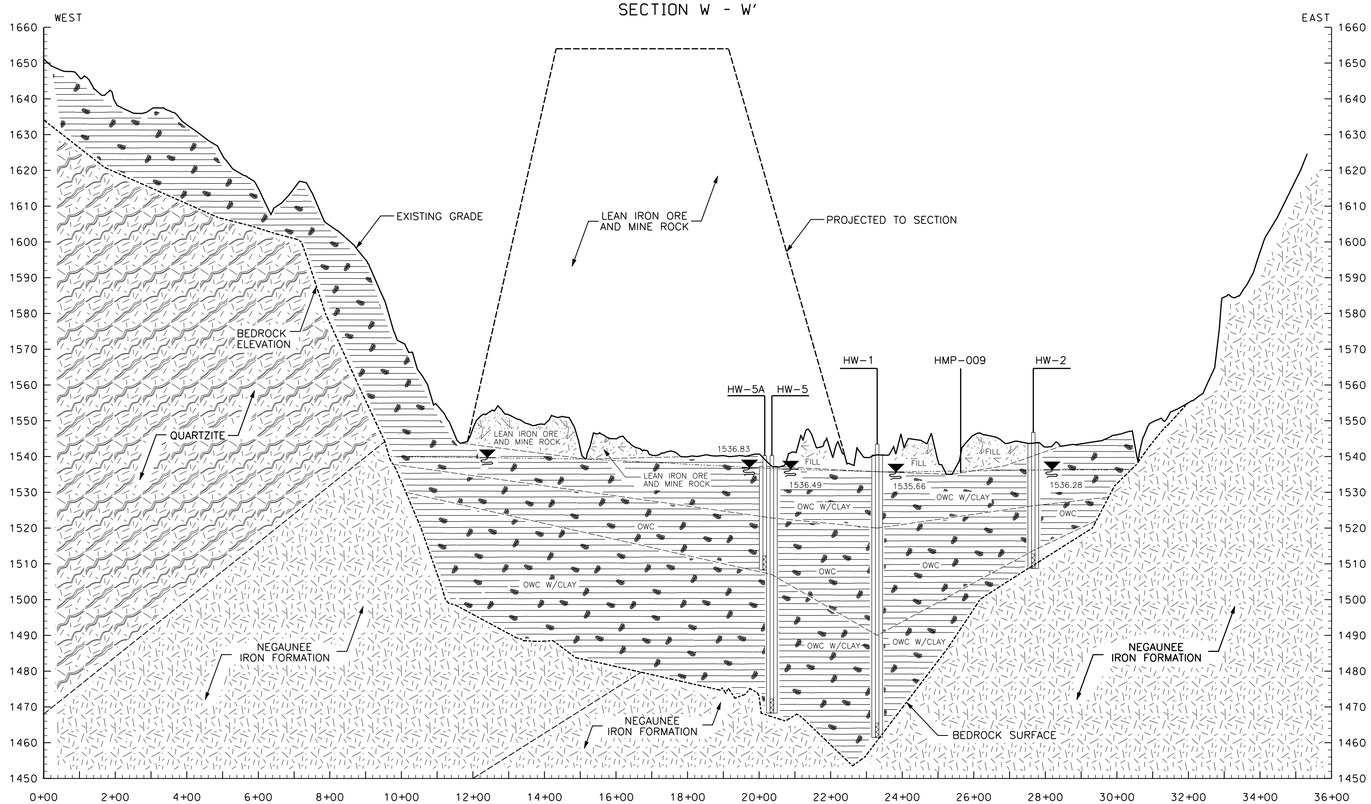
Kennecott Eagle Minerals

FIGURE 5-18
HUMBOLDT MILL
HYDROGEOLOGICAL REPORT
CROSS SECTIONS T-T', U-U' AND V-V'

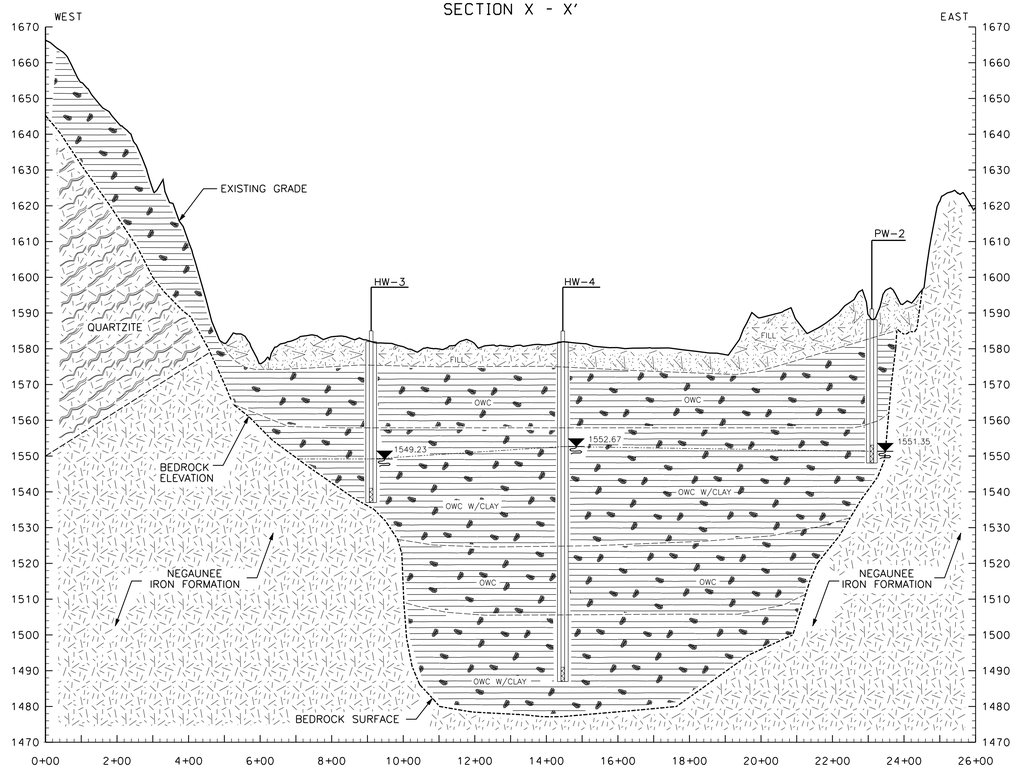
Scale: AS SHOWN	Date: OCTOBER, 2007
Prepared By: JOW	Project No. 06W003

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12/11/2007 jow

SECTION W - W'

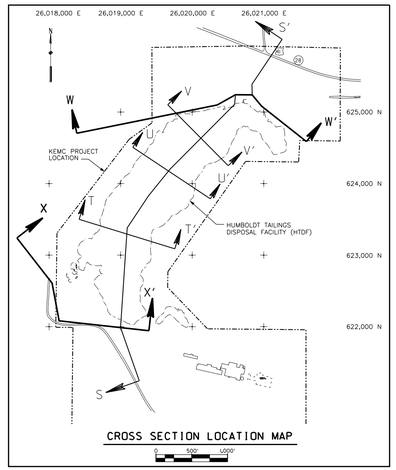


SECTION X - X'



LEGEND

- F FILL — SAND, GRAVEL AND MINE WASTE ROCK
- Owf FINE-GRAINED OUTWASH DEPOSITS — GLACIAL FLUVIAL STRATIFIED SAND AND SILT
- Owc COARSE-GRAINED OUTWASH DEPOSITS — GLACIAL FLUVIAL STRATIFIED SAND, GRAVEL, COBBLES AND BOULDERS
- P PEAT
- T IRON ORE TAILINGS
- IC ICE-CONTACT DEPOSITS — ABLATION TILL, FLOW TILL, GLACIO-FLUVIAL SILT, CLAY AND SAND
- PCu UNDIFFERENTIATED BEDROCK — LOWER PROTEROZOIC METASEDIMENTS AND INTRUSIVE ROCKS AND ARCHEAN GNEISS (BEDROCK)
- INFERRED GEOLOGIC CONTACT
- 1536.9 (HMW-1) WATER LEVEL ELEVATION (6/5/07)



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

Kennecott Eagle Minerals

FIGURE 5-19
HUMBOLDT MILL
HYDROGEOLOGICAL REPORT
CROSS SECTIONS W-W' AND X-X'

Scale: AS SHOWN	Date: OCTOBER, 2007
Prepared By: JOW	Project No. 06W003

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12/11/2007 jow

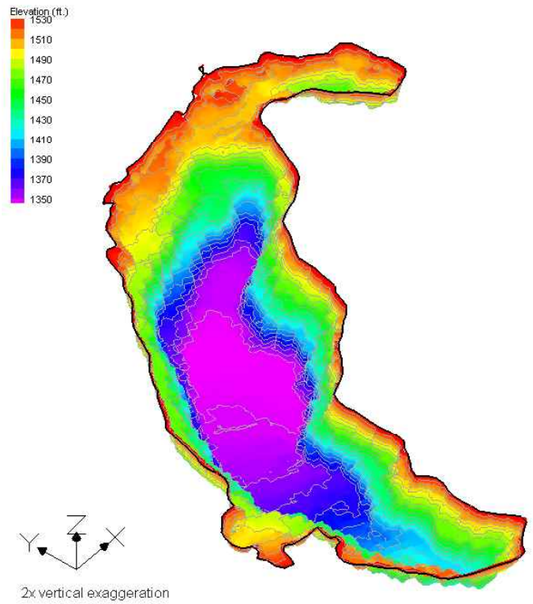
26,018,000 E
26,019,000 E
26,020,000 E
26,021,000 E
26,022,000 E
626,000 N
625,000 N
624,000 N
623,000 N
622,000 N

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
- KEMC PROJECT LOCATION
- WATERSHED BOUNDARY
- 1500 LAKE ELEVATION CONTOUR

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. HTDF WATER LEVEL ELEVATION = 1537.89 FT. MSL. (MAY 31, 2007).



FORMER SECONDARY CRUSHER BUILDING
ELECTRICAL SUBSTATION
FACILITY WATER TOWER
MILL ENTRANCE
OLD CRUSHER BUILDING
CRUSHER PLANT
FORMER PELLET PLANT
MAIN MILL
OFFICE / MAINTENANCE BUILDING
CR 601

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

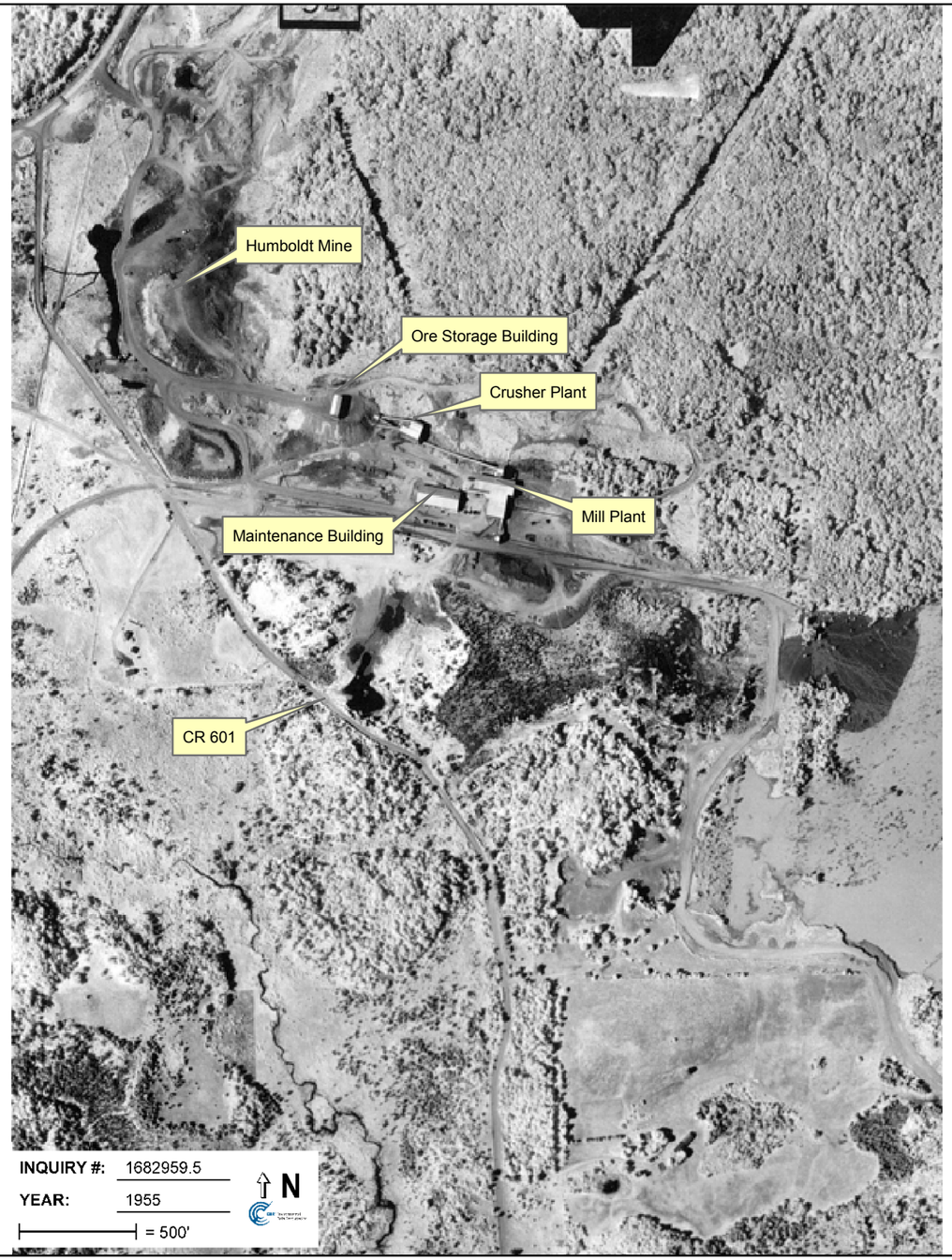
Kennecott Eagle Minerals

FIGURE 5-20
HUMBOLDT MILL
HYDROGEOLOGICAL REPORT
HTDF BATHYMETRY

Scale: 0 250' 500'
Date: OCTOBER, 2007
Prepared By: JOW
Project No. 06W003

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12/11/2007 jow





NOTES

1. Historical Aerial Photos supplied by Environmental Data Resources Inc.
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.

N

Foth
Foth Infrastructure & Environment, LLC

Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	JSL	DATE: AUG. '07
APPROVED BY:	SVD1	DATE: AUG. '07
APPROVED BY:		DATE:

Kennecott
Eagle Minerals

FIGURE 5-21
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HISTORICAL AERIAL PHOTOS

Scale: AS SHOWN	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

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26,017,000 E | 26,018,000 E | 26,019,000 E | 26,020,000 E | 26,021,000 E | 26,022,000 E | 26,023,000 E | 26,024,000 E

627,000 N | 626,000 N | 625,000 N | 624,000 N | 623,000 N | 622,000 N | 621,000 N | 620,000 N | 619,000 N | 618,000 N

MIDDLE BRANCH ESCANABA RIVER

LEAN ORE AND WASTE ROCK

BEDROCK UPLANDS COVERED WITH THIN VENEER OF GLACIAL TILL

HUMBOLDT TAILINGS DISPOSAL FACILITY

WATER ELEV. 1537.88

WATER ELEV. 1712.4

WATER ELEV. 1723.2

WATER ELEV. 1730.5

WATER ELEV. 1734.5

WATER ELEV. 1672.6

WATER ELEV. 1621.5

WATER ELEV. 1576.5

WATER ELEV. 1589.2

WATER ELEV. 1569.3

WATER ELEV. 1606.1

WATER ELEV. 1592.3

WATER ELEV. 1564.8

LAKE LORY

IRON ORE TAILINGS BASIN NORTH

IRON ORE TAILINGS BASIN SOUTH

IRON ORE TAILINGS BASIN WEST

APPROXIMATE LOCATION OF TAILINGS SEEP AND SURFACE STAINING

WEIR

EFFLUENT DISCHARGE PIPE

DECANT WATER EFFLUENT RISER PIPE

APPROXIMATE LOCATION OF TAILINGS SEEP AND SURFACE STAINING

ATHLETIC FIELD

FOUNDATION

HMP-004 1531.85

HMP-009 1534.33

HMP-002

HMP-008 1537.88

HMP-006 1748.94

HMP-005 1543.43

HMP-007 1571.27

HW-1 1535.66

HW-1A 1535.70

HW-2 1536.28

HW-3 1549.23

HW-4 1552.67

HW-5 1536.49

HW-5A 1536.83

HW-6 1533.39

HW-6A 1533.91

HYC-1 1535.60

PW-1 1551.35

PW-2 1579.48

KMW-1 1583.33

KMW-2 1590.09

KMW-3 1576.58

KMW-4 1558.42

KMW-5 1556.51

KMW-6A 1583.51

KMW-7 1557.04

KMW-9 1556.12

KMW-9P

KMW-10 1589.19

MW-1 1583.32

MW-2

MW-3

MW-4

MW-5 1581.04

MW-6

MW-7 1565.24

MW-9

MW-10

MW-11 1587.42

MW-12 1585.67

MW-101 1595.71

MW-102 1590.06

MW-103 1587.43

MW-104

MW-106 1583.48

MW-107

MW-601 1598.55

MW-602 1604.31

MW-603 1596.38

MW-604 1589.17

MW-605 1590.00

MW-606 1602.28

P-602 1604.28

P-604 1588.60

P-605 1590.03

HMS-001 1600.54

HMS-002 1590.53

HMS-003 1589.97

HMS-004 1589.83

HMS-005 1589.23

HMS-006 1585.18

HMS-007 1578.28

TDP-001 1597.33

TDP-002 1607.32

1534 | 1535 | 1536 | 1540 | 1545 | 1550 | 1555 | 1560 | 1565 | 1570 | 1575 | 1580 | 1585 | 1590 | 1595 | 1600 | 1605

LEGEND

- EXISTING ELEV. CONTOUR IN FEET
- PAVED ROAD
- UNPAVED ROAD
- TRAIL
- FENCE
- SURFACE WATER
- SWAMP/WETLAND
- STREAM/LAKE
- BUILDING
- HUMBOLDT TAILINGS DISPOSAL FACILITY (HTDF)
- APPROXIMATE LIMITS OF PRE-EXISTING IRON ORE TAILINGS DISPOSAL FACILITY
- KEMC PROJECT LOCATION
- KMW-10 1589.19 — MONITORING WELL NUMBER, LOCATION AND GROUNDWATER ELEVATION
- 1570 — JUNE 2007 GROUNDWATER CONTOUR (DASHED CONTOURS REPRESENT INFERRED)
- GROUNDWATER FLOW DIRECTION
- APPROXIMATE GROUNDWATER DIVIDE
- WATERSHED 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 2 AND 11, T47N, R29W, HUMBOLDT TOWNSHIP, MARQUETTE COUNTY, MICHIGAN.
4. GROUNDWATER CONTOUR INTERVAL SHOWN IS 1 FOOT NORTH OF HUMBOLT TAILINGS DISPOSAL FACILITY (HTDF) AND 5 FOOT SOUTH OF HTDF. TOPOGRAPHIC CONTOUR INTERVAL IS 10 FOOT.
5. LAKE/POND ELEVATIONS BASED ON APRIL 27, 2006 AERIAL PHOTOGRAPHY UNLESS OTHERWISE MEASURED BY STAFF GAUGE.

0 300' 600'

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CHECKED BY:	JSL	DATE:	OCT. '07
APPROVED BY:	SVD1	DATE:	OCT. '07
APPROVED BY:		DATE:	

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FIGURE 5-22
HUMBOLDT MILL
HYDROGEOLOGICAL REPORT
JUNE 2007 GROUNDWATER CONTOURS

Scale:	AS SHOWN	Date:	OCT. 2007
Prepared By:	JOW	Project No.	06W003

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11/25/2008 jrb2

KMW-5
KSB-16
HA-1-BP
KMW-6
KSB-12
HA-2-BP
KSB-13
HA-3-BP
KSB-5
KSB-4
KSB-3
KMW-1
KSB-1
KSB-6
KMW-9P
KMW-7
KMW-2
KSB-7
KSB-15
KSB-14
KMW-4
MW-601
KSB-19
HA-1
KSB-11
KSB-8
TP-34
KSB-9
SB-607
KSB-10
TP-17
SB-608
KMW-3
KSB-18
HA-2
SB-614
SB-610A
SB-609
SB-613
SB-612
HA-3
SB-611
SB-615
SB-616
SB-618
SB-619
SB-617
KMW-10
P-602
P-604
SB-621
SB-623
SB-622
SB-625
SB-620
SB-626
SB-628
SB-624
MW-603
SB-627
SB-631
SB-630
SB-629
SB-635
SB-632
MW-606
SB-639
SB-640
SB-642
SB-633
SB-636
SB-634
SB-637
SB-638
SB-641
SB-645
SB-644
SB-643
SB-647
SB-648

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.

LEGEND

- Soil Sample Location - Not Sampled for Parameter
- Soil Sample Location - Sample Below Drinking Water Protection Criteria (< 2,100 ug/kg)
- Soil Sample Location - Sample Above Drinking Water Protection Criteria (> 2,100 ug/kg)

N

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REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	JSL	DATE: AUG. '07	
APPROVED BY:	SVD1	DATE: AUG. '07	
APPROVED BY:		DATE:	

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Eagle Minerals

FIGURE 5-23
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
SOIL SAMPLE LOCATIONS
1, 2, 4 - TRIMETHYLBENZENE IN SOIL

Scale: 0 150 300 Feet
Date: AUGUST 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 83/96. 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.

LEGEND

- Soil Sample Location - Not Sampled for Parameter
- Soil Sample Location - Sample Below Drinking Water Protection Criteria (< 1,800 ug/kg)
- Soil Sample Location - Sample Above Drinking Water Protection Criteria (> 1,800 ug/kg)

N

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REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	JSL	DATE: AUG. '07	
APPROVED BY:	SVD1	DATE: AUG. '07	
APPROVED BY:		DATE:	

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FIGURE 5-24
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
SOIL SAMPLE LOCATIONS
1, 3, 5 - TRIMETHYLBENZENE IN SOIL

Scale: 0 150 300 Feet | Date: AUGUST 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.

LEGEND

- Soil Sample Location - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Protection Criteria (< 1,600 ug/kg)
- Groundwater Monitoring Well - Sample Above Drinking Water Protection Criteria (> 1,600 ug/kg)

N

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REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	JSL	DATE: AUG. '07	
APPROVED BY:	SVD1	DATE: AUG. '07	
APPROVED BY:		DATE:	

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FIGURE 5-25
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
SOIL SAMPLE LOCATIONS
N-PROPYLBENZENE IN SOIL

Scale: 0 150 300 Feet

Date: AUGUST 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.

LEGEND

- Soil Sample Location - Not Sampled for Parameter
- Soil Sample Location - Sample Below Drinking Water Protection Criteria (< 1,600 ug/kg)
- Soil Sample Location - Sample Above Drinking Water Protection Criteria (> 1,600 ug/kg)

N

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M:\06w003\mxd\HGR\kmc_humboldt_Sampling_Soil_S-Butylbenzene_Fig5-26_11x17.mxd August 24, 2007

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REVISED	DATE	BY	DESCRIPTION

JSL	DATE: AUG. '07
SVD1	DATE: AUG. '07
	DATE:

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FIGURE 5-26
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
SOIL SAMPLE LOCATIONS
S-BUTYLBENZENE IN SOIL

Scale: 0 150 300 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

KMW-5
KSB-16
HA-1-BP
KMW-6
KSB-12
HA-2-BP
KSB-13
HA-3-BP
KMW-1
KSB-5
KSB-4
KSB-3
KSB-1
KSB-6
KMW-9P
KMW-7
KMW-2
KSB-7
KSB-15
KSB-14
KMW-4
KSB-11
KSB-8
TP-34
KSB-9
KSB-10
TP-17
SB-607
SB-608
KMW-3
KSB-18
HA-2
SB-614
SB-613
SB-612
SB-610A
SB-609
HA-3
SB-611
SB-615
SB-616
SB-618
SB-619
KMW-10
SB-617
P-602
P-604
SB-623
SB-622
SB-625
SB-621
SB-620
SB-626
SB-628
SB-624
SB-627
MW-603
SB-631
SB-630
SB-629
SB-635
SB-632
MW-606
SB-639
SB-640
SB-642
SB-633
SB-636
SB-634
SB-637
SB-638
SB-641
SB-645
SB-644
SB-643
SB-647
SB-648
MW-601
KSB-19
HA-1

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.

LEGEND

- Soil Sample Location - Not Sampled for Parameter
- Soil Sample Location - Sample Below Drinking Water Protection Criteria (<35,000 ug/kg)
- Soil Sample Location - Sample Above Drinking Water Protection Criteria (>35,000 ug/kg)

N

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M:\06w003\mxd\HGR\kmc_humboldt_Sampling_Soil_Naphthalene_Fig5-27_11x17.mxd August 24, 2007

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REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	JSL	DATE: AUG. '07
APPROVED BY:	SVD1	DATE: AUG. '07
APPROVED BY:		DATE:

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FIGURE 5-27
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
SOIL SAMPLE LOCATIONS
NAPHTHALENE IN SOIL

Scale: 0 150 300 Feet	Date: AUGUST 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 83/96. 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.

LEGEND

- Soil Sample Location - Not Sampled for Parameter
- Soil Sample Location - Sample Below Drinking Water Protection Criteria (< 41,000 ug/kg)
- Soil Sample Location - Sample Above Drinking Water Protection Criteria (> 41,000 ug/kg)

N

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JSL	DATE: AUG. '07
SVD1	DATE: AUG. 07
	DATE:

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FIGURE 5-28
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
SOIL SAMPLE LOCATIONS
ANTHRACENE IN SOIL

Scale: 0 150 300 Feet	Date: AUGUST 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.

LEGEND

- Soil Sample Location - Not Sampled for Parameter
- Soil Sample Location - Sample Below Drinking Water Protection Criteria (< 56,000 ug/kg)
- Soil Sample Location - Sample Above Drinking Water Protection Criteria (> 56,000 ug/kg)

N

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REVISED	DATE	BY	DESCRIPTION

JSL	DATE: AUG. '07
SVD1	DATE: AUG. '07
	DATE:

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FIGURE 5-29
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
SOIL SAMPLE LOCATIONS
PHENANTHRENE IN SOIL

Scale: 0 150 300 Feet	Date: AUGUST 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 83/96. 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.

LEGEND

- Soil Sample Location - Not Sampled for Parameter
- Soil Sample Location - Sample Below Residential Drinking Water Protection Criteria (< 4 mg/kg)
- Soil Sample Location - Sample Above Residential Drinking Water Protection Criteria (> 4 mg/kg)

N

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REVISED	DATE	BY	DESCRIPTION

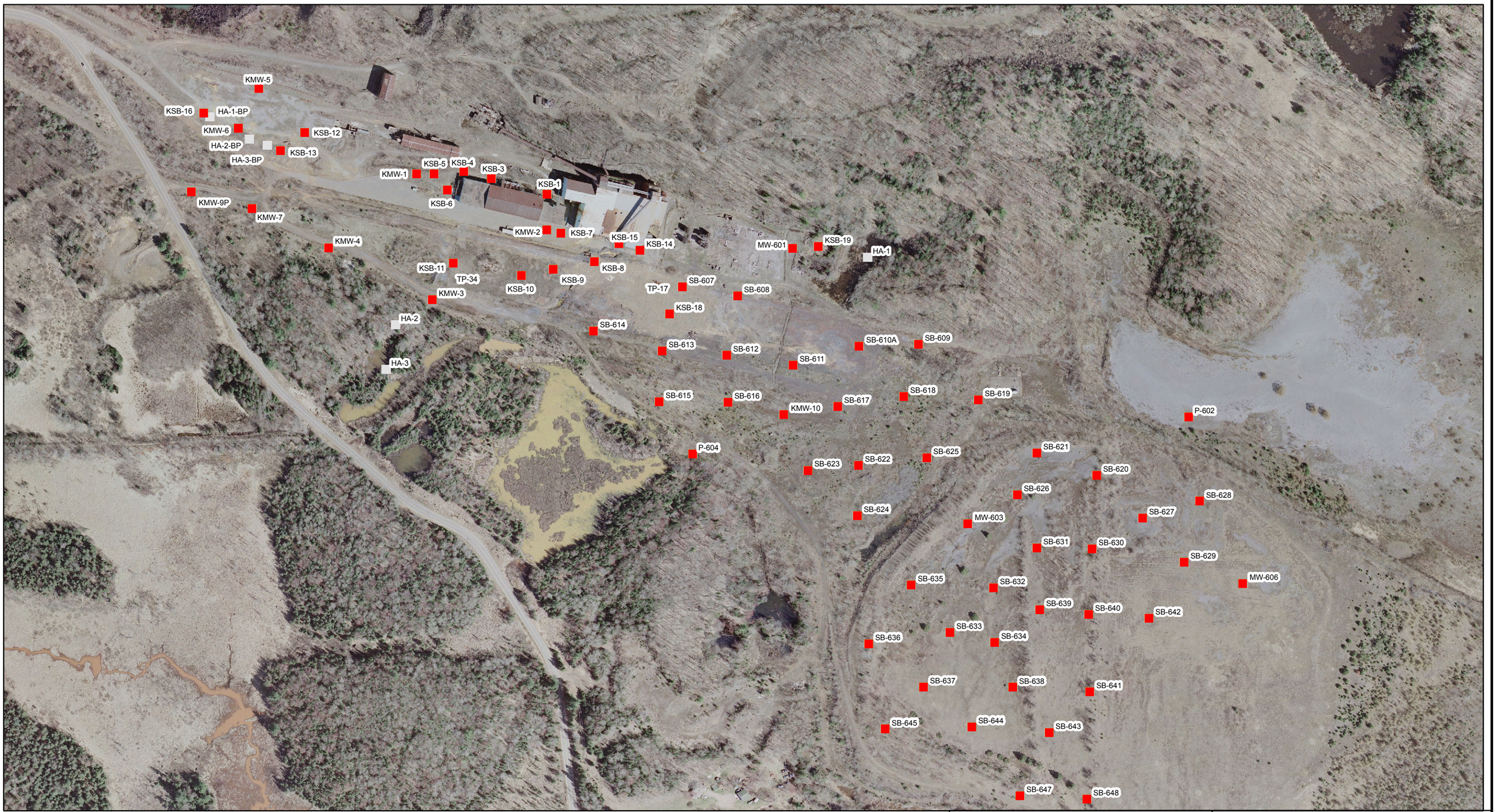
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APPROVED BY:	SVD1	DATE: AUG. '07	
APPROVED BY:		DATE:	

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FIGURE 5-30
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
SOIL SAMPLE LOCATIONS
CYANIDE IN SOIL

Scale: 0 150 300 Feet	Date: AUGUST 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.

LEGEND

- Soil Sample Location - Not Sampled for Parameter
- Soil Sample Location - Sample Below Residential Drinking Water Protection Criteria (< 1 mg/kg)
- Soil Sample Location - Sample Above Residential Drinking Water Protection Criteria (> 1 mg/kg)

N

Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

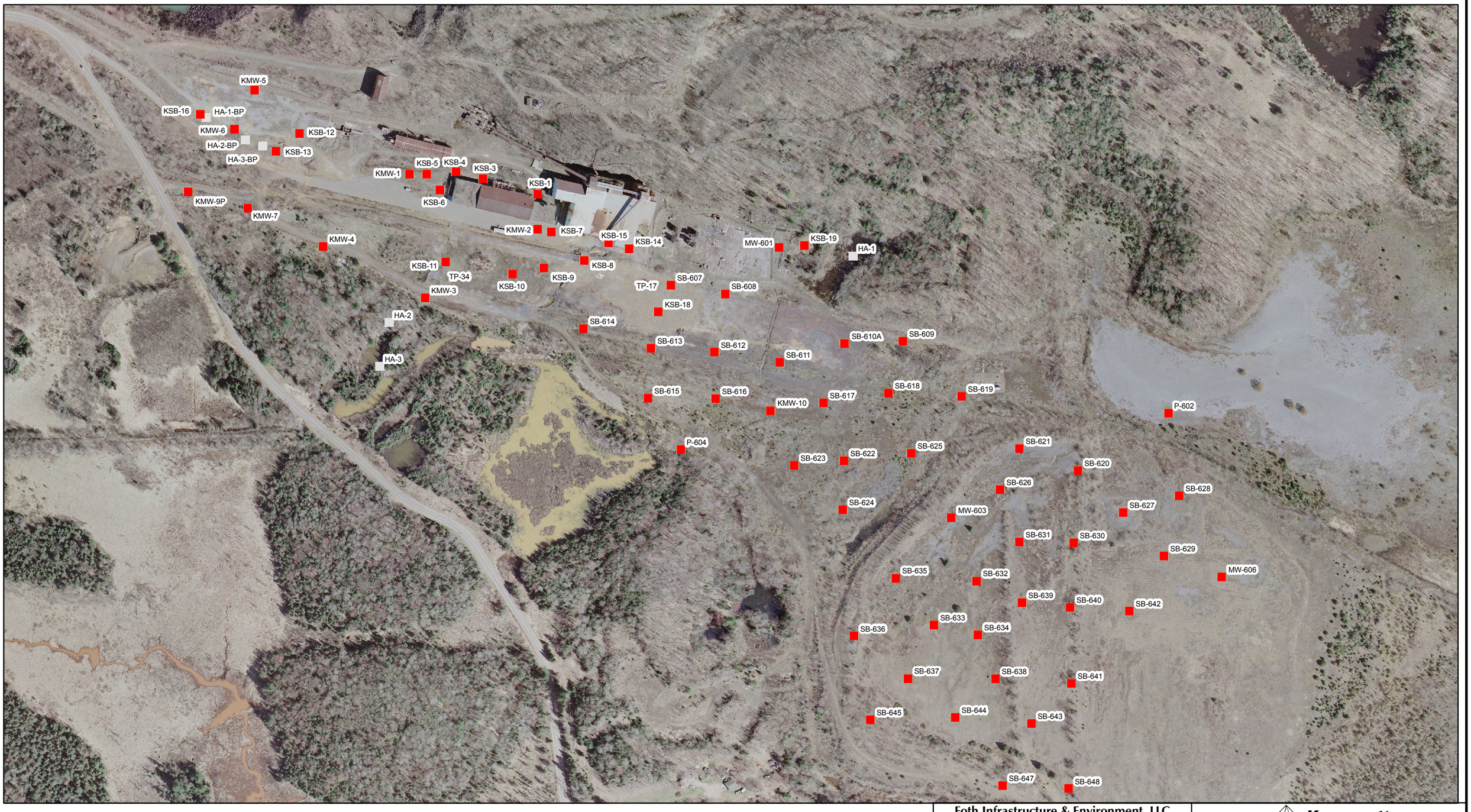
JSL	DATE: AUG. '07
SVD1	DATE: AUG. '07
	DATE:

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FIGURE 5-31
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
SOIL SAMPLE LOCATIONS
ALUMINUM IN SOIL

Scale: 0 150 300 Feet
Date: AUGUST 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.

LEGEND

- Soil Sample Location - Not Sampled for Parameter
- Soil Sample Location - Sample Below Drinking Water Protection Criteria (< 0.8 mg/kg)
- Soil Sample Location - Sample Above Drinking Water Protection Criteria (> 0.8 mg/kg)

N

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REVISED	DATE	BY	DESCRIPTION

JSL	DATE: AUG. '07
SVD1	DATE: AUG. '07
	DATE:

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FIGURE 5-32
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
SOIL SAMPLE LOCATIONS
COBALT IN SOIL

Scale: 0 150 300 Feet

Date: AUGUST 2007

Prepared by: DAT

Project No: 06W003

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KMW-5
KSB-16
HA-1-BP
KMW-6
KSB-12
HA-2-BP
KSB-13
HA-3-BP
KMW-1
KSB-5
KSB-4
KSB-3
KSB-1
KSB-6
KMW-9P
KMW-7
KMW-2
KSB-7
KSB-15
KSB-14
KMW-4
MW-601
KSB-19
HA-1
KSB-11
KSB-8
TP-34
KSB-9
KSB-10
TP-17
SB-607
SB-608
KMW-3
KSB-18
HA-2
SB-614
SB-610A
SB-609
SB-613
SB-612
SB-611
HA-3
SB-615
SB-616
KMW-10
SB-617
SB-618
SB-619
P-602
P-604
SB-625
SB-621
SB-623
SB-622
SB-620
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SB-628
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MW-603
SB-627
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MW-606
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SB-643
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SB-648

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.

LEGEND

- Soil Sample Location - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Protection Criteria (< 6 mg/kg)
- Soil Sample Location - Sample Above Drinking Water Protection Criteria (> 6 mg/kg)

N

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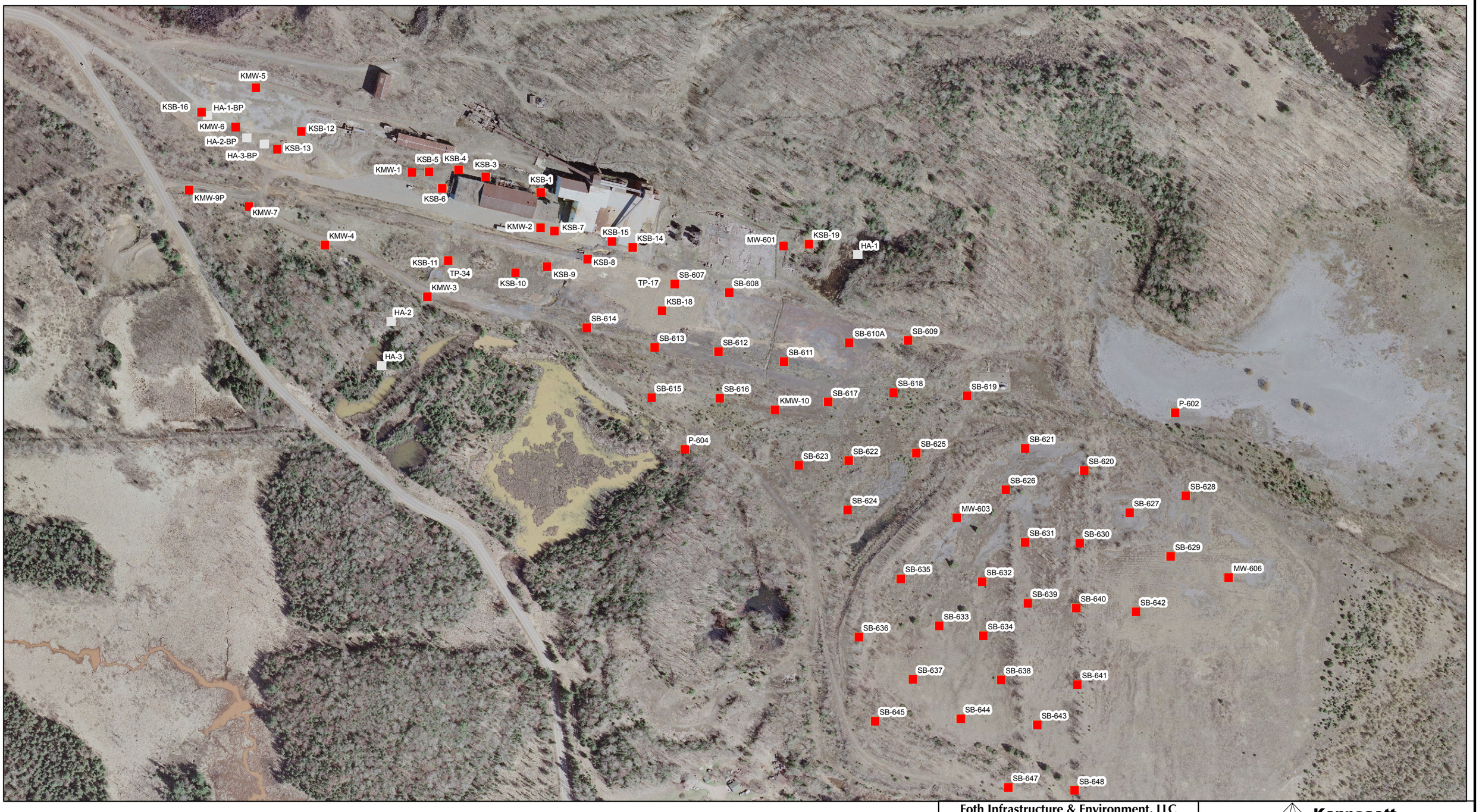
REVISED	DATE	BY	DESCRIPTION

JSL	DATE: AUG. '07
SVD1	DATE: AUG. '07
	DATE:

Kennecott
Eagle Minerals

FIGURE 5-33
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
SOIL SAMPLE LOCATIONS
IRON IN SOIL

Scale: 0 150 300 Feet
Date: AUGUST 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 83/96. 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.

LEGEND

- Soil Sample Location - Not Sampled for Parameter
- Soil Sample Location - Sample Below Drinking Water Protection Criteria (< 1 mg/kg)
- Soil Sample Location - Sample Above Drinking Water Protection Criteria (> 1 mg/kg)

N

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Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	JSL	DATE:	AUG. '07
APPROVED BY:	SVD1	DATE:	AUG. '07
APPROVED BY:		DATE:	

Kennecott
Eagle Minerals

FIGURE 5-34
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
SOIL SAMPLE LOCATIONS
MANGANESE IN SOIL

Scale: 0 150 300 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

KMW-5
KSB-16
HA-1-BP
KMW-6
KSB-12
HA-2-BP
KSB-13
HA-3-BP
KMW-1
KSB-5
KSB-4
KSB-3
KSB-1
KSB-6
KMW-9P
KMW-7
KMW-2
KSB-7
KSB-15
KSB-14
KMW-4
MW-601
KSB-19
HA-1
KSB-11
TP-34
KSB-10
KSB-9
KSB-8
TP-17
SB-607
SB-608
KMW-3
KSB-18
HA-2
SB-614
SB-610A
SB-609
SB-613
SB-612
SB-611
HA-3
SB-615
SB-616
KMW-10
SB-617
SB-618
SB-619
P-602
P-604
SB-623
SB-622
SB-625
SB-621
SB-620
SB-626
SB-628
SB-624
MW-603
SB-627
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MW-606
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SB-642
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SB-641
SB-645
SB-644
SB-643
SB-647
SB-648

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.

LEGEND

- Soil Sample Location - Not Sampled for Parameter
- Soil Sample Location - Sample Below Drinking Water Protection Criteria (< 4.3 mg/kg)
- Soil Sample Location - Sample Above Drinking Water Protection Criteria (> 4.3 mg/kg)

N

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CHECKED BY:	JSL	DATE: AUG. '07
APPROVED BY:	SVD1	DATE: AUG. '07
APPROVED BY:		DATE:

Kennecott
Eagle Minerals

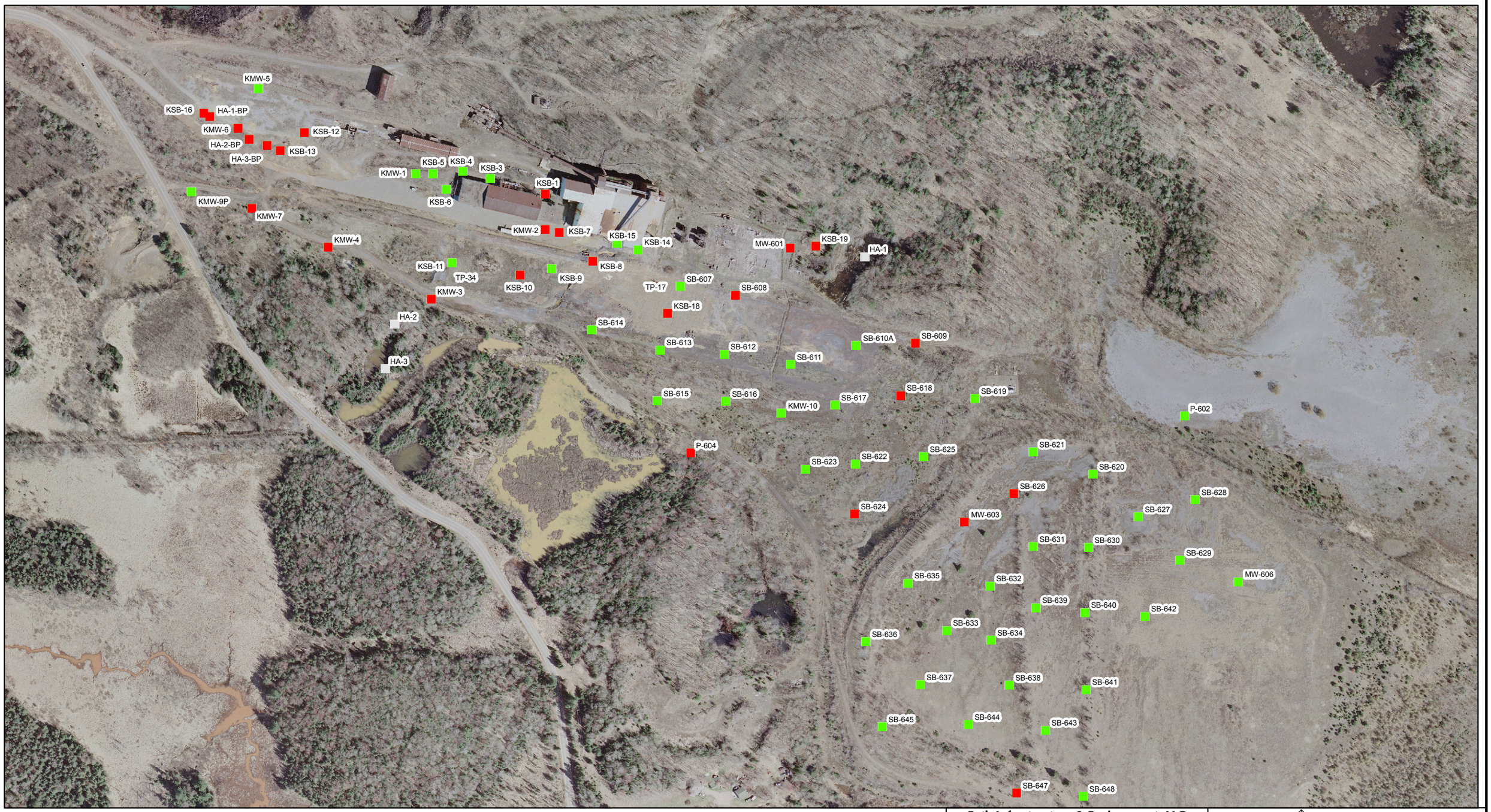
FIGURE 5-35
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
SOIL SAMPLE LOCATIONS
ANTIMONY IN SOIL

Scale: 0 150 300 Feet

Date: AUGUST 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 83/96. 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.

LEGEND

- Soil Sample Location - Not Sampled for Parameter
- Soil Sample Location - Sample Below Drinking Water Protection Criteria (< 4.6 mg/kg)
- Soil Sample Location - Sample Above Drinking Water Protection Criteria (> 4.6 mg/kg)

N

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CHECKED BY:	JSL	DATE: AUG. '07	
APPROVED BY:	SVD1	DATE: AUG. '07	
APPROVED BY:		DATE:	

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FIGURE 5-36
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
SOIL SAMPLE LOCATIONS
ARSENIC IN SOIL

Scale: 0 150 300 Feet

Date: AUGUST 2007

Prepared by: DAT

Project No: 06W003

M:\06w003\mxd\HGR\kmc_humboldt_Sampling_Soil_Arsenic_Fig5-36_11x17.mxd August 24, 2007

KMW-5
KSB-16
HA-1-BP
KMW-6
KSB-12
HA-2-BP
KSB-13
HA-3-BP
KMW-1
KSB-5
KSB-4
KSB-3
KSB-1
KSB-6
KMW-9P
KMW-7
KMW-2
KSB-7
KSB-15
KSB-14
KMW-4
MW-601
KSB-19
HA-1
KSB-11
KSB-8
TP-34
KSB-9
KSB-10
TP-17
SB-607
SB-608
KMW-3
KSB-18
HA-2
SB-614
SB-610A
SB-609
SB-613
SB-612
SB-611
HA-3
SB-615
SB-616
SB-618
SB-619
SB-617
KMW-10
P-602
P-604
SB-625
SB-621
SB-623
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SB-620
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SB-638
SB-641
SB-645
SB-644
SB-643
SB-647
SB-648

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.

LEGEND

- Soil Sample Location - Not Sampled for Parameter
- Soil Sample Location - Sample Below Drinking Water Protection Criteria (< 10 mg/kg)
- Soil Sample Location - Sample Above Drinking Water Protection Criteria (> 10 mg/kg)

N

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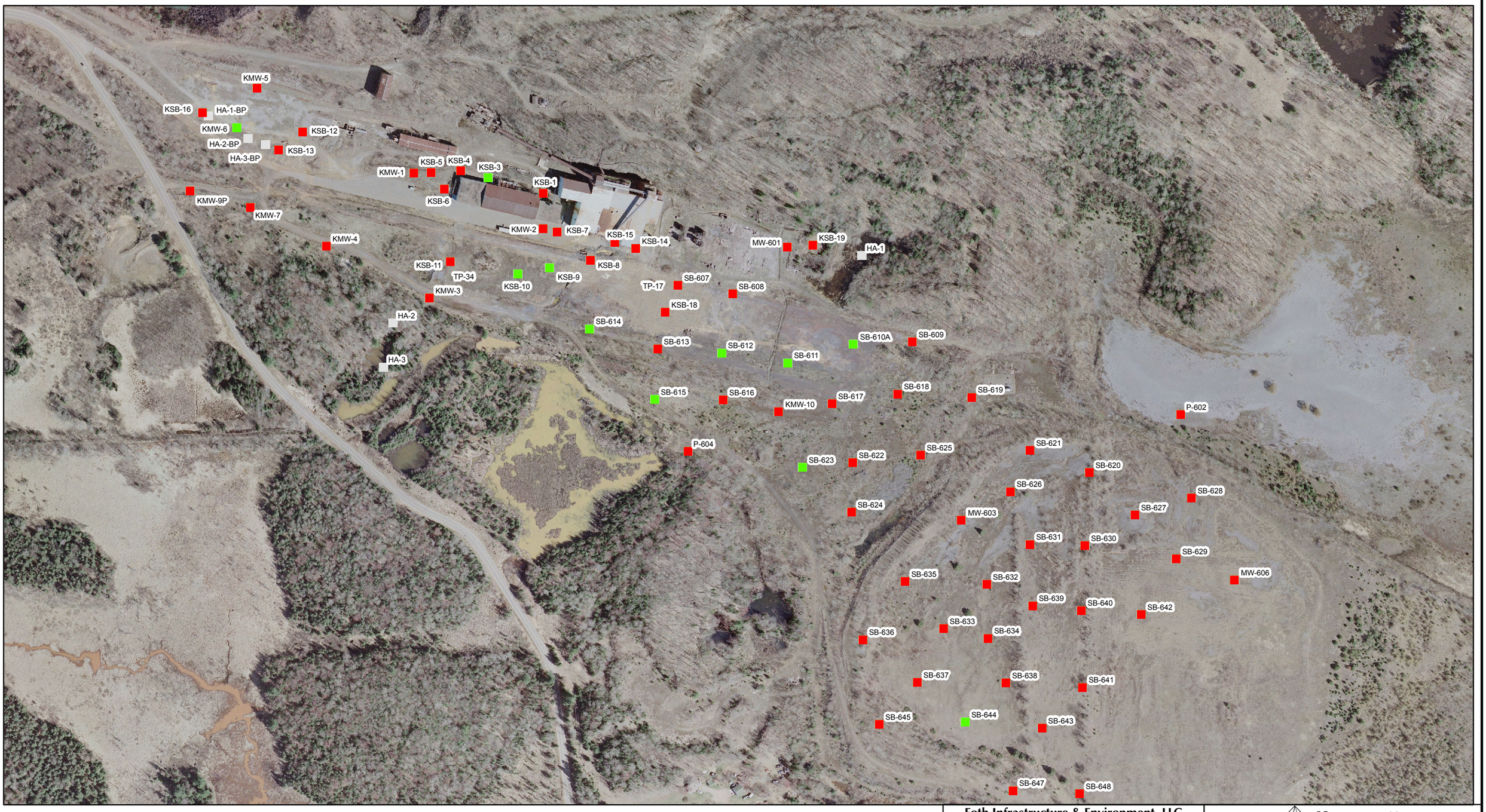
CHECKED BY:	JSL	DATE: AUG. '07	
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APPROVED BY:		DATE:	

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FIGURE 5-37
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
SOIL SAMPLE LOCATIONS
BORON IN SOIL

Scale: 0 150 300 Feet
Date: AUGUST 2007
Prepared by: DAT
Project No: 06W003

M:\06w003\mxd\HGR\kmc_humboldt_Sampling_Soil_Boron_Fig5-37_11x17.mxd August 24, 2007



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.

LEGEND

- Soil Sample Location - Not Sampled for Parameter
- Soil Sample Location - Sample Below Drinking Water Protection Criteria (< 3.4 mg/kg)
- Soil Sample Location - Sample Above Drinking Water Protection Criteria (> 3.4 mg/kg)

N

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	DATE:

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FIGURE 5-38
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
SOIL SAMPLE LOCATIONS
LITHIUM IN SOIL

Scale: 0 150 300 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

M:\06w003\mxd\HGR\kmc_humboldt_Sampling_Soil_Lithium_Fig5-38_11x17.mxd August 24, 2007



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.

LEGEND

- Soil Sample Location - Not Sampled for Parameter
- Soil Sample Location - Sample Below Drinking Water Protection Criteria (< 8,000 mg/kg)
- Soil Sample Location - Sample Above Drinking Water Protection Criteria (> 8,000 mg/kg)

N

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FIGURE 5-39
HUMBOLDT MILL PROJECT - PHASE II ESA
SOIL SAMPLE LOCATIONS
MAGNESIUM IN SOIL

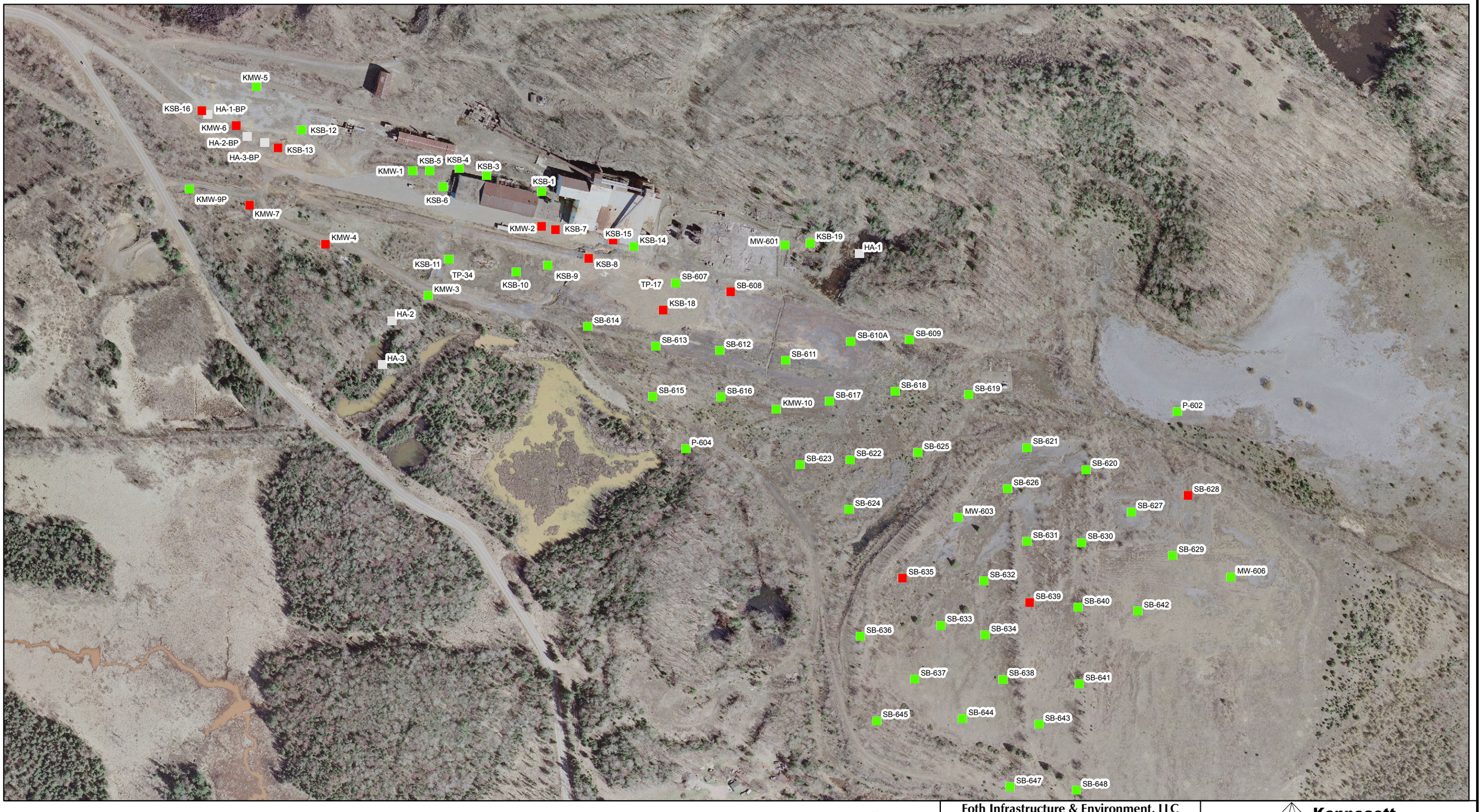
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Date: AUGUST 2007

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.

LEGEND

- Soil Sample Location - Not Sampled for Parameter
- Soil Sample Location - Sample Below Drinking Water Protection Criteria (< 1.5 mg/kg)
- Soil Sample Location - Sample Above Drinking Water Protection Criteria (> 1.5 mg/kg)

N

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FIGURE 5-40
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
SOIL SAMPLE LOCATIONS
MOLYBDENUM IN SOIL

Scale: 0 150 300 Feet

Date: AUGUST 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 83/96. 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.

LEGEND

- Soil Sample Location - Not Sampled for Parameter
- Soil Sample Location - Sample Below Direct Contact Criteria (< 400 mg/kg)
- Soil Sample Location - Sample Above Direct Contact Criteria (> 400 mg/kg)

N

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	DATE:

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FIGURE 5-41
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
SOIL SAMPLE LOCATIONS
LEAD IN SOIL

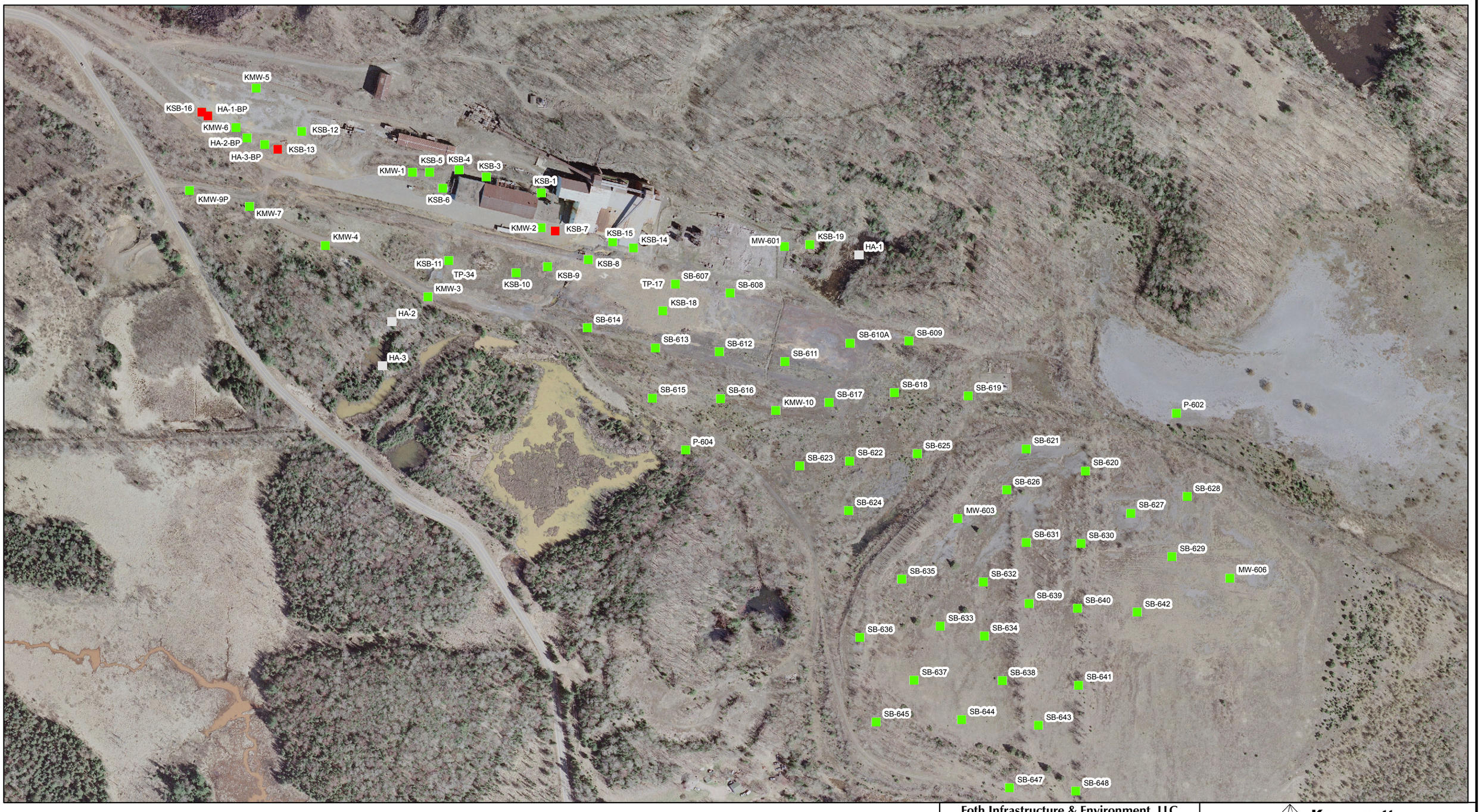
Scale: 0 150 300 Feet

Date: AUGUST 2007

Prepared by: DAT

Project No: 06W003

M:\06w003\mxd\HGR\kmc_humboldt_Sampling_Soil_Lead_Fig5-41_11x17.mxd August 24, 2007



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.

LEGEND

- Soil Sample Location - Not Sampled for Parameter
- Soil Sample Location - Sample Below Drinking Water Protection Criteria (< 100 mg/kg)
- Soil Sample Location - Sample Above Drinking Water Protection Criteria (> 100 mg/kg)

N

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M:\06w003\mxd\HGR\kmc_humboldt_Sampling_Soil_Nickel_Fig5-42_11x17.mxd August 24, 2007

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	DATE:

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FIGURE 5-42
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
SOIL SAMPLE LOCATIONS
NICKEL IN SOIL

Scale: 0 150 300 Feet	Date: AUGUST 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 83/96. 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.

LEGEND

- Soil Sample Location - Not Sampled for Parameter
- Soil Sample Location - Sample Below Drinking Water Protection Criteria (< 4 mg/kg)
- Soil Sample Location - Sample Above Drinking Water Protection Criteria (> 4 mg/kg)

N

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	DATE:

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FIGURE 5-43
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
SOIL SAMPLE LOCATIONS
SELENIUM IN SOIL

Scale: 0 150 300 Feet

Date: AUGUST 2007

Prepared by: DAT

Project No: 06W003

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KMW-5
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KMW-6
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HA-2-BP
KSB-13
HA-3-BP
KSB-5
KSB-4
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KSB-1
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KMW-9P
KMW-7
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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.

LEGEND

- Soil Sample Location - Not Sampled for Parameter
- Soil Sample Location - Sample Below Drinking Water Protection Criteria (< 4.5 mg/kg)
- Groundwater Monitoring Well - Sample Above Drinking Water Protection Criteria (> 4.5 mg/kg)

N

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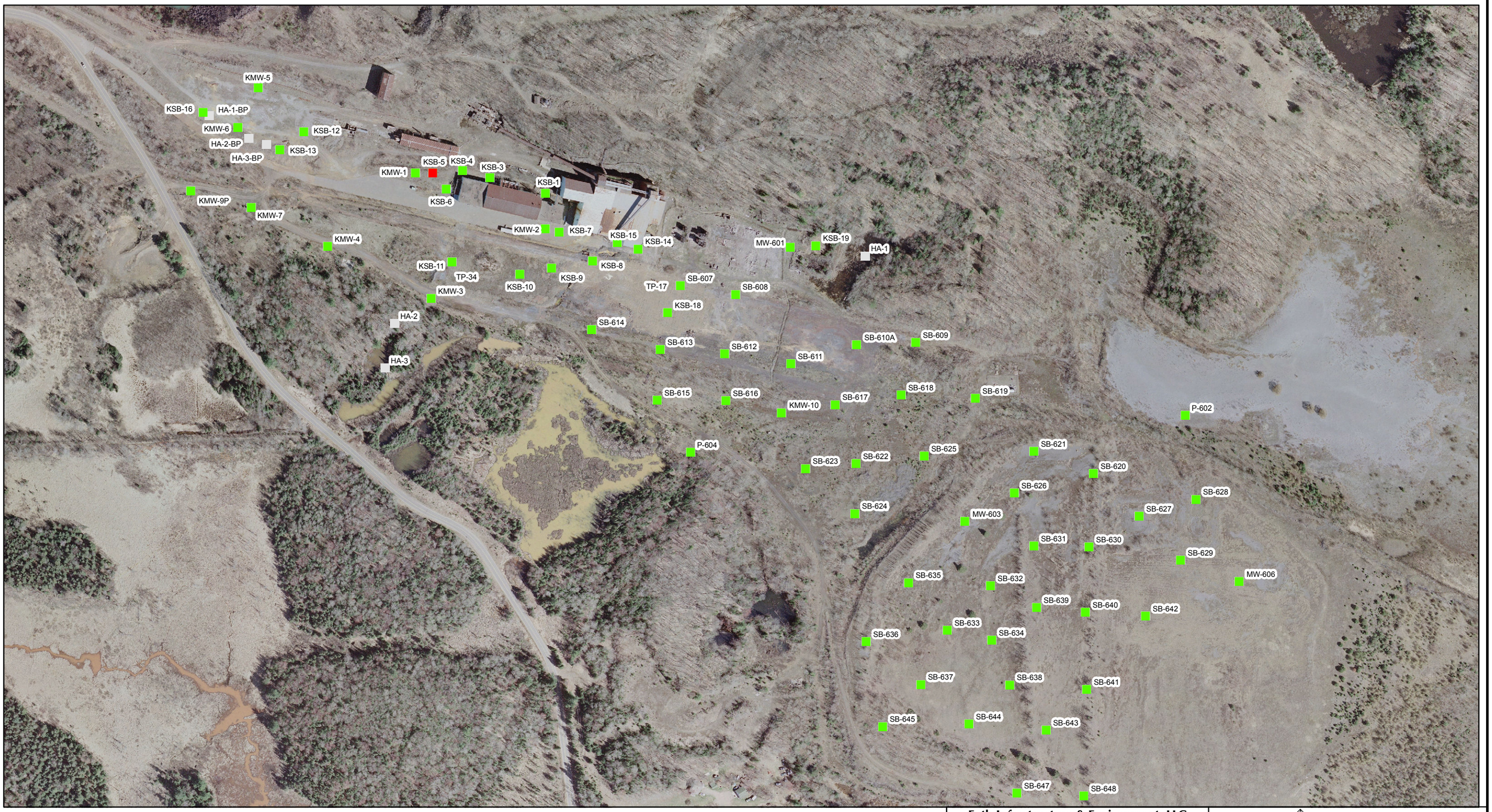
FIGURE 5-44
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
SOIL SAMPLE LOCATIONS
SILVER IN SOIL

Scale: 0 150 300 Feet

Date: AUGUST 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 83/96. 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.

LEGEND

- Soil Sample Location - Not Sampled for Parameter
- Soil Sample Location - Sample Below Drinking Water Protection Criteria (< 2.3 mg/kg)
- Soil Sample Location - Sample Above Drinking Water Protection Criteria (> 2.3 mg/kg)

N

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M:\06w003\mxd\HGR\kmc_humboldt_Sampling_Soil_Thallium_Fig4-45_11x17.mxd August 24, 2007

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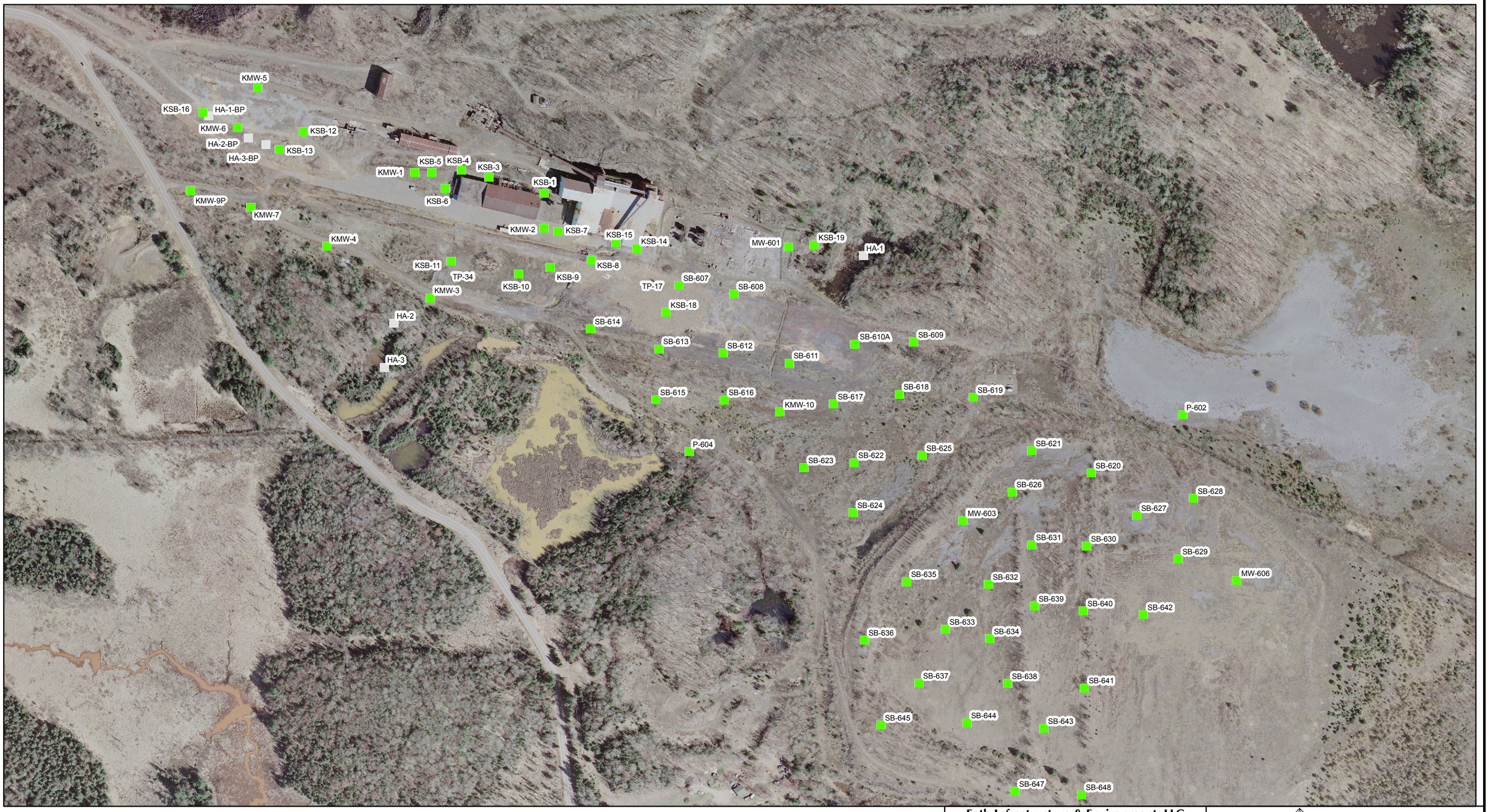
REVISED	DATE	BY	DESCRIPTION

CHECKED BY:	JSL	DATE:	AUG. '07
APPROVED BY:	SVD1	DATE:	AUG. '07
APPROVED BY:		DATE:	

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FIGURE 5-45
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
SOIL SAMPLE LOCATIONS
THALLIUM IN SOIL

Scale: 0 150 300 Feet	Date: AUGUST 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 83/96. 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.

LEGEND

- Soil Sample Location - Not Sampled for Parameter
- Soil Sample Location - Sample Below Drinking Water Protection Criteria (< 2,400 mg/kg)
- Soil Sample Location- Sample Above Drinking Water Protection Criteria (> 2,400 mg/kg)

N

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M:\06w003\mxd\HGR\kmc_humboldt_Sampling_Soil_Zinc_Fig5-46_11x17.mxd August 24, 2007

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APPROVED BY:		DATE:

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FIGURE 5-46
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
SOIL SAMPLE LOCATIONS
ZINC IN SOIL

Scale: 0 150 300 Feet	Date: AUGUST 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 83/96. 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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 5 ug/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 5 ug/L)

N

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M:\06w003\mxd\HGR\kmc_humboldt_Sampling_GW_Benzene_Fig5-47_11x17.mxd August 24, 2007

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SVD1	DATE: AUG. '07
	DATE:

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FIGURE 5-47
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
MONITORING WELL LOCATIONS
BENZENE IN GROUNDWATER NOV 2006

Scale: 0 150 300 Feet

Date: AUGUST 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 83/96. 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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 74 ug/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 74 ug/L)

N

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FIGURE 5-48
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
MONITORING WELL LOCATIONS
ETHYLBENZENE IN GROUNDWATER NOV 2006

Scale: 0 150 300 Feet	Date: AUGUST 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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 280 ug/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 280 ug/L)

N

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APPROVED BY:		DATE:	

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FIGURE 5-49
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
MONITORING WELL LOCATIONS
XYLENES IN GROUNDWATER NOV 2006

Scale: 0 150 300 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

M:\06w003\mxd\HGR\kmc_humboldt_Sampling_GW_Xylenes_Fig5-49_11x17.mxd August 24, 2007



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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 10 mg/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 10 mg/L)

N

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APPROVED BY:		DATE:	

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FIGURE 5-50
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
MONITORING WELL LOCATIONS
NITROGEN/AMMONIA IN GROUNDWATER NOV 2006

Scale: 0 150 300 Feet

Date: AUGUST 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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 250 mg/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 250 mg/L)

N

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JSL	DATE: AUG. '07
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	DATE:

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FIGURE 5-51
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
MONITORING WELL LOCATIONS
SULFATE IN GROUNDWATER NOV 2006

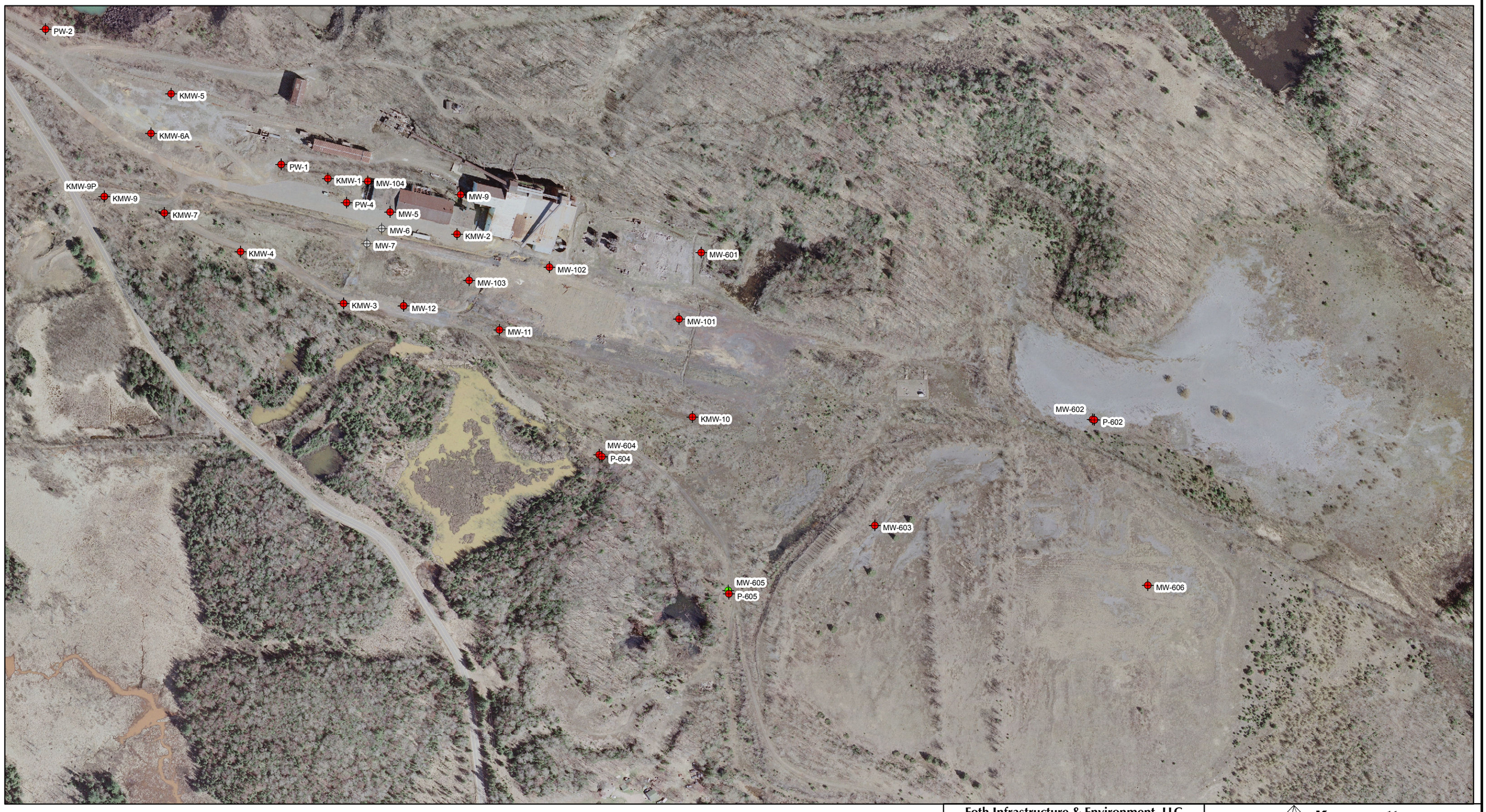
Scale: 0 150 300 Feet

Date: AUGUST 2007

Prepared by: DAT

Project No: 06W003

M:\06w003\mxd\HGR\kmc_humboldt_Sampling_GW_Sulfate_Fig5-51_11x17.mxd August 24, 2007



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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 300 ug/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 300 ug/L)

N

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CHECKED BY:	JSL	DATE: AUG. '07	
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Eagle Minerals

FIGURE 5-52
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
MONITORING WELL LOCATIONS
IRON IN GROUNDWATER NOV 2006

Scale: 0 150 300 Feet	Date: AUGUST 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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 50 ug/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 50 ug/L)

N

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APPROVED BY:		DATE:	

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FIGURE 5-53
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
MONITORING WELL LOCATIONS
MANGANESE IN GROUNDWATER NOV 2006

Scale: 0 150 300 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

M:\06w003\mxd\HGR\kmc_humboldt_Sampling_GW_Manganese_Fig5-53_11x17.mxd August 24, 2007



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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 50 ug/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 50 ug/L)

N

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APPROVED BY:		DATE:	

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FIGURE 5-54
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
MONITORING WELL LOCATIONS
ALUMINUM IN GROUNDWATER NOV 2006

Scale: 0 150 300 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

M:\06w003\mxd\HGR\kmc_humboldt_Sampling_GW_Aluminum_Fig5-54_11x17.mxd August 24, 2007



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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 10 ug/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 10 ug/L)

N

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SVD1	DATE: AUG. '07
	DATE:

Kennecott Eagle Minerals

FIGURE 5-55
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
MONITORING WELL LOCATIONS
ARSENIC IN GROUNDWATER NOV 2006

Scale: 0 150 300 Feet | Date: AUGUST 2007

Prepared by: DAT | Project No: 06W003

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PW-2
KMW-5
KMW-6A
PW-1
KMW-1
MW-104
KMW-9P
KMW-9
PW-4
MW-9
KMW-7
MW-5
MW-6
KMW-2
MW-7
KMW-4
MW-601
MW-102
MW-103
KMW-3
MW-12
MW-101
MW-11
KMW-10
MW-602
P-602
MW-604
P-604
MW-603
MW-605
P-605
MW-606

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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 40 ug/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 40 ug/L)

N

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JSL	DATE: AUG. '07
SVD1	DATE: AUG. '07
	DATE:

Kennecott Eagle Minerals

FIGURE 5-56
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
MONITORING WELL LOCATIONS
COBALT IN GROUNDWATER NOV 2006

Scale: 0 150 300 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

M:\06w003\mxd\HGR\kmc_humboldt_Sampling_GW_Cobalt_Fig5-56_11x17.mxd August 24, 2007



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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 4.5 ug/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 4.5 ug/L)

N

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APPROVED BY:		DATE:	

Kennecott Eagle Minerals

FIGURE 5-57
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
MONITORING WELL LOCATIONS
VANADIUM IN GROUNDWATER NOV 2006

Scale: 0 150 300 Feet	Date: AUGUST 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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 4 ug/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 4 ug/L)

N

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M:\06w003\mxd\HGR\kmc_humboldt_Sampling_GW_Beryllium_Fig5-58_11x17.mxd August 24, 2007

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APPROVED BY:		DATE:	

Kennecott
Eagle Minerals

FIGURE 5-58
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
MONITORING WELL LOCATIONS
BERYLLIUM IN GROUNDWATER NOV 2006

Scale: 0 150 300 Feet	Date: AUGUST 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 83/96. 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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 5 ug/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 5 ug/L)

N

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SVD1	DATE: AUG. '07
	DATE:

Kennecott Eagle Minerals

FIGURE 5-59
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
MONITORING WELL LOCATIONS
CADMIUM IN GROUNDWATER NOV 2006

Scale: 0 150 300 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

M:\06w003\mxd\HGR\kmc_humboldt_Sampling_GW_Cadmium_Fig5-59_11x17.mxd August 24, 2007



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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 100 ug/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 100 ug/L)

N

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JSL	DATE: AUG. '07
SVD1	DATE: AUG. '07
	DATE:

Kennecott Eagle Minerals

FIGURE 5-60
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
MONITORING WELL LOCATIONS
CHROMIUM IN GROUNDWATER NOV 2006

Scale: 0 150 300 Feet
Date: AUGUST 2007
Prepared by: DAT
Project No: 06W003

M:\06w003\mxd\HGR\kmc_humboldt_Sampling_GW_Chromium_Fig5-60_11x17.mxd August 24, 2007



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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 1,000 ug/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 1,000 ug/L)

N

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	DATE:

Kennecott Eagle Minerals

FIGURE 5-61
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
MONITORING WELL LOCATIONS
COPPER IN GROUNDWATER NOV 2006

Scale: 0 150 300 Feet | Date: AUGUST 2007

Prepared by: DAT | Project No: 06W003

M:\06w003\mxd\HGR\kmc_humboldt_Sampling_GW_Copper_Fig5-61_11x17.mxd August 24, 2007



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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 170 ug/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 170 ug/L)

N

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M:\06w003\mxd\HGR\kmc_humboldt_Sampling_GW_Lithium_Fig5-62_11x17.mxd August 24, 2007

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Kennecott
Eagle Minerals

FIGURE 5-62
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
MONITORING WELL LOCATIONS
LITHIUM IN GROUNDWATER NOV 2006

Scale: 0 150 300 Feet	Date: AUGUST 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 83/96. 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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 100 ug/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 100 ug/L)

N

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APPROVED BY:		DATE:	

Kennecott Eagle Minerals

FIGURE 5-63
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
MONITORING WELL LOCATIONS
NICKEL IN GROUNDWATER NOV 2006

Scale: 0 150 300 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

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PW-2
KMW-5
KMW-6A
PW-1
KMW-1
MW-104
KMW-9P
KMW-9
PW-4
MW-9
KMW-7
MW-5
MW-6
KMW-2
MW-7
KMW-4
MW-601
MW-102
MW-103
KMW-3
MW-12
MW-101
MW-11
KMW-10
MW-602
P-602
MW-604
P-604
MW-603
MW-605
P-605
MW-606

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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 2,400 ug/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 2,400 ug/L)

N

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M:\06w003\mxd\HGR\kmc_humboldt_Sampling_GW_Zinc_Fig5-64_11x17.mxd August 24, 2007

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APPROVED BY:		DATE:	

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Eagle Minerals

FIGURE 5-64
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
MONITORING WELL LOCATIONS
ZINC IN GROUNDWATER NOV 2006

Scale: 0 150 300 Feet	Date: AUGUST 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 83/96. 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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 50 ug/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 50 ug/L)

N

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FIGURE 5-65
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HTDF MONITORING WELL LOCATIONS
ALUMINUM IN GROUNDWATER JUNE 2007

Scale: 0 200 400 Feet	Date: AUGUST 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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 6 ug/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 6 ug/L)

N

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APPROVED BY:	SVD1	DATE: AUG. '07	
APPROVED BY:		DATE:	

Kennecott Eagle Minerals

FIGURE 5-66
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HTDF MONITORING WELL LOCATIONS
ANTIMONY IN GROUNDWATER JUNE 2007

Scale: 0 200 400 Feet	Date: AUGUST 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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 300 ug/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 300 ug/L)

N

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APPROVED BY:	SVD1	DATE: AUG. '07	
APPROVED BY:		DATE:	

Kennecott Eagle Minerals

FIGURE 5-67
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HTDF MONITORING WELL LOCATIONS
IRON IN GROUNDWATER JUNE 2007

Scale: 0 200 400 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

M:\06w003\mxd\HGR\kmc_humboldt_Sampling_GW_Iron_HTDF_Fig5-67_11x17.mxd August 27, 2007



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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 4 ug/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 4 ug/L)

N

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APPROVED BY:		DATE:	

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FIGURE 5-68
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HTDF MONITORING WELL LOCATIONS
LEAD IN GROUNDWATER JUNE 2007

Scale: 0 200 400 Feet	Date: AUGUST 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.

LEGEND

- Groundwater Monitoring Well - Not Sampled for Parameter
- Groundwater Monitoring Well - Sample Below Drinking Water Criteria (< 50 ug/L)
- Groundwater Monitoring Well - Sample Above Drinking Water Criteria (> 50 ug/L)

N

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CHECKED BY:	JSL	DATE: AUG. '07	
APPROVED BY:	SVD1	DATE: AUG. '07	
APPROVED BY:		DATE:	

Kennecott Eagle Minerals

FIGURE 5-69
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HTDF MONITORING WELL LOCATIONS
MANGANESE IN GROUNDWATER JUNE 2007

Scale: 0 200 400 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

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MER-001
MER-002
MER-003
HMP-002
HMP-001
WLD-003
WLD-002
WLD-001
WLD-001NW
WLD-001SE
WBR-001
WBR-002
HTP-002
HTP-001
LKL-001
LKL-002
WBR-003
EBR-001
MBR-001

NOTES

1. 1998 Series USGS Digital Orthophoto Quadrangles supplied by Michigan Center of Geographic Information.
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. All Samples use Drinking Water Protection Criteria

LEGEND

- Surface Water - Not Sampled for Parameter
- Surface Water -Sample Below Rule 57 Final Chronic Value
- Surface Water - Sample Above Rule 57 Final Chronic Value

N

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JOS1	DATE: AUG. '07
SVD1	DATE: AUG. '07
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FIGURE 5-70
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
SURFACE WATER SAMPLE LOCATIONS
MANGANESE IN SURFACE WATER AUGUST 2006

Scale: 0 1,500 3,000 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

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NOTES

1. 1998 Series USGS Digital Orthophoto Quadrangles supplied by Michigan Center of Geographic Information.
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. All Samples use Drinking Water Protection Criteria

LEGEND

- Surface Water - Not Sampled for Parameter
- Surface Water -Sample Below Rule 57 Wildlife Value
- Surface Water - Sample Above Rule 57 Wildlife Value

N

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JOS1	DATE: AUG. '07
SVD1	DATE: AUG. '07
	DATE:

Kennecott
Eagle Minerals

FIGURE 5-71
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
SURFACE WATER SAMPLE LOCATIONS
MERCURY IN SURFACE WATER AUGUST 2006

Scale: 0 1,500 3,000 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

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MER-001
MER-002
MER-003
HMP-002
HMP-001
WLD-003
WLD-002
WLD-001
WLD-001NW
WLD-001SE
WBR-001
WBR-002
HTP-002
HTP-001
LKL-001
LKL-002
WBR-003
EBR-001
MBR-001

NOTES

1. 1998 Series USGS Digital Orthophoto Quadrangles supplied by Michigan Center of Geographic Information.
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. All Samples use Drinking Water Protection Criteria

LEGEND

- Surface Water - Not Sampled for Parameter
- Surface Water -Sample Below Rule 57 Final Chronic Value
- Surface Water - Sample Above Rule 57 Final Chronic Value

N

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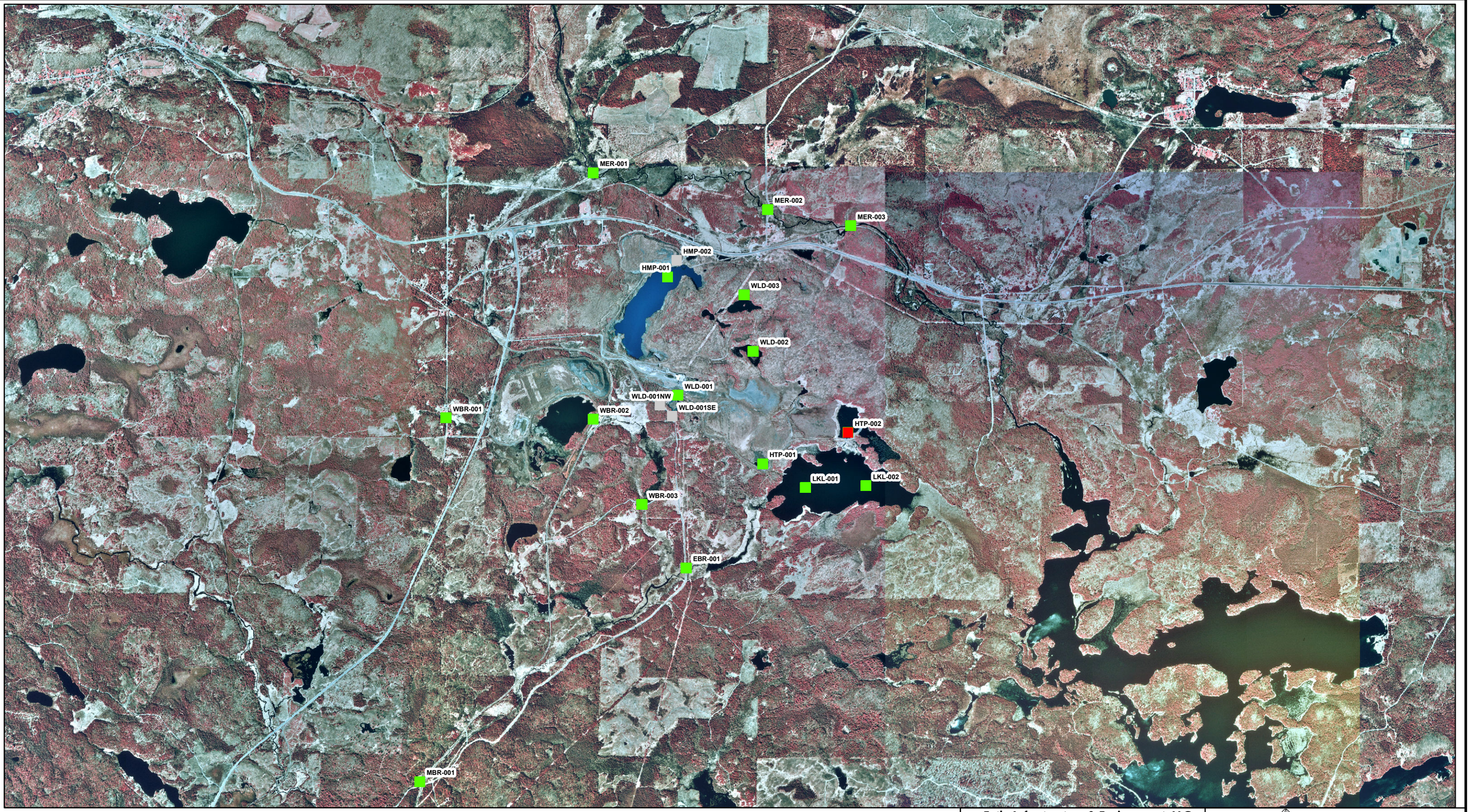
REVISED	DATE	BY	DESCRIPTION

JOS1	DATE: AUG. '07
SVD1	DATE: AUG. '07
	DATE:

Kennecott
Eagle Minerals

FIGURE 5-72
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
SURFACE WATER SAMPLE LOCATIONS
NICKEL IN SURFACE WATER AUGUST 2006

Scale: 0 1,500 3,000 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003



NOTES

1. 1998 Series USGS Digital Orthophoto Quadrangles supplied by Michigan Center of Geographic Information.
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. All Samples use Drinking Water Protection Criteria

LEGEND

- Surface Water - Not Sampled for Parameter
- Surface Water -Sample Below Rule 57 Final Chronic Value
- Surface Water - Sample Above Rule 57 Final Chronic Value

N

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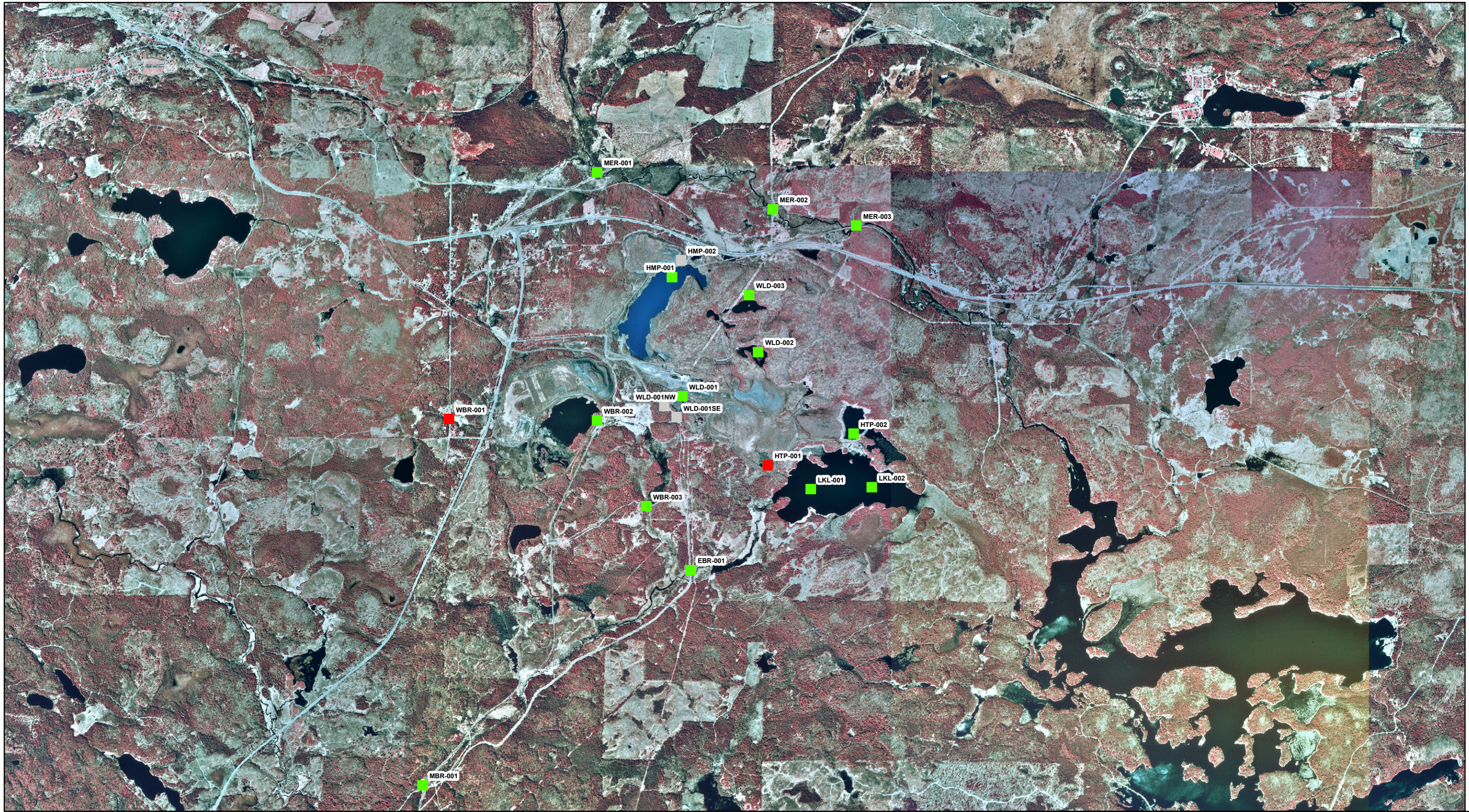
JOS1	DATE: AUG. '07
SVD1	DATE: AUG. '07
	DATE:

Kennecott
Eagle Minerals

FIGURE 5-73
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
SURFACE WATER SAMPLE LOCATIONS
SILVER IN SURFACE WATER AUGUST 2006

Scale: 0 1,500 3,000 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

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NOTES

1. 1998 Series USGS Digital Orthophoto Quadrangles supplied by Michigan Center of Geographic Information.
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. All Samples use Drinking Water Protection Criteria

LEGEND

- Surface Water - Not Sampled for Parameter
- Surface Water -Sample Below Rule 57 Wildlife Value
- Surface Water - Sample Above Rule 57 Wildlife Value

N

Foth Infrastructure & Environment, LLC

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JOS1	DATE: AUG. '07
SVD1	DATE: AUG. '07
	DATE:

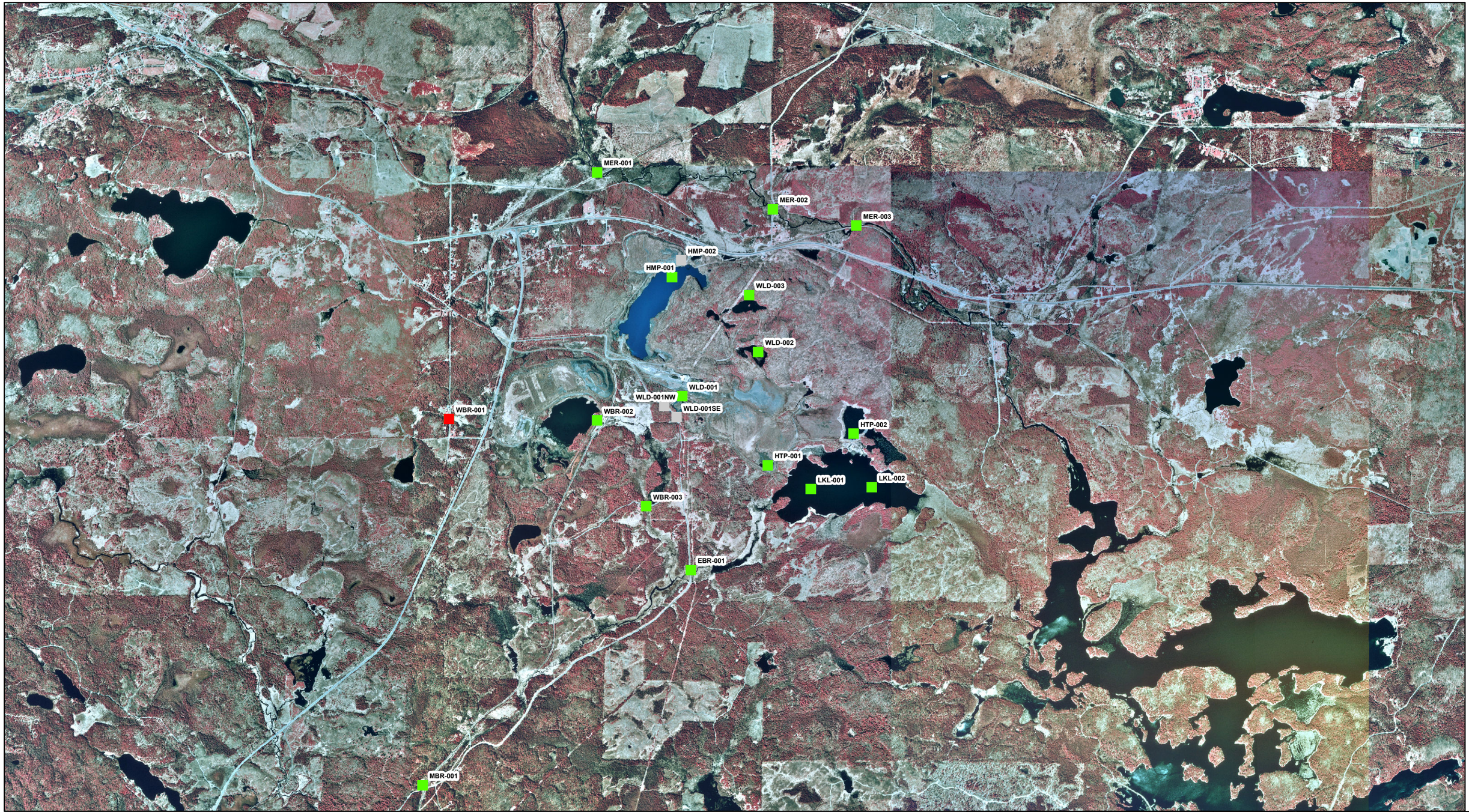
Kennecott
Eagle Minerals

FIGURE 5-74
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
SURFACE WATER SAMPLE LOCATIONS
MERCURY IN SURFACE WATER OCTOBER 2006

Scale: 0 1,500 3,000 Feet | Date: AUGUST 2007

Prepared by: DAT | Project No: 06W003

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NOTES

1. 1998 Series USGS Digital Orthophoto Quadrangles supplied by Michigan Center of Geographic Information.
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. All Samples use Drinking Water Protection Criteria

LEGEND

- Surface Water - Not Sampled for Parameter
- Surface Water -Sample Below Rule 57 Aquatic Maximum Value
- Surface Water - Sample Above Rule 57 Aquatic Maximum Value

N

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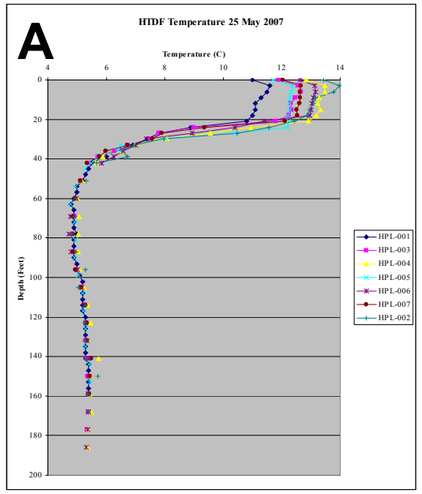
JOS1	DATE: AUG. '07
SVD1	DATE: AUG. '07
	DATE:

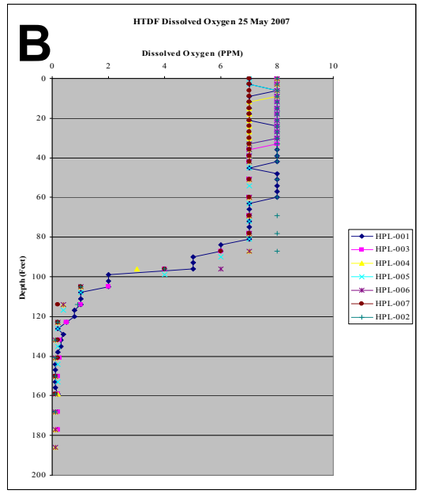
Kennecott Eagle Minerals

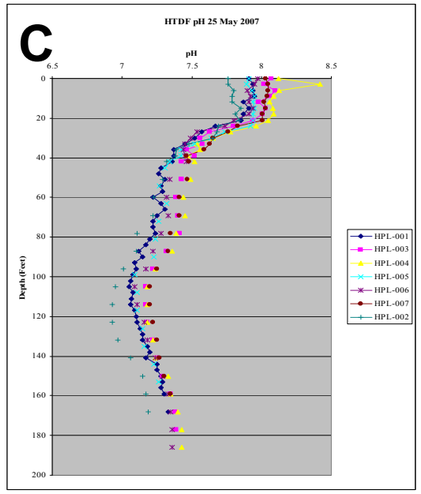
FIGURE 5-75
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
SURFACE WATER SAMPLE LOCATIONS
ZINC IN SURFACE WATER OCTOBER 2006

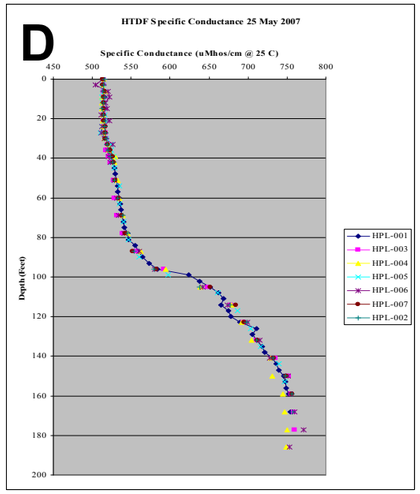
Scale: 0 1,500 3,000 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

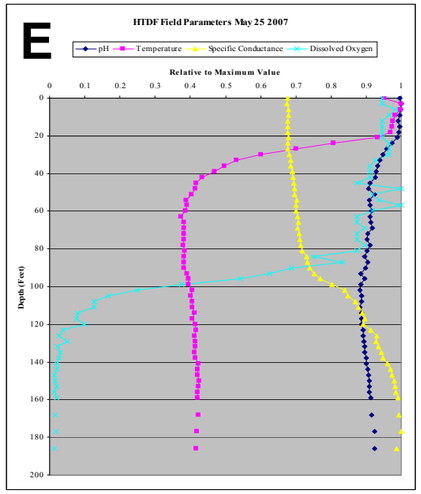
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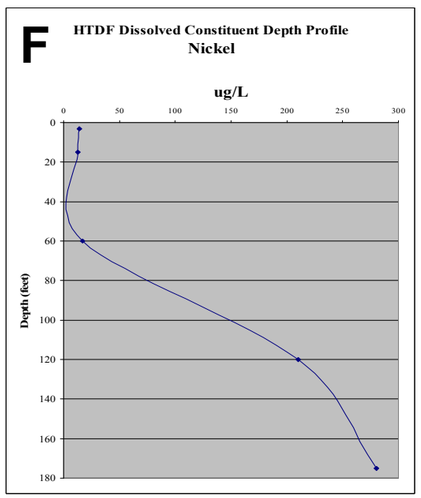


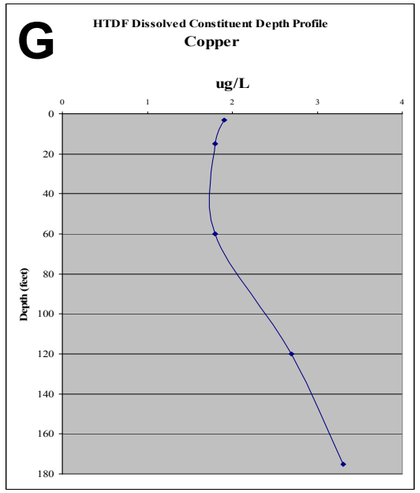


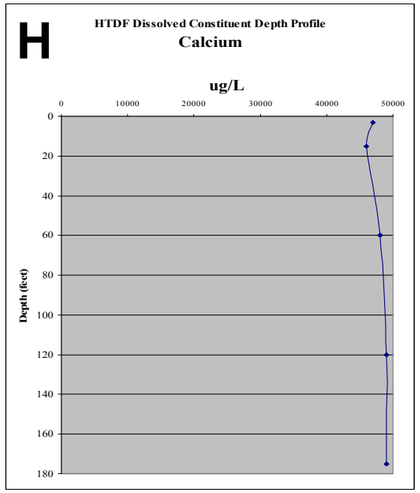


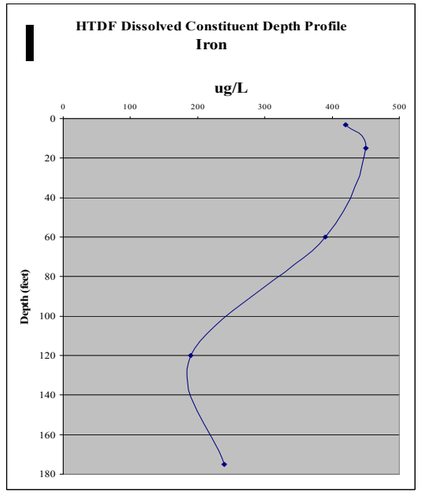


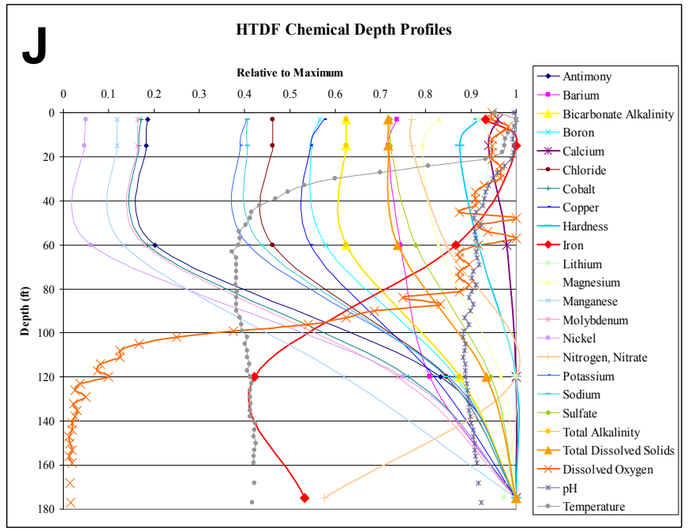












NOTES

E. Four HTDF field parameters at many water depths. Average at each depth from seven horizontal locations. Parameters are plotted relative to the maximum value for each parameter.

K. Depth profiles for twenty-one chemical constituents and three field parameters measured in the HTDF. Parameters are plotted relative to the maximum value for each parameter.

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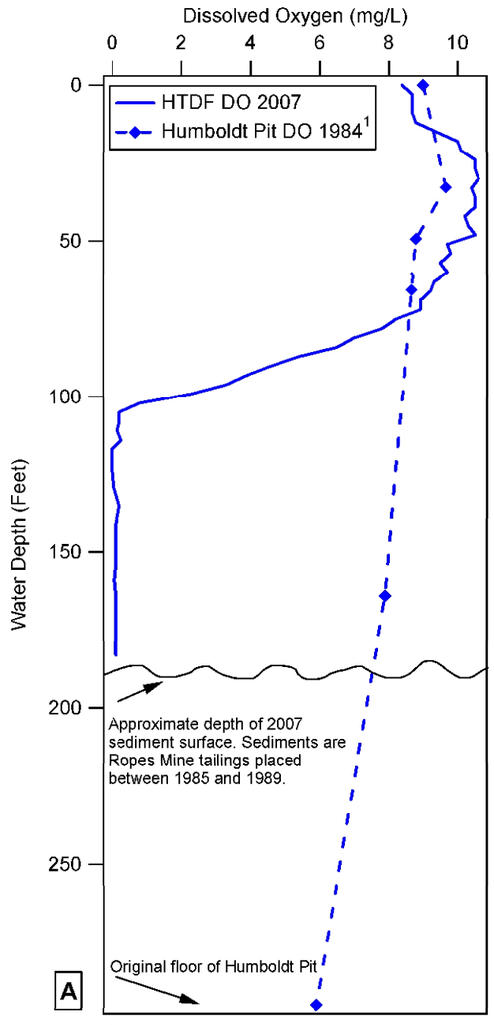
CHECKED BY:	JSL	DATE: AUG. '07
APPROVED BY:	SVD1	DATE: AUG. '07
APPROVED BY:		DATE:

Kennecott Eagle Minerals

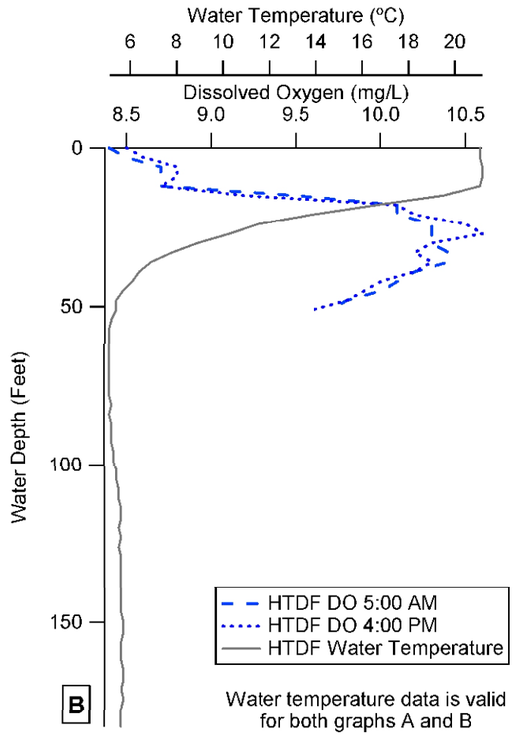
FIGURE 5-76
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HUMBOLDT TAILINGS DISPOSAL FACILITY
(HTDF) PROFILES

Scale:	Date: AUGUST 2007
Prepared by: ECB	Project No: 06W003

Dissolved Oxygen In The HTDF And Humboldt Pit
Historical And Diurnal Variation



[1]Traverse Engineering, 1984



Water temperature data is valid for both graphs A and B

A - Concentration of dissolved oxygen in the water column of the HTDF in July, 2007 and Humboldt Pit in 1984. Before tailings from the Ropes Mine were placed in the Pit, dissolved oxygen was present throughout the water column. This indicates that oxygen consumption from substances such as decaying organic matter was limited. After placement of tailings, oxygen is almost completely consumed below 100 feet.

B - Measurements of dissolved oxygen in the HTDF in the early morning and late afternoon of July 12, 2007. The depth profiles are almost identical and indicate that no significant primary production (algal growth) occurred during this time.

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APPROVED BY:				DATE:

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Eagle Minerals

FIGURE 5-77
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HTDF DISSOLVED OXYGEN

Scale: 0 200 400 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

M:\06w003\mxd\HGR\kmc_humboldt_HTDF_Dissolved_Oxygen_Fig5-77_11x17.mxd September 25, 2007



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.

LEGEND

- Surface Water Sample - Not Sampled for Parameter
- Surface Water Sample - Sample Below Rule 57 Wildlife Value (< 1.3 ng/L)
- Surface Water Sample - Sample Above Rule 57 Wildlife Value (> 1.3 ng/L)
- Humboldt Tailings Disposal Facility Watershed
- Approximate Groundwater Divide

N

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CHECKED BY:	JSL	DATE: AUG. '07
APPROVED BY:	SVD1	DATE: AUG. '07
APPROVED BY:		DATE:

Kennecott Eagle Minerals

FIGURE 5-78
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HTDF SURFACE WATER SAMPLING JUNE 2007
MERCURY

Scale: 0 250 500 Feet

Date: AUGUST 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.

LEGEND

- Surface Water Sample - Not Sampled for Parameter
- Surface Water Sample - Sample Below Rule 57 Final Chronic Value
- Surface Water Sample - Sample Above Rule 57 Final Chronic Value
- Humboldt Tailings Disposal Facility Watershed
- Approximate Groundwater Divide

N

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CHECKED BY:	JSL	DATE: AUG. '07	
APPROVED BY:	SVD1	DATE: AUG. '07	
APPROVED BY:		DATE:	

Kennecott Eagle Minerals

FIGURE 5-79
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HTDF SURFACE WATER SAMPLING JUNE 2007
MANGANESE

Scale: 0 250 500 Feet	Date: AUGUST 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.

LEGEND

- Surface Water Sample - Not Sampled for Parameter
- Surface Water Sample - Sample Below Rule 57 Final Chronic Value
- Surface Water Sample - Sample Above Rule 57 Final Chronic Value
- Humboldt Tailings Disposal Facility Watershed
- Approximate Groundwater Divide

N

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CHECKED BY:	JSL	DATE: AUG. '07	
APPROVED BY:	SVD1	DATE: AUG. '07	
APPROVED BY:		DATE:	

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FIGURE 5-80
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HTDF SURFACE WATER SAMPLING JUNE 2007
LEAD

Scale: 0 250 500 Feet | Date: AUGUST 2007

Prepared by: DAT | Project No: 06W003

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HMP-004
HMP-009
HMP-002
HMP-008
HMP-001
HPL-005
HPL-004
HPL-007
HPL-006
HPL-003
HPL-002
HPL-001
HMP-006
HMP-005
HMP-007

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.

LEGEND

- Surface Water Sample - Not Sampled for Parameter
- Surface Water Sample - Sample Below Rule 57 Final Chronic Value
- Surface Water Sample - Sample Above Rule 57 Final Chronic Value
- Humboldt Tailings Disposal Facility Watershed
- Approximate Groundwater Divide

N

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CHECKED BY:	JSL	DATE: AUG. '07	
APPROVED BY:	SVD1	DATE: AUG. '07	
APPROVED BY:		DATE:	

Kennecott Eagle Minerals

FIGURE 5-81
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HTDF SURFACE WATER SAMPLING JUNE 2007
COPPER

Scale: 0 250 500 Feet	Date: AUGUST 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.

LEGEND

- Surface Water Sample - Not Sampled for Parameter
- Surface Water Sample - Sample Below Rule 57 Final Chronic Value
- Surface Water Sample - Sample Above Rule 57 Final Chronic Value
- Humboldt Tailings Disposal Facility Watershed
- Approximate Groundwater Divide

N

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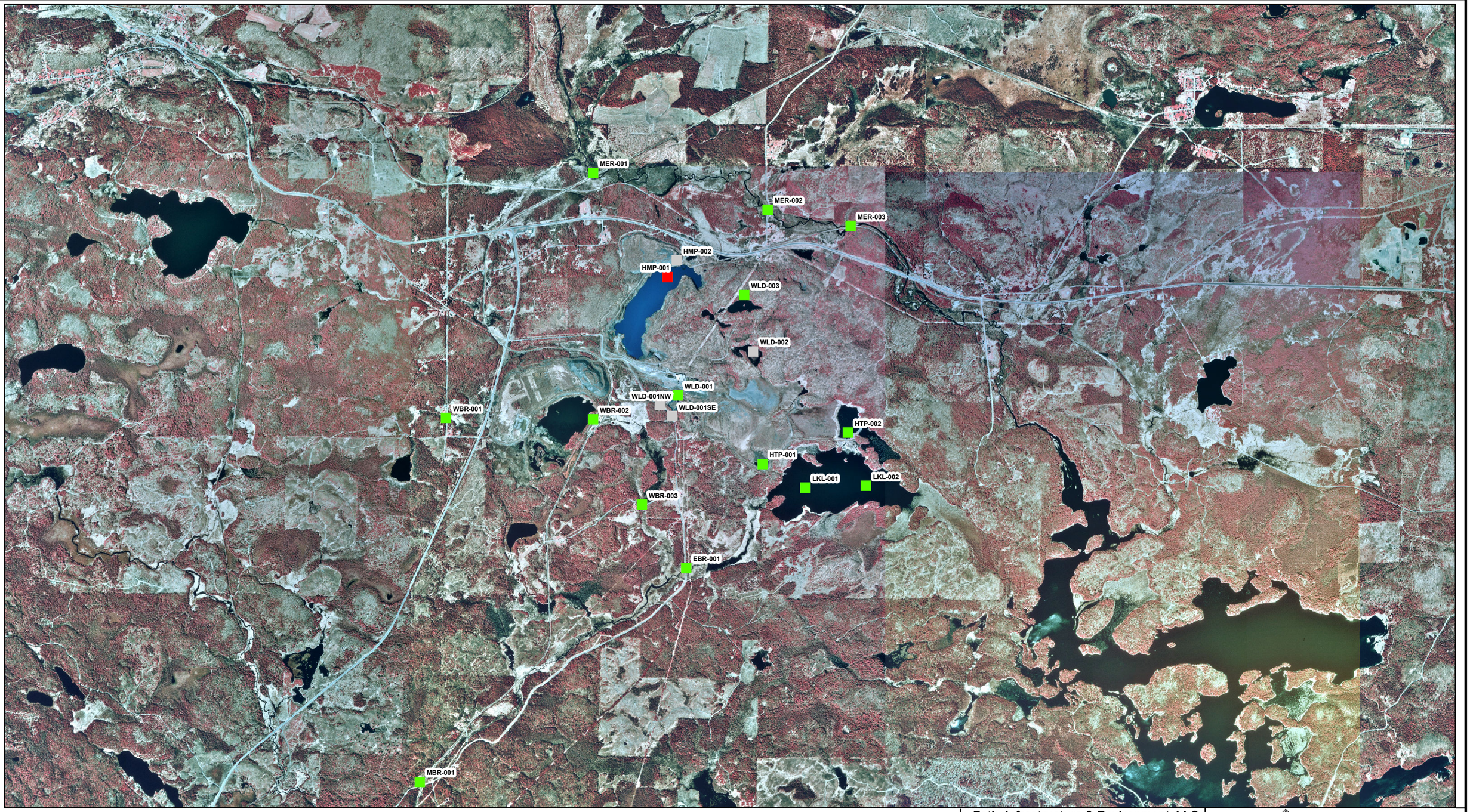
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APPROVED BY:	SVD1	DATE: AUG. '07	
APPROVED BY:		DATE:	

Kennecott Eagle Minerals

FIGURE 5-82
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HTDF SURFACE WATER SAMPLING JUNE 2007
NICKEL

Scale: 0 250 500 Feet		Date: AUGUST 2007	
Prepared by:	DAT	Project No:	06W003

M:\06w003\mxd\HGR\kmc_humboldt_Sampling_SW_Nickel_HTDF_Fig5-82_11x17.mxd September 25, 2007



NOTES

1. 1998 Series USGS Digital Orthophoto Quadrangles supplied by Michigan Center of Geographic Information.
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. All Samples use Drinking Water Protection Criteria

LEGEND

- Surface Water - Not Sampled for Parameter
- Surface Water -Sample Below GSI Protection Criteria
- Surface Water - Sample Above GSI Protection Criteria

N

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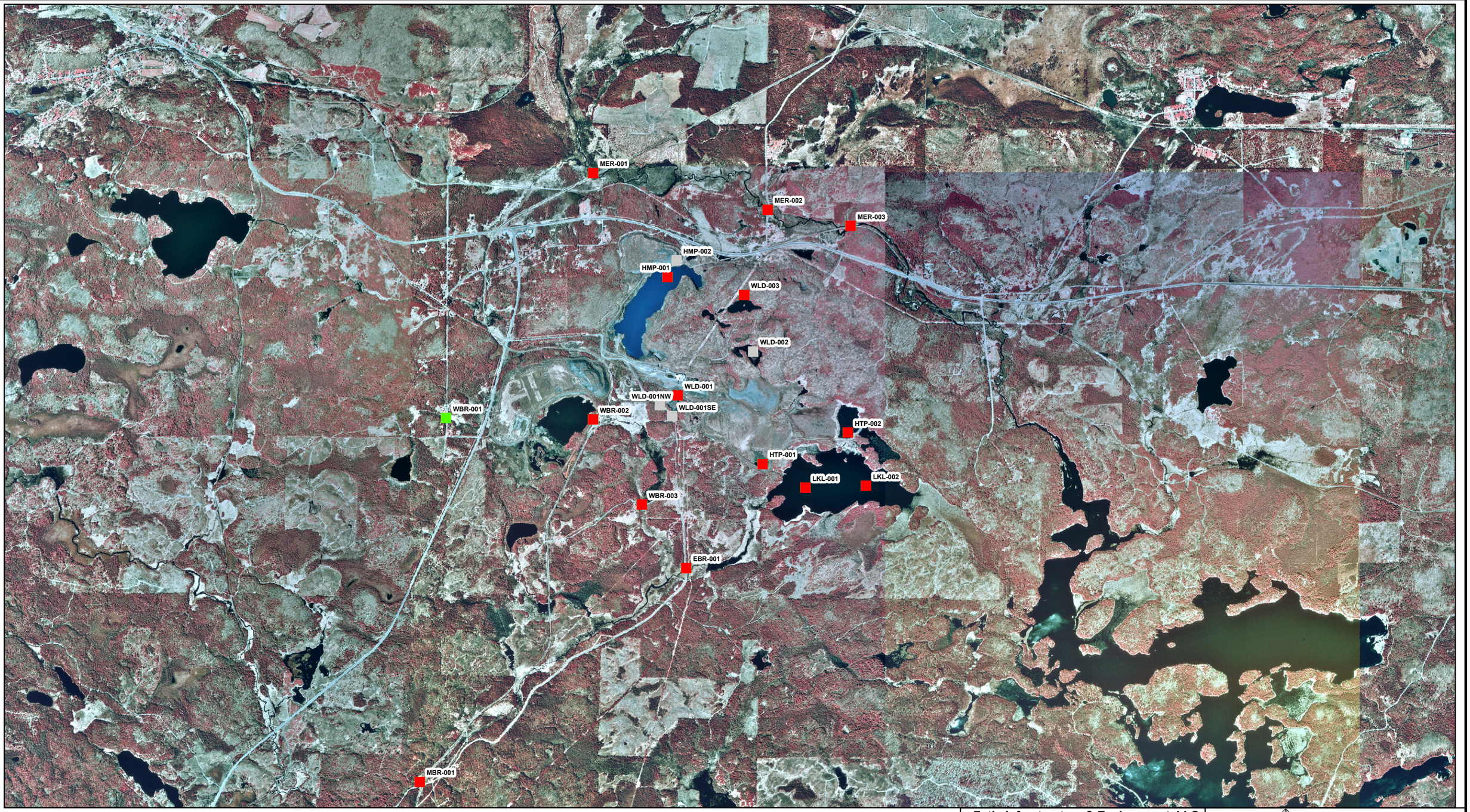
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JOS1	DATE: AUG. '07
SVD1	DATE: AUG. '07
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FIGURE 5-83
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
SURFACE WATER LOCATIONS
ARSENIC IN SEDIMENT AUGUST 2006

Scale: 0 1,500 3,000 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003



NOTES

1. 1998 Series USGS Digital Orthophoto Quadrangles supplied by Michigan Center of Geographic Information.
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. All Samples use Drinking Water Protection Criteria

LEGEND

- Soil Sample - Not Sampled for Parameter
- Soil Sample - Sample Below GSI Protection Criteria
- Soil Sample - Sample Above GSI Protection Criteria

N

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JSL	DATE: AUG. '07
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	DATE:

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FIGURE 5-84
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
SURFACE WATER LOCATIONS
COBALT IN SEDIMENT AUGUST 2006

Scale: 0 1,500 3,000 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

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NOTES

1. 1998 Series USGS Digital Orthophoto Quadrangles supplied by Michigan Center of Geographic Information.
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. All Samples use Drinking Water Protection Criteria

LEGEND

- Soil Sample - Not Sampled for Parameter
- Soil Sample - Sample Below GSI Protection Criteria
- Soil Sample - Sample Above GSI Protection Criteria

N

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APPROVED BY:		DATE:

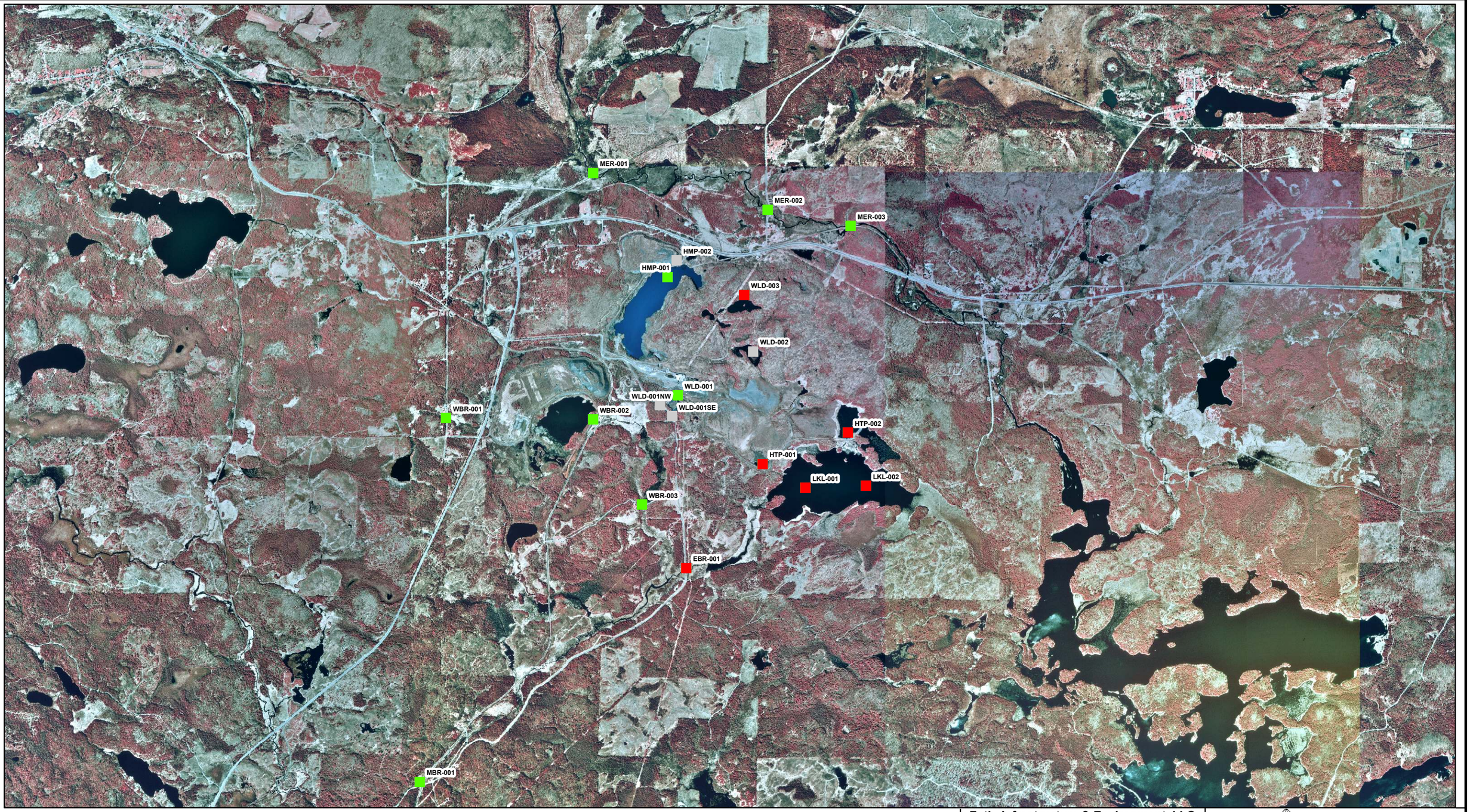
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FIGURE 5-85
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
SURFACE WATER LOCATIONS
LITHIUM IN SEDIMENT AUGUST 2006

Scale: 0 1,500 3,000 Feet | Date: AUGUST 2007

Prepared by: DAT | Project No: 06W003

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NOTES

1. 1998 Series USGS Digital Orthophoto Quadrangles supplied by Michigan Center of Geographic Information.
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. All Samples use Drinking Water Protection Criteria

LEGEND

- Soil Sample - Not Sampled for Parameter
- Soil Sample - Sample Below GSI Protection Criteria
- Soil Sample - Sample Above GSI Protection Criteria

N

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FIGURE 5-86
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
SURFACE WATER LOCATIONS
MERCURY IN SEDIMENT AUGUST 2006

Scale: 0 1,500 3,000 Feet | Date: AUGUST 2007

Prepared by: DAT | Project No: 06W003

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NOTES

1. 1998 Series USGS Digital Orthophoto Quadrangles supplied by Michigan Center of Geographic Information.
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. All Samples use Drinking Water Protection Criteria

LEGEND

- Soil Sample - Not Sampled for Parameter
- Soil Sample - Sample Below GSI Protection Criteria
- Soil Sample - Sample Above GSI Protection Criteria

N

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JSL	DATE: AUG. '07
SVD1	DATE: AUG. '07
	DATE:

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FIGURE 5-87
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
SURFACE WATER LOCATIONS
MOLYBDENUM IN SEDIMENT AUGUST 2006

Scale: 0 1,500 3,000 Feet

Date: AUGUST 2007

Prepared by: DAT

Project No: 06W003



NOTES

1. 1998 Series USGS Digital Orthophoto Quadrangles supplied by Michigan Center of Geographic Information.
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. All Samples use Drinking Water Protection Criteria

LEGEND

- Soil Sample - Not Sampled for Parameter
- Soil Sample - Sample Below GSI Protection Criteria
- Soil Sample - Sample Above GSI Protection Criteria

N

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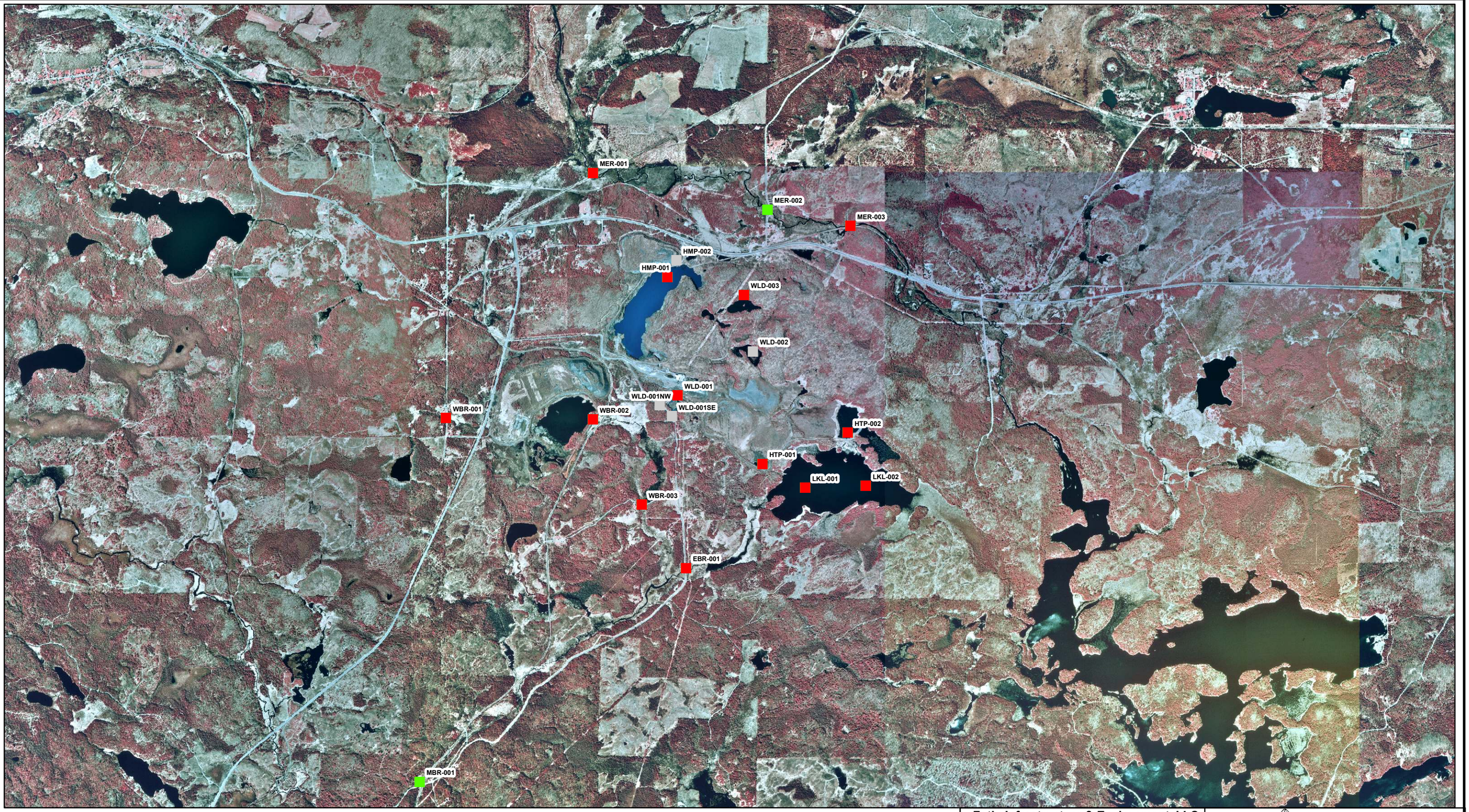
CHECKED BY:	JSL	DATE:	AUG. '07
APPROVED BY:	SVD1	DATE:	AUG. '07
APPROVED BY:		DATE:	

Kennecott Eagle Minerals

FIGURE 5-88

HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
SURFACE WATER LOCATIONS
SELENIUM IN SEDIMENT AUGUST 2006

Scale: 0 1,500 3,000 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003



NOTES

1. 1998 Series USGS Digital Orthophoto Quadrangles supplied by Michigan Center of Geographic Information.
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. All Samples use Drinking Water Protection Criteria

LEGEND

- Soil Sample - Not Sampled for Parameter
- Soil Sample - Sample Below GSI Protection Criteria
- Soil Sample - Sample Above GSI Protection Criteria

N

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CHECKED BY:	JSL	DATE: AUG. '07
APPROVED BY:	SVD1	DATE: AUG. '07
APPROVED BY:		DATE:

Kennecott Eagle Minerals

FIGURE 5-89
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
SURFACE WATER LOCATIONS
SILVER IN SEDIMENT AUGUST 2006

Scale: 0 1,500 3,000 Feet | Date: AUGUST 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.

LEGEND

- Surface Water Sample - Not Sampled for Parameter
- Surface Water Sample - Sample Below GSI Protection Criteria
- Surface Water Sample - Sample Above GSI Protection Criteria
- Humboldt Tailings Disposal Facility Watershed
- Approximate Groundwater Divide

N

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CHECKED BY:	JSL	DATE: AUG. '07
APPROVED BY:	SVD1	DATE: AUG. '07
APPROVED BY:		DATE:

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FIGURE 5-90
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HTDF SEDIMENT SAMPLING MAY 2007
COBALT

Scale: 0 200 400 Feet	Date: AUGUST 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.

LEGEND

- Surface Water Sample - Not Sampled for Parameter
- Surface Water Sample - Sample Below GSI Protection Criteria
- Surface Water Sample - Sample Above GSI Protection Criteria
- Humboldt Tailings Disposal Facility Watershed
- Approximate Groundwater Divide

N

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FIGURE 5-91
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HTDF SEDIMENT SAMPLING MAY 2007
COPPER

Scale: 0 200 400 Feet	Date: AUGUST 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.

LEGEND

- Surface Water Sample - Not Sampled for Parameter
- Surface Water Sample - Sample Below GSI Protection Criteria
- Surface Water Sample - Sample Above GSI Protection Criteria
- Humboldt Tailings Disposal Facility Watershed
- Approximate Groundwater Divide

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FIGURE 5-92
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HTDF SEDIMENT SAMPLING MAY 2007
LITHIUM

Scale: 0 200 400 Feet	Date: AUGUST 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.

LEGEND

- Surface Water Sample - Not Sampled for Parameter
- Surface Water Sample - Sample Below GSI Protection Criteria
- Surface Water Sample - Sample Above GSI Protection Criteria
- Humboldt Tailings Disposal Facility Watershed
- Approximate Groundwater Divide

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FIGURE 5-93
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HTDF SEDIMENT SAMPLING MAY 2007
MANGANESE

Scale: 0 200 400 Feet	Date: AUGUST 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.

LEGEND

- Surface Water Sample - Not Sampled for Parameter
- Surface Water Sample - Sample Below GSI Protection Criteria
- Surface Water Sample - Sample Above GSI Protection Criteria
- Humboldt Tailings Disposal Facility Watershed
- Approximate Groundwater Divide

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FIGURE 5-94
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HTDF SEDIMENT SAMPLING MAY 2007
MERCURY

Scale: 0 200 400 Feet	Date: AUGUST 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.

LEGEND

- Surface Water Sample - Not Sampled for Parameter
- Surface Water Sample - Sample Below GSI Protection Criteria
- Surface Water Sample - Sample Above GSI Protection Criteria
- Humboldt Tailings Disposal Facility Watershed
- Approximate Groundwater Divide

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FIGURE 5-95
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HTDF SEDIMENT SAMPLING MAY 2007
MOLYBDENUM

Scale: 0 200 400 Feet	Date: AUGUST 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.
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3. Site Location - Project Site within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.

LEGEND

- Surface Water Sample - Not Sampled for Parameter
- Surface Water Sample - Sample Below GSI Protection Criteria
- Surface Water Sample - Sample Above GSI Protection Criteria
- Humboldt Tailings Disposal Facility Watershed
- Approximate Groundwater Divide

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FIGURE 5-96
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HTDF SEDIMENT SAMPLING MAY 2007
NICKEL

Scale: 0 200 400 Feet	Date: AUGUST 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.

LEGEND

- Surface Water Sample - Not Sampled for Parameter
- Surface Water Sample - Sample Below GSI Protection Criteria
- Surface Water Sample - Sample Above GSI Protection Criteria
- Humboldt Tailings Disposal Facility Watershed
- Approximate Groundwater Divide

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FIGURE 5-97
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HTDF SEDIMENT SAMPLING MAY 2007
SELENIUM

Scale: 0 200 400 Feet	Date: AUGUST 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.

LEGEND

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- Surface Water Sample - Sample Below GSI Protection Criteria
- Surface Water Sample - Sample Above GSI Protection Criteria
- Humboldt Tailings Disposal Facility Watershed
- Approximate Groundwater Divide

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FIGURE 5-98
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HTDF SEDIMENT SAMPLING MAY 2007
SILVER

Scale: 0 200 400 Feet	Date: AUGUST 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.
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3. Site Location - Project Site within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.

LEGEND

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- Surface Water Sample - Sample Below GSI Protection Criteria
- Surface Water Sample - Sample Above GSI Protection Criteria
- Humboldt Tailings Disposal Facility Watershed
- Approximate Groundwater Divide

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FIGURE 5-99
HUMBOLDT MILL - HYDROGEOLOGICAL REPORT
HTDF SEDIMENT SAMPLING MAY 2007
ZINC

Scale: 0 200 400 Feet	Date: AUGUST 2007
Prepared by: DAT	Project No: 06W003

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