SAMPLING AND ANALYSIS PLAN

ABANDONED MINING WASTES – TORCH LAKE NON-SUPERFUND SITE
QUINCY MINING COMPANY PORTAGE OPERATIONS AREA
HOUGHTON COUNTY, MICHIGAN
SITE ID# 31000098

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PREPARED FOR:

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
REMEDIATION AND REDEVELOPMENT DIVISION
CALUMET FIELD OFFICE
CALUMET, MICHIGAN

Mannik Smith GROUP

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1.0 INTRODUCTION

The Mannik & Smith Group, Inc. (MSG) has prepared this Sampling and Analysis Plan (SAP) to identify data collection activities and associated quality assurance/quality control (QA/QC) measures specific to the Quincy Mining Company Portage Operations Area (QMCP) of the Abandoned Mining Wastes – Torch Lake non-Superfund Site (Project) in Houghton County, Michigan.

The SAP has been prepared in accordance with the *Indefinite Scope Indefinite Delivery (ISID) Discretionary Proposal for Site Investigation Activities* (25 October 2016) prepared by MSG in response to a request from the Michigan Department of Environmental Quality (DEQ), Remediation and Redevelopment Division (RRD), Calumet Field Office under MSG's 2015 Environmental Services ISID Contract Number 00538 with the State of Michigan as amended by *Work Plan Augmentation No. 1* (20 November 2017).

The SAP has been developed to detail the Project's organization and operational responsibilities of key DEQ and MSG personnel working on the Project. The SAP also describes the design and implementation of measurement systems that will be used during the collection of environmental samples for the Project. The document describes the sampling procedures, analytical methods/procedures, data quality objectives (DQOs), data handling, and documentation procedures.

Section 1 of the SAP defines the objectives of the investigation and the organizational structure of the Project team. Section 2 provides the Project background including a description and a brief account of the previous investigative activities implemented in the QMCP. Section 3 provides an outline of the proposed implementation schedule. Section 4 provides a summary of the sampling rationale and environmental media to be sampled during the field activities. Section 5 provides a summary of field procedures, sampling protocols, and laboratory analyses necessary to complete the field activities, Section 6 includes a list of the proposed analytical laboratories, and Section 7 outlines the QA/QC protocols that will be implemented to assess the overall reproducibility of the laboratory analytical results.

1.1 Problem Definition

The Project is characterized by the risks posed by chemical containers and residues historically discarded in or near Torch Lake and along the north shoreline of the Portage Canal. These concerns are distinct and separate from the risks historically addressed under the U.S. Environmental Protection Agency's (EPA's) Superfund program. The EPA defines the Torch Lake Superfund Site as the upper six inches of stamp sand and slag in certain areas of Houghton County and any soil cap and vegetative cover applied to such areas.

The remaining concerns within the Torch Lake Superfund Site footprint and the surrounding areas identified by the DEQ include known or suspected impacts to groundwater, surface water, sediments, and upland media that were not addressed under the Superfund program. Environmental impacts that will be evaluated under the Project include, but are not limited to the assessment of the following:

- Unidentified, significant in-lake and/or terrestrial sources of contamination including polychlorinated biphenyls (PCBs);
- Uncharacterized waste deposits, including uncharacterized drums, on the Torch Lake bottom;
- Bulk disposal areas, including stamp sand deposits, slag dumps, and landfills; and,
- Industrial ruins including coal storage areas, underground storage tanks (USTs), asbestos containing materials (ACM), residual process materials (RPM), and any other waste materials identified during future investigations.

The risks posed to environmental media by these waste deposits and continuing sources of contamination contribute to the limited recovery of the regional ecosystem and present uncertainty over beneficial reuse of the land. As such, the Project investigation is largely driven by documented observations of drums, ACM, RPM, and/or other debris locations on land and in the lake as well as consideration related to historic operations, and detected PCB concentrations.

The objectives of the Project are to support a comprehensive management approach that will guide DEQ's decision making process in addressing risks present throughout the Project area. The primary focus of the Project is to ascertain the source, nature, and extent of contaminants (including PCBs) in all affected environmental media (soil, groundwater, surface water, sediments, and soil gas) within the Project study area. Included is the QMCP that consists of the former mining era industrial areas from the Portage Lake Lift Bridge in Hancock to Dollar Bay along the north shoreline of the Portage Canal, which includes the former Quincy Mining Company (QMC) copper mining and processing operations.

The activities, operations, and wastes related to the QMCP was researched and preliminary terrestrial and underwater surveys were conducted to further identify drums, ACM, RPM, and waste deposits as described in the MSG prepared document entitled *Draft Historical Data Review and Compilation Technical Memorandum* dated July 2018. Implementation of the QMCP SAP will entail collection and analyses of representative sediment, surface water, groundwater, soil, abandoned container, RPM, SACM, and waste samples near these mining era industrial operations, made lands, and previously uncharacterized debris and waste deposits to characterize the extent of any identified contamination.

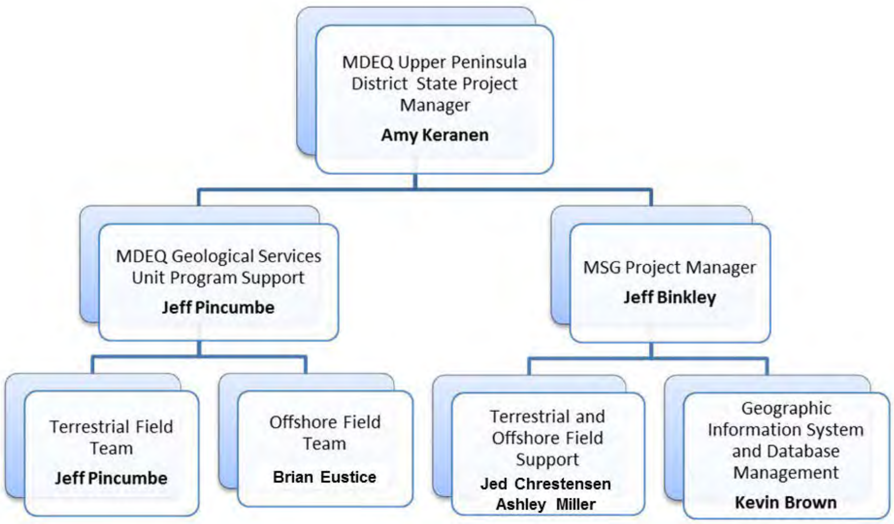
1.2 Project Management

The Project is built upon partnerships and stakeholder engagement. Engagement among team members requires regular communication and is often driven by updated and additional information as well as shifting Project priorities. The management approach, dictated by the DEQ SPM, will be supported by the MSG Project Manager. Additionally, investigative activities will be supported by the DEQ Geological Services Unit (GSU), which will provide the tools, equipment, and resources to facilitate the investigative work within the QMCP.

Coordination of multiple team members will be facilitated by establishing the Project goals, building consensus, exchanging and integrating ideas, and setting a path forward with all team members. This approach will allow for team members to discuss scope and objectives, clarify issues, and learn individual goals, success factors, and ideas. The kick off meeting will establish the foundation for the development and execution of the remainder of the Project.

The general Project organization is presented on **Figure 1-1**.

FIGURE 1-1: PROJECT ORGANIZATION



The following key Project personnel will be involved in planning and/or technical activities performed during the various phases of data collection. Each will receive a copy of the draft SAP for review and the approved SAP prior to field mobilization. A copy will also be retained in the Project file.

TABLE 1-1: KEY PROJECT PERSONNEL

Personnel	Title	Organization	Phone Number	Email
Amy Keranen	State Project Manager	DEQ-RRD	(906)-337-0389	KeranenA@michigan.gov
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Jeff Pincumbe	Field Team Leader	DEQ-GSU	(517) 243-3171	PincumbeJ@michigan.gov
Brian Eustice	Field Team Leader	DEQ-GSU	(517) 242-1170	EusticeB@michigan.gov
Jed Chrestensen	Field Team Leader	MSG	(906) 281-4726	JChrestensen@manniksmithgroup.com
Ashley Miller	Field Team Support	MSG	(330) 646-7870	AMiller@manniksmithgroup.com
Kevin Brown	Geographic Information System/Database Manager	MSG	(517) 316-9232	KBrown@manniksmithgroup.com

2.0 PROJECT DESCRIPTION

Hard rock mining operations were prevalent throughout Houghton and Keweenaw Counties for nearly a century, primarily spanning an era between the mid-1800's and the mid-1900's. As mining activities declined in the region, a majority of the mine holdings, including surface and underground operations were abandoned, scrapped, and remnants otherwise left in-place.

In addition to the western shoreline of Torch Lake and the northern shoreline of the Portage Canal, the Project includes properties remote from Torch Lake proper, such as the 270+ acre Centennial Mine just north of Calumet, the Michigan Smelter, Freda/Redridge, the balance of the Portage Canal, and other areas congruent with the Torch Lake Superfund Site where the response action has been limited to the application of the vegetative cover or eliminating the area from further consideration.

The vast distribution of these former mining operations throughout the region (spanning several townships, villages and cities in Houghton County along the Portage Canal, Lake Superior, Slaughterhouse Creek, and Torch Lake) required that operational areas of the mining companies be divided into geographic subsets, allowing for prioritization of the geographic subsets and establishing a phased approach for assessing and addressing environmental concerns regionally.

The QMCP encompasses the former Quincy Mining Company (QMC) copper mining and processing operations, other historic industrial operations, and residential and commercial properties along the north shoreline of the Portage Canal along the south side of M-26 from the Portage Lake Lift Bridge in Hancock to Dollar Bay. The QMCP consists of approximately 320 acres of land, much of which is made-lands, extending approximately 4.5 miles along the shoreline of the Portage Canal and incorporates many different parcels with multiple property owners. The approximate extent of the made lands is indicated by the 1865 shoreline depicted on ***Figure** 2, Area Features Map.* Residential (single-family residences), undeveloped forested lands, industrial (capped made lands) properties, and Portage Lake border the QMCP.

2.1 Project Background

Copper mining was extensive in the Keweenaw and formed the backbone of the regional economy and society. Copper ore milling and smelting operations conducted from the mid-1860s to the 1960s, including the importation, reprocessing, and smelting of various scrap metals in the later years of operation. Consistent with past industrial practices, Torch Lake and the Portage Canal served as dumping grounds for virtually all mining industry related wastes, including tailings, slag, and various chemicals. At least 20 percent of the Torch Lake's volume is estimated to be filled with tailings and other wastes.

The environmental legacy resulting from over 100 years of mining and reclamation led to Torch Lake and its western shoreline to be designated as a Superfund site by the United States Environmental Protection Agency (EPA) https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0503034 and a Great Lakes Area of Concern by the U.S./Canada Great Lakes Water Quality Agreement https://www.epa.gov/torch-lake-aoc. The EPA undertook cleanup activities to address some of the of the mining industry waste, while others were not addressed or left to recover through natural processes.

Review of file information for QMCP identified subareas within the footprint that have been subject to or associated with historic mining practices. Due to the varying nature of companies that operated within QMCP, the following subsections provide an overview of known historic operations based on available Sanborn Maps and/or other resources for each of the subareas identified on ***Figure 2-1****, Area Features Map.*

Area A – Historically, the western portion of Area A was the location of the Copper Range Railroad Passenger Depot. According to the 1907 Sanborn Map, a "vacant" Lake Superior Smelting Company was located to the east. The parcel is identified as the H.S. Goodell Distributing Station for Lubricating Oils in 1917 and the H.S. Goodell and Company Bulk Oil Station in 1949. The area is currently the location of a condominium complex and the Houghton County Marina.

Area B – Review of the 1907 Sanborn Map indicates Lake Superior Iron Works operated in the southern portion of Area B. The site is identified as the Portage Lake Foundry and Machinery Company on the 1928 Sanborn Map and by 1949 was the location of the Houghton County Road Commission. The northern portion of Area B was identified as a Store House with additional dwellings in 1928 and the location of a filling station in 1949. Area B is currently the location of the Houghton County Road Commission.

Area C – QMC operated Quincy Smelting Works at the location of Area C. The EPA as part of the Torch Lake Superfund Site remedial action capped portions of the Quincy Smelting Works. Quincy Smelter Reclamation Project Torch Lake EPA Superfund Site as-built drawings (USDA NRCS, 2010) indicate that the cap was placed as part of the Torch Lake Superfund Site Quincy Smelter Reclamation Project. The *Fourth Five-Year Review Report for the Torch Lake Superfund Site* (USEPA, 2018) indicated that construction was completed in 2011 and that the Quincy Smelting Works was deleted from the National Priorities List (NPL) in 2013. The capped areas are subject to an on-going DEQ Operation and Maintenance (O&M) plan. Other environmental concerns, including those within the Hancock Ripley Trail corridor, have been addressed and/or mitigated through a series of interim responses and/or institutional controls undertaken by prior owners, the EPA, and the Keweenaw National Park Service Advisory Commission. Further investigation as part of QMCP will not occur. The Keweenaw National Historical Park Advisory Commission currently maintains the property, where public tours of mining-era operations within the former copper smelter are provided.

Area D – Historic mining-era operations include the Portage Lake Foundry and Machinery operating within the area until at least 1949 based on review of Sanborn Maps. Julio Marine & Salvage currently operates at the location.

Area E – Historic land use and/or operations are unknown following review of available historic Sanborn Maps and other resources. The area is currently undeveloped and appears to be used for boat storage. In July 2018, a Michigan Department of Natural Resources (MDNR) surveyor observed potentially impacted soils within the ROW of the Hancock/Ripley Trail within Area E.

Area F – A manufactured gas plant was in operation at the location of Area F, south of the Hancock/Ripley trail. Environmental concerns within this area have previously been addressed and further investigation as part of QMCP will not occur. A Filling Station and Bulk Oil Station that included various gasoline, kerosene, and fuel oil tanks, along with oil and oil pump houses operated within the northwestern portion of Area F, as identified on the 1949 Sanborn Map. Keweenaw Consignment currently operates at the location north of the Hancock Ripley trail, while a residential building and vacant lot are located to the south and east, respectively.

Area G – Standard Oil Company operated at the northwest corner of the area according to the 1917 Sanborn Map. Other historic land use and/or operations are unknown following review of available historic Sanborn Maps and other resources. The area is currently the location of Julio Contracting Company.

Area H – Historic land use and/or operations are unknown following review of available historic Sanborn Maps and other resources. The area is currently the location of Dollar Bay Motor Sports, Isle Royale Seaplanes, and Wuebben Construction.

Area I – Portage Boiler Works operated within Area I in 1907 according to historical Sanborn review and by 1928 Lake Superior Iron and Metal Company operated at the site. The 1949 Sanborn Map depicts Area I was used for scrap iron storage and was the location of the J.H. Green Company; however, the nature of the company is unknown. The area is currently the location of various metal scrap and machinery, but otherwise, appears to be inactive.

Area J – Area J was the location of the Houghton Lumber Yard Company and the Dollar Bay Lumber Company, according to the 1917 and 1928 Sanborn Maps, respectively. However, according to the 1949 Sanborn Map, Henry Borth Company Manufacturing R.R. Shims and UP Oil Company operated within the area. H&Y Marina currently operates at the location.

Area K – According to the 1907 Sanborn Map, Tamarack and Osceola Mining Company had mining operations at the location. By 1917, the location was the site of a Calumet and Hecla Mining Company Coal Dock. The area is currently the location of a condominium complex.

Area L – Area L was not identified on available Sanborn Maps; however, according to Monette's *Dollar Bay, Michigan, Fifty-Fourth of a Local History Series* (Monette, 2000), Dollar Bay Terminal Company erected three storage tank onsite in May of 1945. It was reported the welded steel gasoline tanks each had a capacity of 840,000 gallons, with dimensions of forty feet high and sixty feet in diameter. Dikes or firewalls surrounded each tank, while lake tankers were used to transport the product from Chicago refineries. Three additional tanks were added to the site, which increased storage for kerosene, diesel fuel, and three grades of gasoline. In May 1984, the owner/operator Amoco Oil Company closed the facility, selling the property to Julio Contracting Company of Ripley. The six tanks were dismantled in October 1994 after a tug-barge was used to drain the tanks. The tug-barge has also been observed at another Julio property along the Portage Canal. Other historic land use and/or mining operations are unknown. The current usage of the area is unknown, although it appears to be inactive.

Area M – Lake Superior Smelting Company operated at the location, as identified on the 1928 Sanborn Map; however, only two ice houses remained at the site on the 1949 Sanborn Map. The EPA as part of the Torch Lake Superfund Site remedial action capped portions of Areas M, N, and O. Dollar Bay Torch Lake EPA Superfund Site as-built drawings (USDA NRCS, 2004) indicate that the cap was placed as part of the Torch Lake Superfund Site Dollar Bay remedial action. The *Fourth Five-Year Review Report for the Torch Lake Superfund Site* (USEPA, 2018) indicated that construction was completed in 2002; however, the Dollar Bay parcel has not been deleted from the NPL. The capped areas are subject to an on-going DEQ O&M plan. The balance of the areas were not addressed as part of the Torch Lake Superfund Site remedial action. A building that houses two production wells for water supply to Dollar Bay is currently located within the area. The area appears to be undeveloped with the exception of the Dollar Bay municipal wells.

Area N – The parcel was identified as Tamarack and Osceola Copper Manufacturing Company on the 1907 Sanborn Map. It was the location of John A. Roebling's Sons Copper Manufacturing and Foley Copper Products Company Copper Wire Mill in 1928 and 1949, respectively. The EPA as part of the Torch Lake

Superfund Site remedial action capped portions of Areas M, N, and O. Dollar Bay Torch Lake EPA Superfund Site as-built drawings (USDA NRCS, 2004) indicate that the cap was placed as part of the Torch Lake Superfund Site Dollar Bay remedial action. The *Fourth Five-Year Review Report for the Torch Lake Superfund Site* (USEPA, 2018) indicated that construction was completed in 2002; however, the Dollar Bay parcel has not been deleted from the NPL. The capped areas are subject to an on-going DEQ O&M plan. The balance of the areas were not addressed as part of the Torch Lake Superfund Site remedial action. The area is currently the location of mining-era buildings; however, specific present day use is unknown.

Area O – According to the 1907 Sanborn Map, Area O was the location of Dollar Bay Land and Improvement Company. The parcel is identified as Dollar Bay Lumber Company in 1917 and Dollar Bay Lumber Company Saw Mill and Lumber Yard and Horner Flooring Company Wood Flooring Mill in 1949. Horner Flooring Co. Inc., a manufacturer of hardwood maple basketball flooring, currently operates at the location. The EPA as part of the Torch Lake Superfund Site remedial action capped portions of Areas M, N, and O. Dollar Bay Torch Lake EPA Superfund Site as-built drawings (USDA NRCS, 2004) indicate that the cap was placed as part of the Torch Lake Superfund Site Dollar Bay remedial action. The *Fourth Five-Year Review Report for the Torch Lake Superfund Site* (USEPA, 2018) indicated that construction was completed in 2002; however, the Dollar Bay parcel has not been deleted from the NPL. The capped areas are subject to an on-going DEQ O&M plan. The balance of the areas were not addressed as part of the Torch Lake Superfund Site remedial action.

Area P – This area was not identified on available Sanborn Maps; however, further review of Monette's *Dollar Bay, Michigan, Fifty-Fourth of a Local History Series* (Monette, 2000), indicates that the parcel was owned by Lake Superior Smelting Company and was used as a slag dump. Present day use appears to be a scrap/recycling facility called "The People's Store," and includes a residential and farm area to the east.

2.2 Contaminants of Concern and Target Analytes

The analytical results from various historical investigative were used to assist in the characterization of the QMCP. Further, the sample locations from these events were also evaluated to assist in locating the horizontal and vertical locations of proposed sampling locations included in this SAP. The locations and respective analytical results used to develop this SAP are summarized in the MSG prepared document entitled; *Draft Historical Data Review and Compilation Technical Memorandum* dated July 2018.

Although relevant, the DEQ drinking water and groundwater/surface water interface pathways criteria exceedances for metals were excluded from the groundwater evaluation. Similarly, the metals exceedances for soil criteria protective of the DEQ drinking water and groundwater/surface water interface pathways are also excluded. The rationale for this exclusion is twofold:

- The Project investigation and anticipated response actions are being undertaken pursuant to Part 201 of Michigan's NREPA, being PA 451 of 1994, as amended. The concentrations of metals in excess of the DEQ drinking water and groundwater/surface water interface pathways criteria are ubiquitous in the study area and are predominantly the result of the presence of stamp sands. Stamp sands are not defined as a hazardous substance nor are they subject to regulation under Part 201 unless the property otherwise contains hazardous substances in excess of concentrations that satisfy the cleanup criteria for unrestricted residential use; and,
- The study area is part of Operable Unit (OU) 2 for which the EPA Record of Decision (ROD) remedy called for No Action. The EPA's ROD OU 2 includes groundwater, surface water, submerged tailings and sediments in Torch Lake, Portage Lake, the Portage Canal, and other area water bodies. Note that EPA's No Action determination relies on the following to mitigate the effects of stamp sand to the extent practicable:
  - The reduction of stamp sand loading to surface water bodies expected because of the remedial action taken at OU 1 (select surface tailings, drums, and slag piles on the western shore of Torch

Lake) and OU 3 (select surface tailing and slag deposits beyond Torch Lake located throughout the region, including portions of the Quincy Smelter and Dollar Bay that are located within the QMCP study area);

- Ongoing natural sedimentation and detoxification;
- Institutional programs and practices controlling potential future exposure to site-affected drinking water that were intended to be administered at the county and state level; and,
- The long-term monitoring and the five-year review process monitoring requirements of the remedy selected for OU 1 and OU 3 under the 1992 ROD.

2.2.1 QMCP

Between 1990 and 2012, samples evaluated as part of SAP development were collected for field screening and laboratory analysis from the following environmental media in the QMCP:

- Surface soil
- Subsurface soil
- Surface water
- Groundwater

The analytical and screening results indicate that inorganic contaminants, VOCs, and SVOCs were present in surface and subsurface soil and groundwater in excess of Part 201 Residential and Non-Residential Cleanup Criteria for Response Activity of Michigan's Natural Resources and Environmental Protection Act (NREPA), being Public Act (PA) 451 of 1994, as amended, including the following:

- Groundwater Surface Water Interface Protection Criteria (GSIPC)
- Groundwater Surface Water Interface Criteria (GSIC)
- Residential Drinking Water Protection Criteria (DWPC)
- Residential Drinking Water Criteria (DWC)
- Water Solubility
- Residential Groundwater Volatilization to Indoor Air Inhalation
- Residential Soil Volatilization to Indoor Air Inhalation Criteria (SVIAIC)
- Residential Infinite Source Volatile Soil Inhalation Criteria (VSIC)
- Residential Finite VSIC for 5 meter source thickness
- Residential Finite VSIC for 2 meter source thickness
- Residential Particulate Soil Inhalation Criteria (PSIC)
- Residential Direct Contact Criteria (DCC)
- Non-residential DWPC
- Non-residential DWC
- Non-residential Groundwater Volatilization to Indoor Air Inhalation
- Non-residential Infinite Source VSIC
- Non-residential Finite VSIC for 5 meter source thickness
- Non-residential Finite VSIC for 2 meter source thickness
- Non-residential PSIC
- Non-residential DCC

Analytical results for inorganic contaminants exceeding applicable criteria during previous investigations in the QMCP include the following:

- Arsenic
- Copper
- Cyanide
- Lead
- Manganese

As a result surface soil, subsurface soil, groundwater, sediment, and surface water collected during implementation of the SAP in the QMCP will be analyzed at a minimum for the aforementioned metals, along with barium, cadmium, chromium, mercury, selenium, silver, and zinc.

Based on the findings summarized above, it is anticipated that up to 119 sampling locations, including soil, groundwater, surface water, and sediment will be established in the QMCP including the following target analytes:

Surface Soils/Waste Deposits (0 to 6 inches below ground surface [bgs])

- Inorganic chemicals of concern (COCs) (Metals and Available Cyanide) by methods 6010/200.7, 6020/200.8, 7471/245.5 and ASTM D7284;
- VOCs by 8260;
- PCBs by 8081/8082;
- SVOCs by 8270; and,
- Asbestos by Polarizing Light Microscopy (PLM) – California Air Resource Board (CARB) 435 – 1,000 point count – analytical sensitivity 0.1%.

Subsurface Soils (> 6 inches bgs)

- Inorganic COCs (Metals and Available Cyanide) by methods 6010/200.7, 6020/200.8, 7471/245.5 and ASTM D7284;
- VOCs by 8260;
- PCBs by 8081/8082; and
- SVOCs by 8270.

Groundwater

- Inorganic COCs (Metals) by methods 6010/200.7, 6020/200.8, and 7471/245.5;
- VOCs by 8260;
- PCBs by 8081/8082; and
- SVOCs by 8270.

Sediment

- Inorganic COCs (Metals) by methods 6010/200.7, 6020/200.8, and 7471/245; and,
- PCBs by 8081/8082.

Surface Water

- Inorganic COCs (Metals) by methods 6010/200.7, 6020/200.8, 7471/245.5; and,
- PCBs by 8081/8082; and,
- SVOCs by 8270.

Drums, Containers, Building Materials, Bulk Asbestos, RPM, and Waste Deposits – Not Associated with Sediment/Depositional Wastes

- Inorganic COCs (Metals) by methods 6010/200.7, 6020/200.8, 7471/245.5;
- PCBs by 8081/8082;
- Bulk Asbestos by PLM Method 600/R-93/116; and,
- Waste Characteristics by various methods.

2.2.2 Portage Canal

During 2007, 2008, and 2011, the analytical results from sediment samples within Torch Lake indicated that contaminants emanating from documented contamination on land might be affecting the nearshore aquatic environment of Torch Lake. While prior sediment sampling activities completed within the footprint of QMCP were not evaluated as part of SAP development, a Project consistent approach will be followed to characterize the Portage Canal.

The DEQ has developed a collaborative approach to the Project that incorporates advanced technological methods and common sampling approaches for use in characterizing the study area. For QMCP, MSG assisted in these characterization activities by conducting historical archive research and mapping including the identification of historic shoreline and landward industrial operations responsible for the generation and/or disposal of wastes in and along the Portage Canal. MSG utilized Sanborn Fire Insurance Maps, historic navigational charts, and aerial photographs to reconstruct mining era industrial operations, potential waste and disposal areas, including items of environmental interest in and around the north side of the Portage Canal.

In addition to historical research, the DEQ GSU conducted side-scan-sonar surveys at three investigative locations within the Portage Canal in August 2017 to support development of a plan for investigation, sampling, and assessment of potential offshore contaminant sources. The side-scan sonar imagery was used to identify anomalies on the lake bottom that GSU will further assess by autonomous underwater vehicle (AUV) video surveillance during 2018.

Subject to the results of the underwater surveillance, offshore sampling will be completed in areas of observed drums and debris areas using the DEQ GSU's sampling vessel and equipment. Sediment and/or submerged drums samples will be collected and analyzed for contaminants as described in the preceding subsections.

3.0 PROPOSED SCHEDULE

MSG has prepared this SAP to detail the planned approaches for investigative sampling, field screening, and laboratory analyses to be used at the QMCP. The proposed investigative and sampling methods are described in more detail in Section 4 and Section 5 of this SAP.

Preliminary field activities are scheduled to begin in August 2018. Sampling and screening activities will be implemented in a phased approach and are anticipated to be initiated in September 2018. Laboratory analytical results are anticipated to become available approximately 30 to 45 days after receipt of the samples by the analytical laboratory. The anticipated schedule is outlined in the table below.

TABLE 3-1
SCHEDULE

Activities	Dates (Month Day, Year)		Deliverables	Deliverable Due Date
	Anticipated Date(s) of Initiation	Anticipated Date of Completion		
• HASP Preparation • SAP Preparation • Planning Meetings • Site Access Arrangements • Right of Way Permitting • Utilities Clearance • Physical and Health Hazard Inventory • Laboratory Arrangements	May 01, 2018	September 3, 2018	Draft and Final SAP	Draft SAP July 31, 2018 and final following receipt of DEQ review comments and planning meetings

Activities	Dates (Month Day, Year)		Deliverables	Deliverable Due Date
	Anticipated Date(s) of Initiation	Anticipated Date of Completion		
Field Sample Collection – DEQ GSU Terrestrial and Offshore Investigation	September 04, 2018	September 13, 2018	Log Books, Sampling and Screening Logs	2 weeks after completing field activities
Laboratory Analysis – DEQ Environmental Laboratory or Selected Contract Laboratory	September 17, 2018	October 15, 2018	Laboratory Analytical Report and EDDs	4 weeks after submitting the last sample(s)

Mobilization and field sampling activities are subject to change based on factors related to unforeseen circumstances, personnel and equipment availability, and similar conditions. Key project personnel, including the DEQ SPM and representatives from DEQ-GSU and MSG, will meet daily during sampling and fieldwork events to review findings, adjust, and plan next steps as needed.

4.0 FIELD PROCEDURES AND SAMPLE COLLECTION

The field procedures and sample collection activities will be used to evaluate the presence of contaminated environmental media in the QMCP. This Section describes the sampling methodology and procedures that will be implemented to collect samples from various environmental media.

The proposed sampling locations for each of the areas within the QMCP are described in Section 2. The proposed terrestrial and offshore sampling and screening locations are depicted as follows:

- Historical Sample Analytical Results and Proposed Sampling Locations Map – Soil Area A – Figure 4-1a
- Historical Sample Analytical Results and Proposed Sampling Locations Map – Groundwater Area A – Figure 4-1b
- Historical Sample Analytical Results and Proposed Sampling Locations Map – Soil Area B – Figure 4-2a
- Historical Sample Analytical Results and Proposed Sampling Locations Map – Groundwater Area B – Figure 4-2b
- Historical Sample Analytical Results and Proposed Sampling Locations Map – Soil Areas C-F – Figure 4-3
- Historical Sample Analytical Results and Proposed Sampling Locations Map – Soil Areas G-J – Figure 4-4a
- Historical Sample Analytical Results and Proposed Sampling Locations Map – Groundwater Areas G-J – Figure 4-4b
- Historical Sample Analytical Results and Proposed Sampling Locations Map – Groundwater Areas L-P – Figure 4-5

Proposed sampling locations, proposed laboratory analyses, and sampling rationale are summarized on Table 4-1.

4.1 Potential Physical and Health Hazard Inventory

The investigation of the QMCP will include a physical inspection on properties where written access is granted to the DEQ. In the cases where access is not granted or requested based on historic operational and investigative findings, property conditions will be evaluated from a neighboring property or the Portage Canal or public right of way where access was permitted. Potentially, GSU provided drone imagery might also be used to identify potential areas of environmental concern. The inspection will include the inventory and locating of historical structures and artifacts associated with the former industrial operations within each area.

During the summer of 2018 each area will be inspected for potential physical and health hazards. Such hazards may include potentially abandoned drums and containers, suspect asbestos containing materials, stained or oily soils, pipes discharging to the Portage Canal, and similar observed environmental conditions. Potential physical hazards, including waste deposits, metal debris, and similar conditions in areas without restricted access will also be recorded.

Inventoried locations will be located with a GPS unit with sub-meter accuracy. Documented accessible abandoned containers, RPM, waste, and suspect asbestos containing materials (SACM) will be sampled during implementation of the field program.

4.2 Surface Soil and Waste Deposit Sampling

Grab soil samples will be collected from proposed surface soil (0-6 inches) sampling locations. In sampling areas where waste deposits or historical surface soils have been capped or covered, the surface soil sample will be collected from directly beneath the cover media. These conditions are anticipated to be encountered in the areas where the EPA installed a cap. Proposed surface soil sampling locations are illustrated on Figure 4-1 through Figure 4-5.

Specific procedures selected for this Project are summarized as follows:

- The location of each sampling point will be sketched on field documentation, and the coordinates of the sample location will be recorded using a GPS receiver with sub-meter accuracy.
- Rocks and organic matter (including grasses, shallow vegetation roots, and leaves) will be scraped from the surface of each location before surface soil is collected.
- Direct push boring techniques will be used to collect soil samples from each location. The surface samples will be collected from the 0 to 6 inch interval of the extracted soil core. Down hole sampling equipment will be decontaminated prior to sampling at another location. Decontamination fluids will be discharged to the ground surface by the DEQ.
- Soil samples will be transferred directly into laboratory-provided sample jars.
- Sample jars will be labeled using the nomenclature outlined in Section 5.1, and placed in a cooler on ice for shipment to the identified analytical laboratory under chain of custody.
- Investigative-derived wastes (IDW), including potentially contaminated soil will be returned to the boring location from which it was generated by the DEQ. Personal protective equipment (PPE) and waste generated by sample preparation will be bagged and staged for disposal as municipal solid waste by the DEQ.

Field team members will don a new pair of disposable nitrile gloves prior to collection of each sample. The stainless-steel coring device will be decontaminated after collection of each sample by washing in an alconox-and-water solution, rinsing with distilled water, and drying with disposable paper towels.

Laboratory information related to the chemical analyses of surface soil samples is summarized in Section 6.

Field Screening
Soil will be field-screened with the following equipment:

- PID.

Sample Collection Equipment

- Laboratory-provided sample containers; and,
- Stainless steel trowels/coring tool.

Container and Analytical Requirements List

Matrix	Containers (Numbers, Size, and Type)	Analytical Parameter(s)	Analytical Method	Preservation Requirements	Holding Time
Surface Soil	One 250 mL wide mouth glass jar	Available Cyanide, Arsenic, Barium, Cadmium, Chromium, Copper, Lead, Mercury, Manganese, Selenium, Silver, and, Zinc	6010/200.7 6020/200.8 7471/245.5 ASTM D7284	Cool to 4°C	6 months; 28 Days
		PCBs	8081/8082	Cool to 4°C	12 months
		SVOCs	8270	Cool to 4°C	14 Days
	One MeOH Kit, 40 mL glass vial	VOCs	8260	Cool to 4°C	14 Days
	One 4oz. glass bottle	Asbestos	CARB 435	None	Indefinite

Notes:

°C – degrees Celsius
mL – Milliliter
MeOH – Methanol
oz - Ounce
PCBs – Polychlorinated Biphenyls
SVOCs – Semi-Volatile Organic Compounds
VOCs – Volatile Organic Compounds

4.3 Subsurface Soil Sampling

Soil borings will be advanced to evaluate subsurface conditions. It is anticipated that a track-mounted hydraulic push-probe drill rig will be used to retrieve continuous soil cores from the subsurface. Actual boring depths will be determined in the field and will be based on field observations and field screening results. Proposed soil boring locations are illustrated on Figure 4-1 through Figure 4-5. Subsurface soil samples collected for laboratory analysis will be selected based on field screening results and visual or olfactory indication that contamination may be present. The soil borings will be logged and screened with a PID.
Select borings will be chosen for the collection of groundwater samples based on field observations. It is anticipated that a stainless steel slotted screen will be installed in select boring locations to allow for the collection of groundwater analytical samples.

- It is anticipated that soil borings will be advanced by the DEQ GSU. DEQ will be responsible for coordinating utility locates using Michigan's one-call system and in accordance with *Public Act 174, Miss Dig Underground Facility Damage Prevention and Safety Act.* MSG will assimilate the notification information and pre-mark investigative locations to facilitate the DEQ SPM's completion of required utilities clearance notifications. Given the anticipated ubiquitous utilities within the public ROWs, GSU will conduct third party utility location through use of geophysical techniques.
- The location of each sampling point will be sketched on field documentation, and the coordinates of the sample location will be recorded using a GPS receiver with sub-meter accuracy.
- The lithology for each boring will be classified by the field geologist in accordance with the Unified Soil Classification System (USCS).
- Before advancing reusable downhole equipment, the driller will decontaminate all equipment including the working end of the hydraulic probe. Care will be taken to avoid placing equipment, tools, and materials on the ground during the boring activities.
- It is anticipated that borings will be advanced using a 5-foot long, 1.5-inch diameter Macro-Core sampler to collect continuous soil samples at all borings using a motor-driven hydraulic hammer to the desired depth.
- Soil samples will be transferred directly into laboratory-provided sample jars.

- Sample jars will be labeled using the nomenclature outlined in **Section 5.1**, and placed in a cooler on ice for shipment to the identified analytical laboratory under chain of custody.
- IDW, including potentially contaminated soil will be returned to the boring location from which it was generated. PPE and waste generated by sample preparation will be bagged and staged for disposal as municipal solid waste by the DEQ.

Laboratory information related to the chemical analyses of subsurface soil samples is summarized in **Section 6**.

Field Screening
Soil will be field-screened with the following equipment:

- PID.

Sample Collection Equipment

- Laboratory-provided sample containers; and,
- Stainless bowls; and,
- Stainless steel trowels.

Container and Analytical Requirements List

Matrix	Containers (Numbers, Size, and Type)	Analytical Parameter(s)	Analytical Method	Preservation Requirements	Holding Time
Subsurface Soil	One 250 mL wide mouth glass jar	Available Cyanide, Arsenic, Barium, Cadmium, Chromium, Copper, Lead, Mercury, Manganese, Selenium, Silver, and, Zinc	6010/200.7 6020/200.8 7471/245.5 ASTM D7284	Cool to 4°C	6 months; 28 Days
		PCBs	8081/8082	Cool to 4°C	12 months
		SVOCs	8270	Cool to 4°C	14 Days
	1 MeOH Kit, 40 mL glass vial	VOCs	8260	Cool to 4°C	14 Days

Notes:

°C – degrees Celsius
mL – Milliliter
MeOH – Methanol
PCBs – Polychlorinated Biphenyls
SVOCs – Semi-Volatile Organic Compounds
VOCs – Volatile Organic Compounds

4.4 Groundwater Sampling

Groundwater samples will be collected from select soil borings advanced in each study area utilizing a mill-point stainless steel screen, or similar reusable sampling rod. The actual locations and depths of the groundwater samples from soil borings will be determined in the field and will be based on field observations and field screening results. The proposed soil boring and groundwater sampling locations are illustrated on **Figure 4-1** through **Figure 4-5**.

The down hole sampling tools will be advanced into the water-bearing zone in each boring. The outer rod will be withdrawn to expose the internal stainless steel screen. Following the installation of the mill-point screen sampling rod, a low-flow peristaltic pump with disposable tubing will be used to collect a groundwater grab sample from the screened sample interval. Field parameters for dissolved oxygen (DO), pH, oxidation reduction potential (ORP), conductivity, temperature, and turbidity will be measured with a water-quality monitoring instrument equipped with a flow-through cell at the time of groundwater sample collection.

In the event of minimal groundwater presence and/or slow recharge, the available groundwater will be sampled regardless of the purge volume or field parameter stability. Groundwater will be pumped directly into laboratory-provided sample containers. Sample containers will be labeled using the nomenclature outlined in Section 5.1, and placed in a cooler on ice for delivery to the designated laboratory under Chain of Custody (COC) control.

Laboratory information related to the chemical analyses of groundwater samples are summarized in Section 6.

Sample Collection Equipment

- Laboratory-provided sample containers;
- Peristaltic pump;
- Tubing or similar compatible material;
- Water quality meter with flow through cell such as a YSI Model 6820; and
- Turbidity-meter.

Container and Analytical Requirements List

Matrix	Containers (Numbers, Size, and Type)	Analytical Parameter(s)	Analytical Method	Preservation Requirements	Holding Time
Groundwater	One 500-mL plastic	Arsenic, Barium, Cadmium, Chromium, Copper, Lead, Mercury, Manganese, Selenium, Silver, and, Zinc	6010/200.7 6020/200.8 7471/245.5	HNO^3 to PH<2; Cool to 4°C	6 months; 28 Days
	Three 1-L Amber glass	PCBs	8081/8082	Cool to 4°C	12 months
		SVOCs	8070	Cool to 4°C	7 Days
	Three 40-mL glass vials	VOCs	8260	HCl to pH < 2; Cool to 4°C	14 Days

Notes:

°C – Degrees Celsius
< - Less than
HCl – hydrochloric acid
HNO_3 – nitric acid
L – Liter
mL – Milliliter
PCBs – Polychlorinated Biphenyls
SVOCs – Semi-Volatile Organic Compounds
VOCs – Volatile Organic Compounds

4.5 Surface Water Sampling

The collection of surface water samples will be at the discretion of field sampling personnel. In locations where drums or other wastes are observed, suggesting unusual conditions, a surface water sample may be collected. If a surface water sample is collected, it will be prior to the collection of any sediment samples at that location. The tentatively proposed surface water and sediment locations are depicted on Figure 4-2 through Figure 4-5. It is anticipated that sample locations will be located near landward sampling locations or submerged containers or near upland drainage discharge points to assess the potential for contamination related to the migration of contaminants from potentially identified sources. It is anticipated that surface water samples will be collected from the water column within 1 foot of the canal bottom. Prior to sample collection, the depth to the bottom of the canal from the water surface will be measured and recorded in the field log book.

Surface water may be collected directly into sample containers if the depth of the water is sufficient or a dip sampler may be used. Alternatively, a low-flow peristaltic pump and Teflon tubing may be used to pump water from the lake into laboratory-provided sample containers. Sample containers will be labeled using the nomenclature outlined in Section 5.1, and properly preserved for delivery to the designated laboratory under

COC control. At the time of sample collection field measurements of temperature, conductivity, pH, ORP, turbidity, and DO will also be made at all locations.

Laboratory information related to the chemical analyses of surface water samples is summarized in Section 6.

Sample Collection Equipment

- Laboratory-provided sample containers;
- Dip sampler (if needed);
- Peristaltic pump (if needed);
- Teflon tubing or similar compatible material (if needed);
- Water quality meter such as a YSI Model 6820; and
- Turbidity-meter.

Container and Analytical Requirements List

Matrix	Containers (Numbers, Size, and Type)	Analytical Parameter(s)	Analytical Method	Preservation Requirements	Holding Time
Surface Water	One 500-mL plastic	Arsenic, Barium, Cadmium, Chromium, Copper, Lead, Mercury, Manganese, Selenium, Silver, and, Zinc	6010/200.7 6020/200.8 7471/245.5	HNO^{3} to PH<2; Cool to 4°C	6 months; 28 Days
	Two 1-L Amber glass	PCBs	8081/8082	Cool to 4°C	12 Months
		SVOCs	8270	Cool to 4°C	14 Days

Notes:

°C – Degrees Celsius
< - Less than
HCl – hydrochloric acid
HNO3 – nitric acid
L – Liter
mL – Milliliter
PCBs – Polychlorinated Biphenyls
SVOCs – Semi-Volatile Organic Compounds

4.6 Sediment and Submerged Drum Sampling

Proposed sediment sample locations within the Portage Canal are depicted on Figure 4-2 through Figure 4-5. At locations that are co-located with a surface water sample, the sediment sample collection will follow the collection of the surface water sample. Final sampling locations may be modified based on underwater reconnaissance completed by DEQ GSU. It is anticipated that sample locations will be located near terrestrial sampling locations or where submerged containers were observed or near upland drainage discharge points to assess the potential for contamination related to the migration of contaminants from potentially identified sources.

It is anticipated that sediment will be collected from multiple intervals within the sediment profile to evaluate the vertical extent of contamination. Sediment samples will be collected utilizing the DEQ GSU's vibracore sampler. Lexane tubing or similar will be advanced in the sediment using the vibracore. The extracted sample core will be opened and the sediment column logged, screened and sampled, based on screening results and observations within the sample core. If the AUV video surveillance indicates submerged drums in the target areas identified by side scan sonar, GSU will use an AUV equipped with a sampling arm in an attempt to sample the drum contents.

Following collection, the sediment and/or submerged drum samples will be placed into a container constructed of inert material, homogenized, and transferred to the appropriate sample containers. The depth of water at the sample location will be recorded prior to sampling. Visual observations, including physical characteristics, staining, or olfactory evidence of contamination within the sediment will be recorded. Sample containers will be labeled using the nomenclature outlined in **Section 5.1**, and placed in a cooler on ice for delivery to the designated laboratory under chain of custody.

Laboratory information related to the chemical analyses of sediment samples is summarized in **Section 6**.

Sample Collection Equipment

- Laboratory-provided sample containers;
- Stainless steel bowls;
- Stainless steel trowels; and,
- Sample coring devices

Container and Analytical Requirements List

Matrix	Containers (Numbers, Size, and Type)	Analytical Parameter(s)	Analytical Method	Preservation Requirements	Holding Time
Sediment	One 250 mL wide mouth glass jar	Arsenic, Barium, Cadmium, Chromium, Copper, Lead, Manganese, Mercury, Selenium, Silver, and, Zinc	6010/200.7 6020/200.8 7471/245.5	Cool to 4°C	6 months; 28 Days
		PCBs	8081/8082	Cool to 4°C	12 months
		SVOCs	8270	Cool to 4°C	14 Days

Notes:

°C – Degrees Celsius
mL – Milliliter
PCBs – Polychlorinated Biphenyls
SVOCs – Semi-Volatile Organic Compounds

4.7 Drums, Containers, Building Materials, Bulk Asbestos, RPM, and Waste Deposit Sampling

Grab or composite samples may be collected from identified waste deposits and/or RPM. The contents of open or dilapidated drums or containers will be sampled. Field personnel will not open sealed drums or containers, but may elect to sample near such containers to determine if the contents of the containers are discharging to the surrounding environmental media. The collection of container or waste samples will be consistent with surface soil sampling methodologies described in **Section 4.2**.

Field decisions may be made to collect samples from abandoned containers and SACM. SACM will be organized into homogenous groups and a minimum of three representative samples will be collected from each homogenous group. Samples will be placed in sealable plastic bags/containers and submitted to the laboratory for analysis.

Laboratory information related to the chemical analyses of container contents, waste samples, RPM, and asbestos is summarized in **Section 6**.

Field team members will don a new pair of disposable nitrile gloves prior to collection of each sample. The stainless-steel coring device will be decontaminated after collection of each sample by washing in an alconox-and-water solution, rinsing with distilled water, and drying with disposable paper towels.

Field Screening

Soil will be field-screened with the following equipment:

- PID.

Sample Collection Equipment

- Laboratory-provided sample containers;
- Sealable plastic bags/containers; and,
- Stainless steel trowels/coring tool.

Container and Analytical Requirements List

Matrix	Containers (Numbers, Size, and Type)	Analytical Parameter(s)	Analytical Method	Preservation Requirements	Holding Time
Drum, Containers, RPM (Waste Characterization)	One 4-oz glass jar	TCLP VOCs	NA	Cool to 4°C	14 Days
	Two 16-oz glass jars	TCLP SVOCs	NA	Cool to 4°C	14 Days
		TCLP Pesticides	NA	Cool to 4°C	14 Days
		TCLP Herbicides	NA	Cool to 4°C	14 Days
		TCLP Metals	NA	Cool to 4°C	180 Days (28 for Hg)
		Reactive Cyanide	SW7.3.3.2NA	Cool to 4°C	28 Days
		Reactive Sulfide	SW7.3.4.2	Cool to 4°C	28 Days
		pH	SW9045D	Cool to 4°C	7 Days
		Flashpoint/Ignitability	SW1010A	Cool to 4°C	180 Days
		Free Liquids	SW9095B	Cool to 4°C	28 Days
		PCBs	SW8082	Cool to 4°C	14 Days
		Moisture	SW3550C	Cool to 4°C	14 Days
		SVOCs	SW846 8270D	Cool to 4°C	14 Days
		Pesticides	SW8081	Cool to 4°C	14 Days
		Herbicides	SW8151	Cool to 4°C	14 Days
		Metals by ICP (RCRA 8)	SW846 6010C	Cool to 4°C	180 Days
		Mercury	SW7471B	Cool to 4°C	28 Days
	Two 40 mL vials	VOCs (*DEQ "plus" list*)	SW8260B	10 mL methanol, 4°C	6 months; 28 Days
Bulk Asbestos	Sealable Plastic Bag	PLM Method 600/R-93/116	PLM	None	Indefinite

Notes:

°C – degrees Celsius
mL – Milliliter
MeOH – Methanol
oz - Ounce
PCBs – Polychlorinated Biphenyls
PLM – Polarized Light Microscopy
SVOCs – Semi-volatile Organic Compounds
TCLP – Toxicity Characteristic Leaching Procedure
VOCs – Volatile Organic Compounds

5.0 SAMPLING PROCEDURES

This Section describes the Project-specific sample nomenclature, management of IDW, decontamination, custody procedures, and other standard operating procedures intended for use on this Project.

5.1 Sample Nomenclature

All samples for analysis, including QC samples, will be given a unique sample number. The sample numbers will be recorded in the field logbook and/or established sample tracking forms, on the sample jars, and on the COC paperwork. The sample identification (ID) number will be used to track field-screening data and laboratory analytical results from each parcel in the Project database.

MSG and the field sampling team will assign each sample its unique ID based on the nomenclature outlined below. The sample identification will be used for documentation purposes in field logbooks, as well as for presentation of the analytical data in memoranda and reports. The Project samples will be identified using the following format:

Project Identification Code
QMCP = Quincy Mining Company Portage Operations Area

Sample Media Code
This shall consist of the following:

- ASBBLK = Bulk Asbestos
- DM = Drum or container sample
- GW = Groundwater sample
- PW = Potable Well
- RPM = Residual Process Material
- SB = Subsurface soil sample
- SD = Sediment sample
- SDM = Submerged drum content sample
- SS = Surface soil sample
- SW = Surface water sample

Sample Number Code
The two digit sample number code will correspond to the consecutive sample count for a given sample media. For example, soil borings are tentatively numbered 01 through 69 and sediment samples are tentatively numbered 01 through 14. Field decisions will ultimately determine the total number of sampling locations for each media type.

Sample Interval or Sample Depth Code
The sample depth or interval code will utilize the top and bottom of the sample interval consisting of the following: This shall consist of the following:

- a_1-b_1"= Where "a_1" represents the top of the sample interval and "b_1" represents the bottom of the sample interval followed by " or ' to indicate the units are in inches or feet. For groundwater samples, the screen interval of the monitoring well shall represent the top and bottom of the sample interval.
- a_2-b_2'= If more than one sample is collected at location at a different depth interval than above, where "a_2" represents the top of the second sample interval and "b_2" represents the bottom of the second sample interval followed by ' to indicate the units are in feet.

QA/QC Identification Code
FD = Field duplicate

Date Code
MMDDYY = The two-digit month (MM), followed by the two-digit day (DD), followed by the two-digit year (YY).

Surface soil sample ID's will be constructed with the Project identification code, followed by the sample media code, followed by the sample interval code, followed by the QA/QC identification, if applicable. A sample identification example for a surface soil sample follows:

- QMCP-SS01-0-6" = the first surface soil sample collected from the QMCP from the 0-6 inch sample interval.

Subsurface soil sample ID's will be constructed with the Project identification code, followed by the sample media code, followed by the sample interval code, followed by the QA/QC identification, if applicable. A sample identification example for a subsurface soil sample follows:

- QMCP-SB14-1-3' = subsurface soil sample collected from the fourteenth soil boring advanced in the QMCP from the 1-3 foot sample interval.

Groundwater sample ID's will be constructed with the Project identification code, followed by the sample media code, followed by the sample/screen interval code, followed by the QA/QC identification, if applicable. A sample identification example for a field duplicate groundwater sample follows:

- QMCP-GW03-8-13'-FD = field duplicate of the third groundwater sample collected from the QMCP from a monitoring well screened from 8 to 13 feet.

Surface water sample ID's will be constructed with the Project identification code, followed by the sample media code, followed by the sample interval code, followed by the QA/QC identification, if applicable. A sample identification example for a surface water sample follows:

- QMCP-SW01-39-40' = the first surface water sample collected from the QMCP from a depth of 39 to 40 feet.

Sediment sample ID's will be constructed with the Project identification code, followed by the sample media code, followed by the sample interval code, followed by the QA/QC identification, if applicable. A sample identification example for a sediment sample collected from Torch Lake follows:

- QMCP-SD10-0-6" = the tenth sediment sample collected from the QMCP from the 0-6-inch sample interval.

Residual Process Material sample ID's will be constructed with the identification code, followed by the sample media code, followed by the sample/screen interval code, followed by the QA/QC identification, if applicable. A sample identification example for a residual process material sample follows:

- QMCP-RPM01-0-6"' = the first residual process material sample collected from the QMCP from a depth of 0 to 6 inches.

Drum or Container sample ID's will be constructed with the Project identification code, followed by the sample media code, followed by the sample interval code, followed by the QA/QC identification, if applicable. A sample identification example for a drum/container sample follows:

- QMCP-DM03-0-6" = the third drum/container sample collected from the QMCP from the 0-6 inch sample interval.

Submerged Drum or Container sample ID's will be constructed with the Project identification code, followed by the sample media code, followed by the sample interval code, followed by the QA/QC identification, if applicable. A sample identification example for a drum/container sample follows:

- QMCP-SDM05-3-5' = the third drum/container sample collected from the QMCP from the 0-6 inch sample interval.

Bulk Asbestos sample ID's will be constructed with the Project identification code, followed by the sample media code, followed by the date code. A sample identification example for a bulk asbestos (material) sample follows:

- QMCP-ASBBLK05-081818 = the fifth bulk asbestos (material) sample collected from the QMCP, collected on August 18, 2018.

5.2 Decontamination Procedures and Management of Investigative-Derived Wastes

For purposes of this SAP, IDWs are defined as any byproduct of the field activities that is suspected or known to be contaminated with hazardous substances. The performance of field activities will produce waste products, such as spent sampling supplies (*e.g.*, sample tubing, disposable sample devices, paper towels, etc.), and expendable PPE. Disposable sampling supplies and PPE will be containerized in trash bags, near the work, which may include terrestrial locations and offshore locations, and disposed of as non-hazardous municipal solid waste at the end of the Project phase.

5.2.1 Terrestrial Investigation

Soil boring advancement and monitoring well installation will result in the generation of soil cuttings, purge water, and decontamination water. It is anticipated that soil cuttings, following logging, screening, and sampling will be temporarily contained in a five-gallon bucket. Following completion of the boring installation the staged soil cuttings will be returned to the boring. For locations where groundwater samples are collected, the soil cuttings will be staged until all samples have been collected and the sampling equipment extracted from the boring. Purge water generated as a result of groundwater sampling activities will be temporarily containerized in five-gallon bucket. Following groundwater sampling collection the collected purge water will be returned to the boring and the boring will be backfilled with the soil cuttings. Expendable groundwater sampling materials will be containerized in a trash bag for disposal as non-hazardous municipal solid waste at the end of the Project phase. Commercially-available topsoil may be added to soil sampling locations to restore original grade as necessary.

It is anticipated that reusable equipment, including the stainless steel sampling screen, will be decontaminated between boring locations using steam-cleaning methods which will minimize decontamination water. In addition, some parts or equipment may be decontaminated using an alconox wash and rinse. Decontamination water generated through washing and rinsing will be discharged in the vicinity of the sample locations. Spray bottles of wash and rinse water may be used to minimize the volume of decontamination fluids generated but the soil boring and well installation activities.

5.2.2 Offshore Investigation

Offshore sampling locations will result in the generation of similar waste streams. Spent Lexane tubing used in the collection of vibra-core sediment samples will be collected and staged for disposal as non-hazardous municipal solid waste. Sample tubing and similar reusable sampling equipment will be collected in a trash bag for disposal as non-hazardous municipal solid waste. Spent sampling supplies and PPE will be staged on the sampling vessel until the vessel returns to the dock at which time bagged and containerized waste will be transferred to a dumpster for disposal.

Excess sediment, debris, and surface water generated as a result of the sampling activities will be temporarily containerized on the vessel in a five-gallon bucket until sampling at the location is complete. Following completion of the sampling activities the excess sediment and surface water will be returned to the lake in the vicinity of the sample location.

It is anticipated that reusable equipment will be decontaminated on board the sampling vessel using an alconox wash and rinse. Spray bottles of wash and rinse water may be used to minimize the volume of decontamination fluids generated during the surface water and sediment sampling activities. Decontamination water generated through washing and rinsing will be discharged to the lake in the vicinity of the sample location.

In the event that free phase oils or liquids or grossly contaminated media are encountered during the terrestrial or offshore sampling activities, contingency containment will be available in the area of the work. Contingencies for containment will include two, clean, five-gallon buckets with lids that will be used to contain any free phase product or residues. The contingency containment will also be used to containerize decontamination fluids resulting from encountering the grossly contaminated material. The containerized waste will be sampled and characterized for proper disposal. It is assumed that any grossly contaminated media collected as a contingency will be temporarily secured and staged at the property where it was generated or at facility secure location until it can be properly characterized and disposed.

5.3 Sample Handling, Tracking, and Custody Procedures

All samples will be identified, handled, shipped, tracked, and maintained under COC. This section discusses sample ID, sample labels, custody seals, sample documentation, sample COC, the field log book, and sample shipment.

5.3.1 Sample Identification

As described in Section 5.1, each sample collected will be given a unique sample ID number that is project- and location-specific. A record of sample ID numbers will be kept with the field records and recorded on chain-of-custody forms.

5.3.2 Sample Labels

Sample labels will be affixed to sample containers. The label will be completed with the following information written in indelible ink:

- Project name and location
- Sample ID number
- Date and time of sample collection
- Preservative used
- Sample collector's initials
- Analyses required

After labeling, each sample will be placed in a cooler that contains ice to maintain the sample temperature at 4 ± 2 ºC. A temperature blank will be provided in each cooler for the laboratory to confirm storage temperature upon sample receipt.

5.3.3 Custody Seals

A self-adhesive custody seal will be placed across the lid of each sample cooler so that the cooler cannot be opened without breaking the seal. The shipping containers in which samples will be stored will be sealed with self-adhesive custody seals any time they are not in someone's possession or view before shipping. Custody seals will be signed and dated.

Custody seals also will be used in combination with strapping tape on the shipping containers to ensure that samples have not been disturbed during transport. Openings will be taped shut to prevent potential leakage during transport.

5.3.4 Sample Documentation

Documentation during sampling is essential to ensure proper sample identification. Sampling personnel will adhere to the general guidelines summarized below for maintaining field documentation:

- Documents will be completed in permanent black ink;
- Entries will be legible;
- Errors will be corrected by crossing out with a single line and then dating and initialing the lineout in a manner that allows the initial entry to be read;
- Any serialized documents including the sampling forms will be maintained in a site file folder by MSG field personnel and referenced in the site logbook; and,
- Unused portions of pages will be crossed out, and each page will be signed and dated.

MSG field personnel will be responsible for ensuring that sampling activities are properly documented.

5.3.5 Sample Chain of Custody

The field team will use standard sample custody procedures to maintain and document sample integrity during sample collection, transportation, storage, and analysis. A sample will be considered to be in custody if one of the statements below applies:

- It is in a person's physical possession or view;
- It is in a secure area with restricted access;
- It is placed in a container and secured with an official seal such that the sample cannot be reached without breaking the seal; and,
- Special instructions regarding short holding/extraction times will be noted.

COC procedures provide an accurate written record that traces the possession of in individual samples from the time of collection in the field to the time of acceptance at the laboratory. The chain-of-custody form will be used to document samples collected and the analyses requested. The field personnel will record the following information on the chain-of-custody record:

- Project name and number;
- Sampling location;
- Name and signature of sampler;
- Destination of samples (laboratory name);
- Sample ID number;
- Date and time of collection;
- Number and type of containers filled;
- Analyses requested;
- Preservatives used (if applicable);
- Filtering (if applicable);
- Sample designation (grab or composite);
- Signatures of individuals involved in custody transfer;
- Air bill number (if applicable); and,
- Project contact and telephone number.

Unused lines on the COC record will be crossed out. Field personnel will sign chain-of-custody records that are initiated in the field, and the air bill number will be recorded. The record will be placed in a waterproof plastic bag and taped to the inside of the shipping container used to transport the samples. Signed air bills will serve as evidence of custody transfer between field personnel and the courier and between the courier and the laboratory. Copies of the COC records and the air bills will be retained and filed by field personnel before the containers are shipped.

Laboratory chain-of-custody begins with sample receipt and continues until samples are discarded. Laboratories analyzing samples must follow custody procedures at least as stringent as those required by the U.S. EPA Contract Laboratory Program (CLP) Statement of Work (SOW) (U.S. EPA 2007). The laboratory should designate a specific individual as the sample custodian. The custodian will receive incoming samples, sign the accompanying custody forms, and retain copies of the forms as permanent records. The laboratory sample custodian will record pertinent information concerning the samples, including the person(s) delivering the samples, the date and time received, and sample condition at the time of receipt (sealed, unsealed, or broken container; temperature; and other relevant remarks).

The sample ID numbers, along with unique laboratory ID numbers, will be recorded on the sample receipt form. After the sample transfer process is complete, the custodian is responsible for maintaining internal logbooks, tracking reports, and other records necessary to maintain custody throughout sample preparation and analysis.

The laboratory will provide a secure storage area for samples. Access to this area will be restricted to authorized personnel. The custodian will ensure that samples requiring special handling, including samples that are heat- or light-sensitive or have other unusual physical characteristics, will be properly stored and maintained prior to analysis.

5.3.6 Sample Shipment

The procedures summarized below will be implemented to ship samples collected during this Project.

- The cooler will be filled with bubble wrap, sample bottles, and packing material. Sufficient packing material will be used to prevent sample containers from breaking during shipment. Enough ice will be added to maintain the sample temperature at 4 ± 2 °C. A temperature blank will be provided in each cooler for the laboratory to confirm storage temperature upon sample receipt. In addition, in order to avoid interference with the laboratory analysis, the packing material will be handled and used in such a manner that it will not contact the sample media at the Project.
- The COC records will be placed inside a waterproof plastic bag. The bag will be sealed and taped to the inside of the cooler lid. The air bill, if required, will be filled out before the samples are handed over to the carrier. The laboratory will be notified if the sampler suspects that the sample contains any substance that would require laboratory personnel to take safety precautions.
- The cooler will be closed and taped shut with strapping tape around both ends. If the cooler has a drain, the drain will be taped shut both inside and outside the cooler.
- Signed and dated custody seals will be placed on the front and side of each cooler. Wide clear tape will be placed over the seals to prevent accidental breakage.
- The COC record will be transported in the taped sealed cooler. When the cooler is received at the analytical laboratory, laboratory personnel will open the cooler and sign the chain-of-custody record to document the transfer of samples.

Multiple coolers may be sent in one shipment to the laboratory. The outsides of the coolers will be marked to indicate the number of coolers in the shipment. Alternatively, samples may be transported by DEQ personnel directly to the environmental laboratory. Standard chain of custody procedures will be followed during transfer of the samples to the laboratory.

5.4 Sampling SOPs

DEQ GSU will reference and follow DEQ Standard Operating Procedures (SOPs) specific to but not limited to groundwater sampling, surface water sampling, decontamination procedures, sediment sampling, subsurface soil sampling, soil gas/vapor intrusion sampling, and soil boring logging and sampling.

5.5 Field Log Book

Complete and accurate documentation is essential to demonstrate that field measurement and sampling procedures are carried out as described in this. Field personnel will use permanently bound field logbooks with sequentially numbered pages to record and document field activities. The logbook will list the contract name and number, the Project name and number; the Project name and location; and the names of subcontractors.

At a minimum, the following information will be recorded in the field logbook:

- Names and affiliations of on-site personnel and visitors;
- Weather conditions during the field activity;
- Summary of daily activities and significant events;
- Information regarding sample collection, including collection date and time, sample ID number, sampling location, sample matrix (such as water or soil), sample type (such as regular, duplicate, blank, grab, or composite), and sampling depth;
- Notes of conversations with coordinating officials;
- References to other field logbooks or forms that contain specific information;
- Discussions of problems encountered and their resolution;
- Discussions of deviations from the SAP or other governing documents; and,
- Description of photographs taken

Changes or corrections will be made by crossing out the item with a single line initialed and dated by the person performing the correction. The original item, although erroneous, will remain legible beneath the cross-out. The new information will be written above the crossed-out item. Corrections will be written clearly and legibly with indelible ink.

6.0 LABORATORY INFORMATION

Investigative samples will be delivered by a courier or shipped under COC control to the designated laboratory listed in the table below.

Matrix	Laboratory Name	Laboratory Address	Laboratory Contact Name	Laboratory Phone Number	Accept Saturday Deliveries
Surface Soil Subsurface Soil Groundwater Surface Water Sediment	DEQ Environmental Laboratory	3350 N. Martin Luther King Blvd. Lansing, MI 48906-2933	DEQ Laboratory Services Section Kirby Shane	(517) 335-9800	No
Composite Soil for Waste Characterization	ALS Environmental	3352 128th Ave Holland MI, 49424	Alex Csaszar	(616) 399-6070	Yes
Bulk Asbestos and Asbestos in Soil	TestAmerica, Inc.	4101 Shuffel Street NW North Canton, OH 44720	Kris Brooks	330-966-9790	Yes

Although the DEQ Environmental Laboratory does not perform certain waste characterization analyses and asbestos analysis, the contract laboratory program requires that the samples be shipped and managed by the DEQ Environmental Laboratory. The laboratory or MSG will deliver the samples under COC to the appropriate laboratory in the Contract Laboratory Program. Field personnel will follow these procedures unless directed otherwise by DEQ or laboratory personnel.

6.1 Measurement and Performance Criteria

Generic measurement and performance criteria will be used. These criteria will ensure that data are sufficiently sensitive, precise, accurate, and representative to support Project decisions. The criteria are summarized below.

- Sensitivity – Sensitivity is the ability of the method or instrument to detect the contaminant of concern and other target analytes at the level of interest.
- Accuracy – Accuracy is a measure of the agreement between an observed value and an accepted reference value. It is a combination of the random error (precision) and systematic error (bias), which are due to sampling and analytical operations. Accuracy is determined by percent recovery calculations of laboratory QC samples.
- Precision – Precision is a measure of the closeness of agreement among individual measurements. Precision is determined by relative percent difference (RPD) and/or standard deviation calculations for laboratory duplicate samples.
- Completeness – Completeness is a measure of the amount of valid data obtained compared to the amount of data that was planned to be collected. Completeness is project specific but is generally around 90 percent.
- Representativeness – Representativeness is a measure of the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Simply, this is the degree to which samples represent the conditions for which they were taken.
- Comparability – Comparability is a measure of the degree to which one data set can be compared with another. Some conditions of comparability of data sets are as follows: standardized sampling and analysis, consistency of reporting units, and standardized data format.

The DEQ Environmental Laboratory will validate analytical results, ensuring that the data is acceptable for use in supporting Project decisions.

6.2 Data Quality Objectives Criteria

DQOs address requirements that include when, where, and how to collect samples; the number of samples; and the limits on tolerable error rates. Sufficient data will be obtained from a representative number of samples to support defensible decisions by DEQ and to determine whether further actions at the Project are necessary. These steps should periodically be revisited as new information about a problem is learned.

The following is a list of DQOs that apply to the QMCP Analytical data must meet all requirements for comparison to the following regulations:

Surface Soil

- DEQ Cleanup Criteria Requirements for Response Activity.
  http://www.michigan.gov/deq/0,4561,7-135-3311_4109-251790--,00.html
  - Rule 299.46 Generic soil cleanup criteria for residential category; and,
  - Rule 299.48 Generic soil cleanup criteria for nonresidential category.

Subsurface Soil

- DEQ Cleanup Criteria Requirements for Response Activity.
  http://www.michigan.gov/deq/0,4561,7-135-3311_4109-251790--,00.html
  - Rule 299.46 Generic soil cleanup criteria for residential category; and,
  - Rule 299.48 Generic soil cleanup criteria for nonresidential category.

Groundwater

- DEQ Cleanup Criteria Requirements for Response Activity
  http://www.michigan.gov/deq/0,4561,7-135-3311_4109-251790--,00.html
  - Rule 299.44 Generic groundwater cleanup criteria.

Surface Water

- DEQ – Rule 57 Water Quality Values, Surface Water Assessment Section
  http://www.michigan.gov/deq/0,4561,7-135-3313_3681_3686_3728-11383--,00.html
- EPA Ecological Screening Levels (ESLs)
  https://www3.epa.gov/region5/waste/cars/esl.htm

Sediment

- DEQ Cleanup Criteria Requirements for Response Activity;
  http://www.michigan.gov/deq/0,4561,7-135-3311_4109-251790--,00.html
  - Rule 299.46 Generic soil cleanup criteria for residential category; and,
  - Rule 299.48 Generic soil cleanup criteria for nonresidential category.
- EPA ESLs;
  https://www3.epa.gov/region5/waste/cars/esl.htm
- Sediment Quality Guidelines, Threshold Effect Concentrations (TECs) and Probable Effect Concentrations (PECs), MacDonald, et al, 2000.
  https://www.michigan.gov/documents/deq/deq-rrd-OpMemo_4Attach3Sediments_250004_7.pdf

Bulk Asbestos

- EPA, National Emission Standards for Hazardous Air Pollutants (NESHAP).
  - 40 Code of Federal Regulations (CFR), Part 61, Subpart M.
  https://www.gpo.gov/fdsys/pkg/CFR-2011-title40-vol8/pdf/CFR-2011-title40-vol8-part61-subpartM.pdf

Waste

- 40 Code of Federal Regulations (CFR) Part 261 – Identification and Listing of Hazardous Waste.
  - 40 CFR Part 261 Subpart C – Characteristics of Hazardous Waste.
  https://www.gpo.gov/fdsys/pkg/CFR-2012-title40-vol27/xml/CFR-2012-title40-vol27-part261.xml

7.0 QUALITY CONTROL ACTIVITIES

The following sections describe the field and laboratory quality control procedures.

7.1 Field Quality Control

QC samples will be collected to evaluate the field sampling and decontamination methods, and the overall reproducibility of the laboratory analytical results. Specifically, QC samples will be collected at the following frequencies:

- Field duplicate samples
  - 1 per 10 investigative samples

Field duplicate samples will be collected using the same sampling techniques as its associated investigative sample. Field duplicate samples will be processed, stored, packaged, and analyzed by the same methods as the investigative samples. Sample nomenclature specific to QC samples is listed in **Section 5.1**. For field duplicates, the RPD between the duplicate and investigative sample will be calculated by the MSG QA reviewer and those RPDs greater than 50 percent (where detections are greater than the quantitation limit) will be summarized in the site investigation report. Corrective actions may include resampling, reassessment of the laboratory's methods, or the addition of data qualifiers to laboratory results.

Matrix spike/matrix spike duplicate (MS/MSD) samples will not be collected during the implementation of field activities. Alternatively, MS/MSD will be selected by the laboratory or "batched". As such, MS/MSD samples may not be derived from investigative samples from the Project, but may come from another sample set at the laboratory. The DEQ Environmental Laboratory will flag data based on the MS/MSD results if appropriate, but the MS/MSD results will not be reported with investigative sample results. The collection of samples for MS/MSD analyses will not be conducted as part of this investigation.

7.2 Analytical Quality Control

QC for analytical procedures will be performed at the frequency described in the laboratory SOPs. In addition, method-specific QC requirements will be used to ensure data quality.

7.3 Performance Evaluation Samples

Performance evaluation samples will not be used in this site assessment.

7.4 Quality Assurance Assessment / Corrective Actions

Field activities are anticipated to require one, 2-week mobilization for completion; no long-term project field audit will be completed at this time.

7.5 Documentation, Records, and Data Management

The DEQ Environmental Laboratory and Contract Laboratories, as applicable will be expected to provide analytical results in electronic data deliverable (EDD) and report formats, with QA/QC and investigative data results. The EDDs will be specifically requested from the DEQ Environmental Laboratory and will include analyte comments. Sample comments will be added to the database by MSG. Laboratory-generated data will be imported to the Project database for mapping, reporting, and archival activities. Laboratory reports will be archived electronically in the MSG Project file and by the DEQ Environmental Laboratory.

8.0 REFERENCES

1. Department of Natural Resources and Environment. Letter of Notice Re: Dollar Bay Well Field, Dollar Bay, Houghton County, Site ID: 31000089. August 4, 2010
2. Michigan Department of Environmental Quality. Brownfield Redevelopment Assessment Report for Hancock/Ripley Trail Property. November 25, 2002.
3. Michigan Department of Environmental Quality. Letter of Notice Re: Complaint Inspection, Julio Construction Property Adjacent to Keweenaw Canal, Ripley, Houghton County. December 12, 1995.
4. Michigan Department of Environmental Quality. Quincy Mining Company Portage, Houghton County, Site ID #31000098, Bathymetric Investigation-Side Scan Sonar. January 9, 2018.
5. Michigan Department of Transportation. Geoenvironmental Services Unit Materials & Technology Division. Michigan Department of Transportation M-DOT M-26, Ripley, Houghton County Hydrogeological Investigation. April 18, 1991.
6. Monette, Clarence J., Dollar Bay, Michigan, Fifty-Fourth of a Local History Series. Greenlee Printing Co. Of Calumet Michigan. September 20, 2000.
7. SCA Environmental. Phase II Hydrogeological Investigation Work Plan, Houghton County Road Commission Ripley Garage, Prepared for Houghton County Road Commission. August 22, 1996.
8. Traverse Engineering Services. 1st Preliminary Report Dollar Bay Wells. March 31, 1995.
9. TriMedia Environmental & Engineering. Baseline Environmental Assessment: Royce Road Marina, Royce Road, Franklin Township, Houghton County, MI 49930. October 26, 2015.
10. United States Department of Agriculture Natural Resources Conservation Service. Detail Remedial Plans for Dollar Bay Torch Lake EPA Superfund Site in Cooperation with the U.S. Environmental Protection Agency, MI Department of Environmental Quality, Houghton/Keweenaw Soil and Water Conservation District. March 2, 2004.
11. United States Department of Agriculture Natural Resources Conservation Service. Detail Remedial Plans for Quincy Smelter Reclamation Project in Cooperation with the U.S. Environmental Protection Agency & MI Department of Environmental Quality & Franklin Township. June 2010.
12. United States Department of Health and Human Services. Public Health Service Agency for Toxic Substances and Disease Registry Division of Health Assessment and Consultation. Health Consultation, Review of Activity-Based Sampling on the Hancock/Ripley Trail, Former Quincy Smelter Site, Town of Ripley, Houghton County, Michigan. EPA Facility ID: MID980901946. November 27, 2006.
13. United States Environmental Protection Agency. Fourth Five-Year Review Report for the Torch Lake Superfund Site, Houghton County, Michigan. March 22, 2018.
14. Weston Solutions, Inc. Summary Report for the Torch Lake Area Assessment, Torch Lake NPL Site and Surrounding Area, Keweenaw Peninsula, Michigan. December 13, 2007.

FIGURES

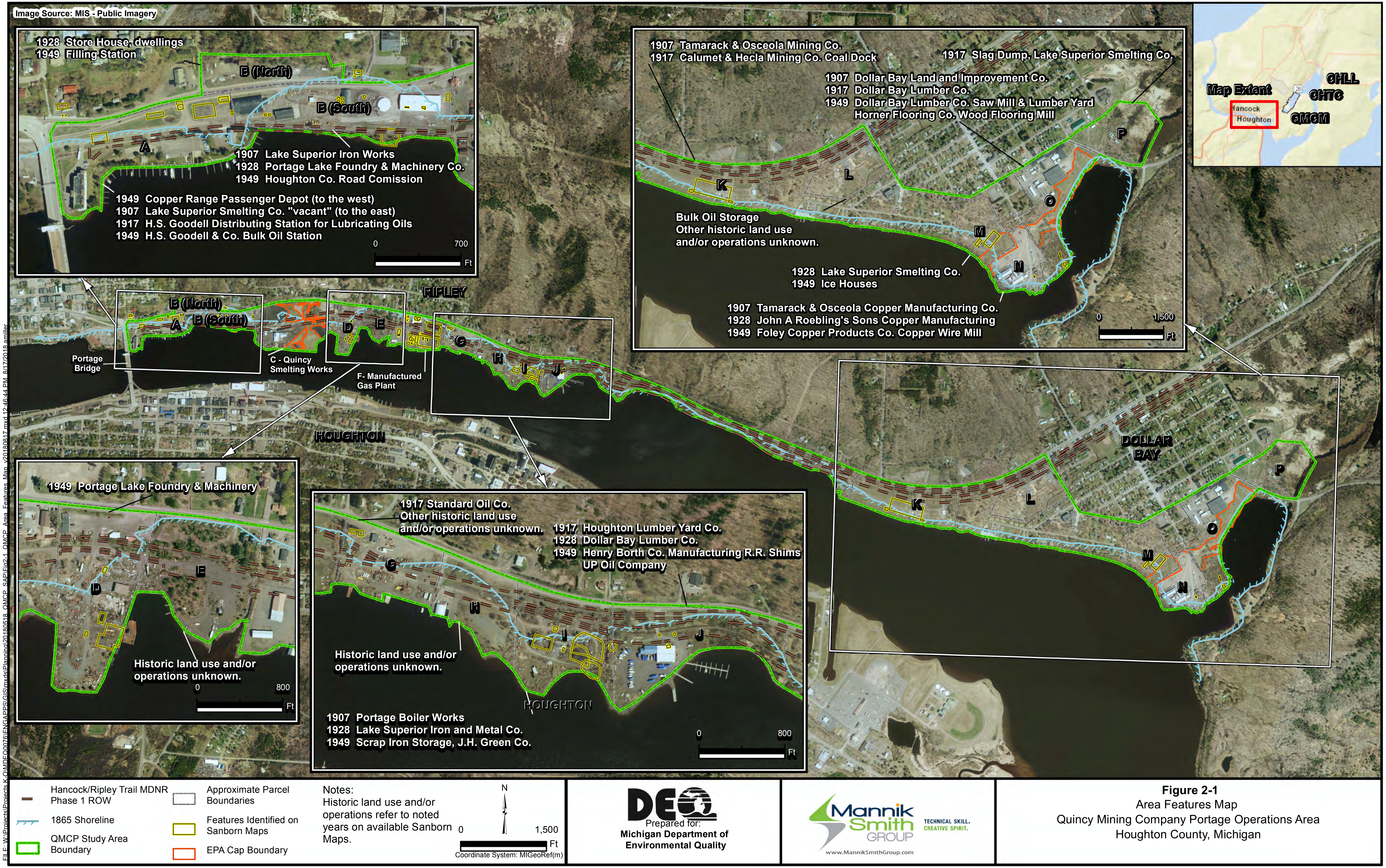

Figure 2-1
Area Features Map
Quincy Mining Company Portage Operations Area
Houghton County, Michigan

AREA A
- 1949 Copper Range Passenger Depot (to the west)
- 1907 Lake Superior Smelting Co. "vacant" (to the east)
- 1917 H.S Goodell Distributing Station for Lubricating Oils
- 1949 H.S. Goodell & Co. Bulk Oil Station

DATA SOURCES

Sample IDs | **Date Range**

1) **"SS-..."** **June 2002**
-MDEQ. *Brownfield Redevelopment Assessment Report for Hancock/Ripley Trail Property.* November 25, 2002.

2) **"TH#..."** **April – October 1990**
-M-DOT Geoenvironmental Services Unit Materials & Technology Division. *Michigan Department of Transportation M-DOT M-26, Ripley, Houghton County Hydrogeological Investigation.* April 18, 1991.

MDEQ Part 201 Cleanup Criteria for Response Action
[1]=Statewide Default Background Level
[2]*=Groundwater Surface Water Interface Protection Criteria
[3]=Soil Saturation Concentration Screening Levels
[4]*=Residential Drinking Water Protection Criteria
[5]=Residential Soil Volatilization to Indoor Air Inhalation Criteria
[6]=Residential Infinite Source Volatile Soil Inhalation Criteria (VSIC)
[7]=Residential Finite VSIC for 5 Meter Source Thickness
[8]=Residential Finite VSIC for 2 Meter Source Thickness
[9]=Residential Particulate Soil Inhalation Criteria
[10]=Residential Direct Contact Criteria
[11]*=Nonresidential Drinking Water Protection Criteria
[12]=Nonresidential Soil Volatilization to Indoor Air Inhalation
[13]=Nonresidential Infinite Source Volatile Soil Inhalation Criteria
[14]=Nonresidential Finite VSIC for 5 Meter Source Thickness
[15]=Nonresidential Finite VSIC for 2 Meter Source Thickness
[16]=Nonresidential Particulate Soil Inhalation Criteria
[17]=Nonresidential Direct Contact Criteria
* Exceedances of criteria 2, 4, and 11 shown for organics and cyanide only
Evaluation based on MDEQ Criteria at time of Project completion

PCBs | Inorganics / Cyanide
VOCs | SVOCs

- At Least One Exceedance for Indicated Parameter Group
- No Exceedances for Indicated Parameter Group
- At Least One Detection of PCBs
- PCBs Not Detected
- Indicated Parameter Group Not Analyzed

Proposed Sample Location Type
- Soil Boring & Groundwater
- Sediment
- Sample Results Displayed on Another Figure
- Proposed Location Displayed on Another Figure
- Hancock/Ripley Trail MDNR Phase 1 ROW
- 1865 Shoreline
- Feature Identified on Sanborn Maps
- Approximate Parcel Boundaries
- QMCP Study Area Boundary

Notes:
- J = estimated value
- mg/kg = milligrams per kilogram
- ug/kg = micrograms per kilogram
- * = result is from cleanup run

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Coordinate System: MIGeoRef(m)

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Figure 4-1a
Historical Sample Analytical Result and Proposed Sampling Locations Map - Soil Area A
Quincy Mining Company Portage Operations Area
Houghton County, Michigan

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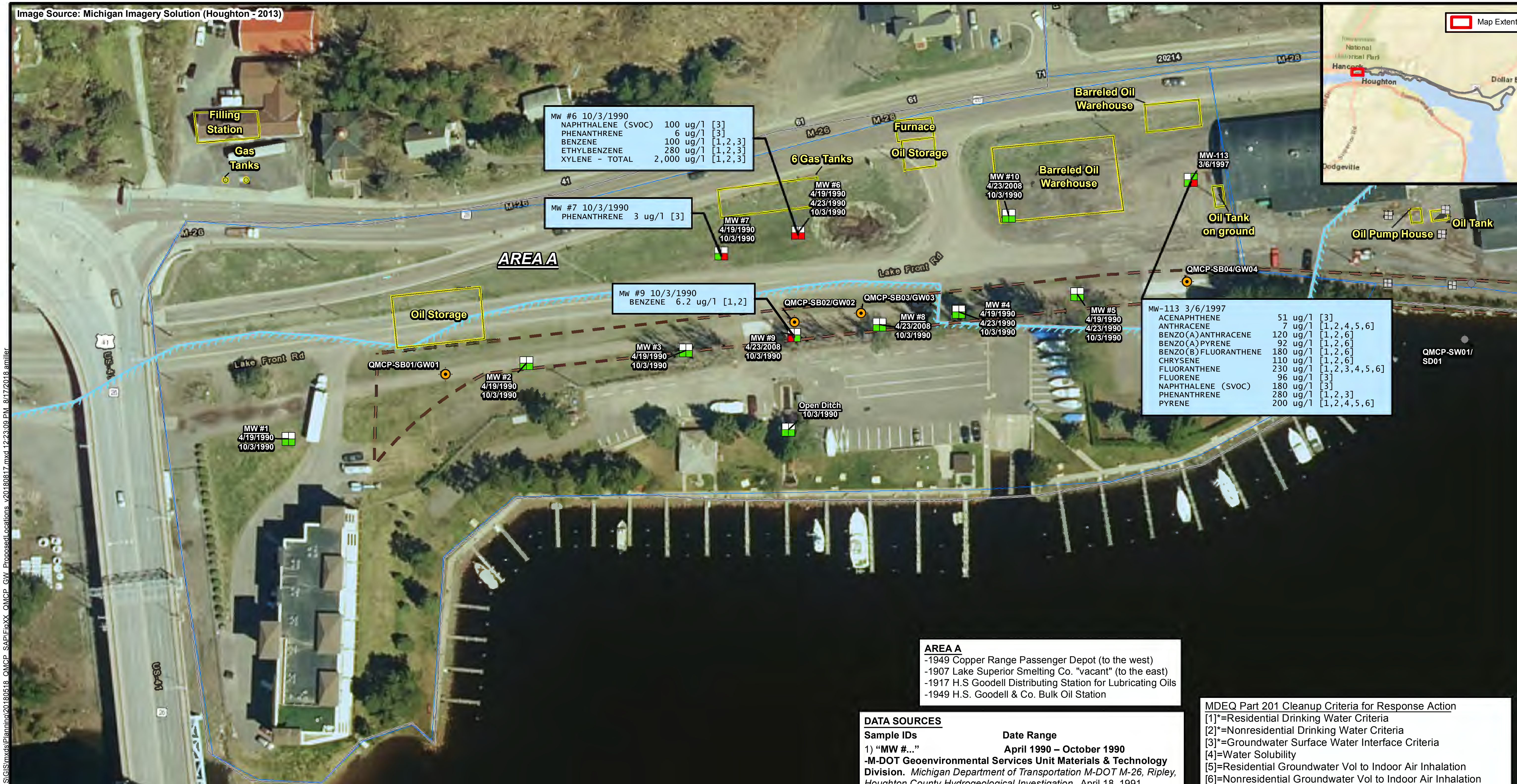

AREA A
- -1949 Copper Range Passenger Depot (to the west)
- -1907 Lake Superior Smelting Co. "vacant" (to the east)
- -1917 H.S Goodell Distributing Station for Lubricating Oils
- -1949 H.S. Goodell & Co. Bulk Oil Station

DATA SOURCES

Sample IDs	Date Range
1) **"MW #..."**	**April 1990 – October 1990**
2) **"MW-..."**	**July 1995 – July 1998**

1) **-M-DOT Geoenvironmental Services Unit Materials & Technology Division.** *Michigan Department of Transportation M-DOT M-26, Ripley, Houghton County Hydrogeological Investigation.* April 18, 1991.

2) **-SCA Environmental.** *Phase II Hydrogeological Investigation Report, Houghton County Road Commission Ripley Garage.* Prepared for Houghton County Road Commission. August 1998.

MDEQ Part 201 Cleanup Criteria for Response Action
[1]*=Residential Drinking Water Criteria
[2]*=Nonresidential Drinking Water Criteria
[3]*=Groundwater Surface Water Interface Criteria
[4]=Water Solubility
[5]=Residential Groundwater Vol to Indoor Air Inhalation
[6]=Nonresidential Groundwater Vol to Indoor Air Inhalation
[7]=Flammability and Explosivity Screening Level
* Exceedances of criteria 1, 2, and 3 are shown for organics only
Evaluation based on MDEQ Criteria at time of Project completion

PCBs Inorganics / Cyanide
VOCs SVOCs

- At Least One Exceedance for Indicated Parameter Group
- No Exceedances for Indicated Parameter Group
- At Least One Detection of PCBs
- PCBs Not Detected
- Indicated Parameter Group Not Analyzed

Proposed Sample Location Type
- Soil Boring & Groundwater
- Sediment
- Proposed Location Displayed on Another Figure
- Sample Results Displayed on Another Figure
- Hancock/Ripley Trail MDNR Phase 1 ROW
- 1865 Shoreline
- Features Identified on Sanborn Maps
- Approximate Parcel Boundaries
- QMCP Study Area Boundary

Notes:
- *J = estimated value*
- *ug/l = micrograms per liter*

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Coordinate System: MIGeoRef(m)

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Figure 4-1b
Historical Sample Analytical Result and Proposed Sampling Locations Map - Groundwater Area A
Quincy Mining Company Portage Operations Area
Houghton County, Michigan

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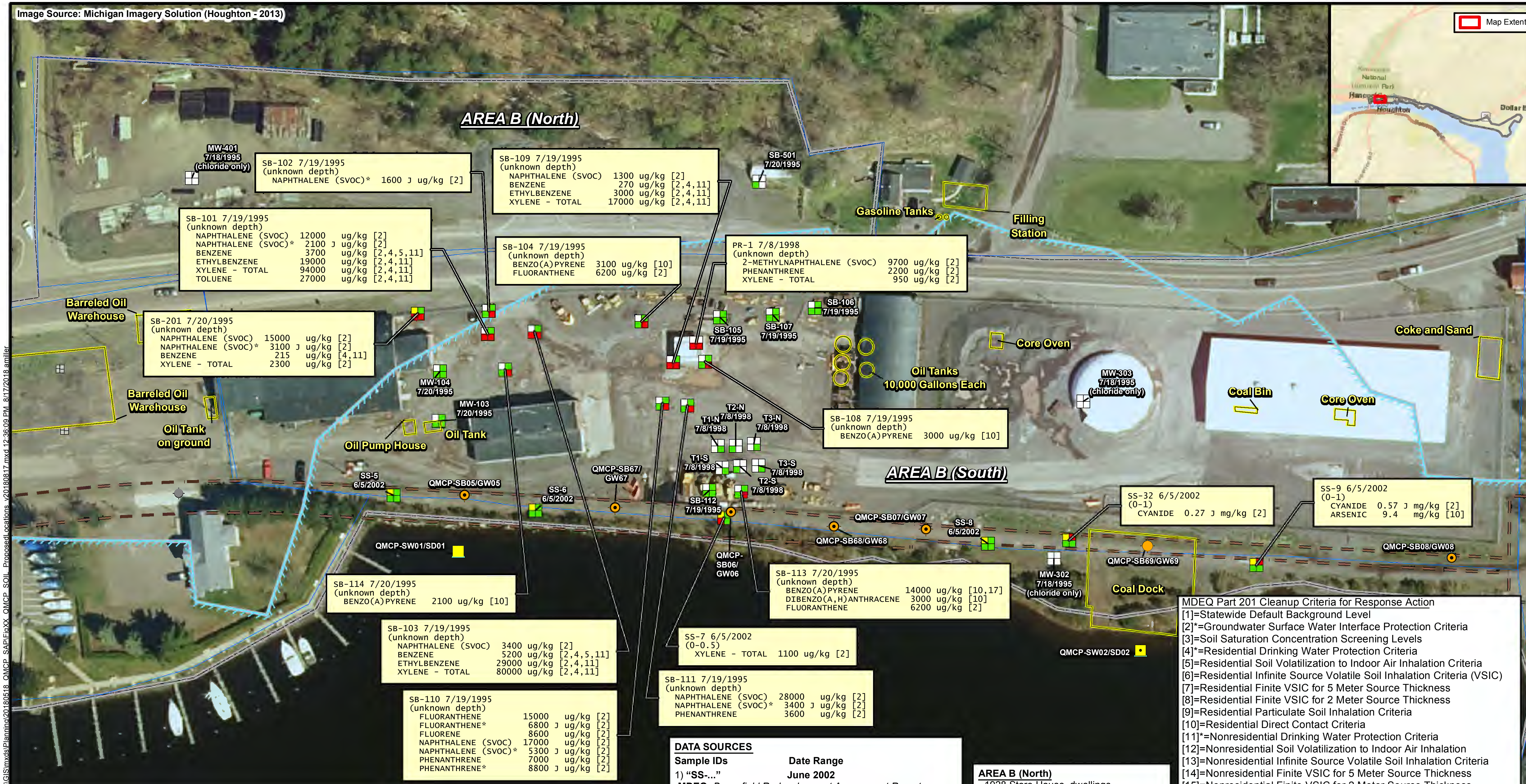

MDEQ Part 201 Cleanup Criteria for Response Action

[1]=Statewide Default Background Level
[2]*=Groundwater Surface Water Interface Protection Criteria
[3]=Soil Saturation Concentration Screening Levels
[4]*=Residential Drinking Water Protection Criteria
[5]=Residential Soil Volatilization to Indoor Air Inhalation Criteria
[6]=Residential Infinite Source Volatile Soil Inhalation Criteria (VSIC)
[7]=Residential Finite VSIC for 5 Meter Source Thickness
[8]=Residential Finite VSIC for 2 Meter Source Thickness
[9]=Residential Particulate Soil Inhalation Criteria
[10]=Residential Direct Contact Criteria
[11]*=Nonresidential Drinking Water Protection Criteria
[12]=Nonresidential Soil Volatilization to Indoor Air Inhalation
[13]=Nonresidential Infinite Source Volatile Soil Inhalation Criteria
[14]=Nonresidential Finite VSIC for 5 Meter Source Thickness
[15]=Nonresidential Finite VSIC for 2 Meter Source Thickness
[16]=Nonresidential Particulate Soil Inhalation Criteria
[17]=Nonresidential Direct Contact Criteria
* Exceedances of criteria 2, 4, and 11 shown for organics and cyanide only
Evaluation based on MDEQ Criteria at time of Project completion

DATA SOURCES

Sample IDs	Date Range
1) "SS-..."	June 2002

-MDEQ. *Brownfield Redevelopment Assessment Report for Hancock/Ripley Trail Property.* November 25, 2002.

2) "SB-/PR-/MW-/T-..." July 1995 – July 1998

-SCA Environmental. *Phase II Hydrogeological Investigation Report, Houghton County Road Commission Ripley Garage.* Prepared for Houghton County Road Commission. August 1998.

AREA B (North)
- 1928 Store House, dwellings
- 1949 Filling Station

AREA B (South)
- 1907 Lake Superior Iron Works
- 1928 Portage Lake Foundry & Machinery
- 1949 Houghton Co. Road Comission

PCBs | Inorganics / Cyanide
VOCs | SVOCs

At Least One Exceedance for Indicated Parameter Group
No Exceedances for Indicated Parameter Group
At Least One Detection of PCBs
PCBs Not Detected
Indicated Parameter Group Not Analyzed

Proposed Sample Location Type

Soil Boring & Groundwater
Sediment & Surface Water
Sediment
Sample Results Displayed on Another Figure
Proposed Location Displayed on Another Figure
Hancock/Ripley Trail MDNR Phase 1 ROW
1865 Shoreline
Feature Identified on Sanborn Maps
Approximate Parcel Boundaries
QMCP Study Area Boundary

Notes:
- J = estimated value
- mg/kg = milligrams per kilogram
- ug/kg = micrograms per kilogram
- * = result is from cleanup run

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Figure 4-2a
Historical Sample Analytical Result and Proposed Sampling Locations Map - Soil Area B
Quincy Mining Company Portage Operations Area
Houghton County, Michigan

DATA SOURCES

Sample IDs	Date Range
1) "MW-/SB-…"	July 1995 – July 1998

-SCA Environmental. *Phase II Hydrogeological Investigation Report, Houghton County Road Commission Ripley Garage.* Prepared for Houghton County Road Commission. August 1998.

AREA B (North)
- 1928 Store House, dwellings
- 1949 Filling Station

AREA B (South)
- 1907 Lake Superior Iron Works
- 1928 Portage Lake Foundry & Machinery Co.
- 1949 Houghton Co. Road Comission

MDEQ Part 201 Cleanup Criteria for Response Action
[1]*=Residential Drinking Water Criteria
[2]*=Nonresidential Drinking Water Criteria
[3]*=Groundwater Surface Water Interface Criteria
[4]=Water Solubility
[5]=Residential Groundwater Vol to Indoor Air Inhalation
[6]=Nonresidential Groundwater Vol to Indoor Air Inhalation
[7]=Flammability and Explosivity Screening Level
* Exceedances of criteria 1, 2, and 3 are shown for organics only
Evaluation based on MDEQ Criteria at time of Project completion

PCBs | Inorganics / Cyanide
VOCs | SVOCs

- At Least One Exceedance for Indicated Parameter Group
- No Exceedances for Indicated Parameter Group
- At Least One Detection of PCBs
- PCBs Not Detected
- Indicated Parameter Group Not Analyzed

Proposed Sample Location Type
- Soil Boring & Groundwater
- Sediment & Surface Water
- Sediment
- Proposed Location Displayed on Another Figure
- Sample Results Displayed on Another Figure
- Hancock/Ripley Trail MDNR Phase 1 ROW
- 1865 Shoreline
- Features Identified on Sanborn Maps
- Approximate Parcel Boundaries
- QMCP Study Area Boundary

Notes:
- J = estimated value
- ug/l = micrograms per liter

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Coordinate System: MIGeoRef(m)

Prepared for:
Michigan Department of Environmental Quality

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Figure 4-2b
Historical Sample Analytical Result and Proposed Sampling Locations Map - Groundwater Area B
Quincy Mining Company Portage Operations Area
Houghton County, Michigan

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MDEQ Part 201 Cleanup Criteria for Response Action
[1]=Statewide Default Background Level
[2]*=Groundwater Surface Water Interface Protection Criteria
[3]=Soil Saturation Concentration Screening Levels
[4]*=Residential Drinking Water Protection Criteria
[5]=Residential Soil Volatilization to Indoor Air Inhalation Criteria
[6]=Residential Infinite Source Volatile Soil Inhalation Criteria (VSIC)
[7]=Residential Finite VSIC for 5 Meter Source Thickness
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[14]=Nonresidential Finite VSIC for 5 Meter Source Thickness
[15]=Nonresidential Finite VSIC for 2 Meter Source Thickness
[16]=Nonresidential Particulate Soil Inhalation Criteria
[17]=Nonresidential Direct Contact Criteria
* Exceedances of criteria 2, 4, and 11 shown for organics and cyanide only
Evaluation based on MDEQ Criteria at time of Project completion

AREA C
- Quincy Smelting Works

AREA D
- 1949 Portage Lake Foundry & Machinery

AREA E
- Historic land use and/or operations unknown

AREA F
- Manufactured Gas Plant

DATA SOURCES

Sample IDs	Date Range
1) "SS-..."	June 2002
2) "Mickelson-..."	September 2007

1) -MDEQ. *Brownfield Redevelopment Assessment Report for Hancock/Ripley Trail Property.* November 25, 2002.

2) -Weston Solutions, Inc. *Summary Report for the Torch Lake Area Assessment, Torch Lake NPL Site and Surrounding Areas, Keweenaw Peninsula, Michigan*

PCBs | Inorganics / Cyanide
VOCs | SVOCs

- At Least One Exceedance for Indicated Parameter Group
- No Exceedances for Indicated Parameter Group
- At Least One Detection of PCBs
- PCBs Not Detected
- Indicated Parameter Group Not Analyzed

Proposed Sample Location Type
- Surface Soil
- Soil Boring & Groundwater
- Sediment & Surface Water
- Sediment
- Hancock/Ripley Trail MDNR Phase 1 ROW
- 1865 Shoreline
- Feature Identified on Sanborn Maps
- Approximate Parcel Boundaries
- EPA Cap Boundary
- QMCP Study Area Boundary

Notes:
- J = estimated value
- mg/kg = milligrams per kilogram
- ug/kg = micrograms per kilogram
- * = result is from cleanup run

N
0 200 Ft
Coordinate System: MIGeoRef(m)

DEQ
Prepared for:
Michigan Department of Environmental Quality

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Figure 4-3
Historical Sample Analytical Result and Proposed Sampling Locations Map - Soil Areas C-F
Quincy Mining Company Portage Operations Area
Houghton County, Michigan

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AREA G
- 1917 Standard Oil Co.
- Other historic land use and/or operations unknown

AREA H
- Historic land use and/or operations unknown

AREA I
- 1907 Portage Boiler Works
- 1928 Lake Superior Iron and Metal Co.
- 1949 A& Scrap Iron Storage, J.H. Green Co.

AREA J
- 1917 Houghton Lumber Yard Co
- 1928 Dollar Bay Lumber Co.
- 1928 Henry Borth Co. Manufacturing R.R. Shims UP Oil Company

DATA SOURCES

Sample IDs	Date Range
1) "SS-..."	June 2002
2) "GP-"	June 2012
3) " H&Ymarina-..."	September 2007

1) "SS-..." June 2002
-MDEQ. *Brownfield Redevelopment Assessment Report for Hancock/Ripley Trail Property.* November 25, 2002.

2) "GP-" June 2012
-Trimedia Environmental & Engineering. *Baseline Environmental Assessment:Royce Road Marina, Royce Road, Franklin Township, Houghton County, MI 49930.* October 26, 2015.

3) " H&Ymarina-..." September 2007
-Weston Solutions, Inc. *Summary Report for the Torch Lake Area Assessment, Torch Lake NPL Site and Surrounding Areas, Keweenaw Peninsula, Michigan*

MDEQ Part 201 Cleanup Criteria for Response Action
[1]=Statewide Default Background Level
[2]*=Groundwater Surface Water Interface Protection Criteria
[3]=Soil Saturation Concentration Screening Levels
[4]*=Residential Drinking Water Protection Criteria
[5]=Residential Soil Volatilization to Indoor Air Inhalation Criteria
[6]=Residential Infinite Source Volatile Soil Inhalation Criteria (VSIC)
[7]=Residential Finite VSIC for 5 Meter Source Thickness
[8]=Residential Finite VSIC for 2 Meter Source Thickness
[9]=Residential Particulate Soil Inhalation Criteria
[10]=Residential Direct Contact Criteria
[11]*=Nonresidential Drinking Water Protection Criteria
[12]=Nonresidential Soil Volatilization to Indoor Air Inhalation
[13]=Nonresidential Infinite Source Volatile Soil Inhalation Criteria
[14]=Nonresidential Finite VSIC for 5 Meter Source Thickness
[15]=Nonresidential Finite VSIC for 2 Meter Source Thickness
[16]=Nonresidential Particulate Soil Inhalation Criteria
[17]=Nonresidential Direct Contact Criteria
* Exceedances of criteria 2, 4, and 11 shown for organics and cyanide only
Evaluation based on MDEQ Criteria at time of Project completion

PCBs | Inorganics / Cyanide
VOCs | SVOCs

- At Least One Exceedance for Indicated Parameter Group
- No Exceedances for Indicated Parameter Group
- At Least One Detection of PCBs
- PCBs Not Detected
- Indicated Parameter Group Not Analyzed

Proposed Sample Location Type
- Surface Soil
- Soil Boring & Groundwater
- Sediment & Surface Water
- Sediment
- Hancock/Ripley Trail MDNR Phase 1 ROW
- 1865 Shoreline
- Feature Identified on Sanborn Maps
- Approximate Parcel Boundaries
- QMCP Study Area Boundary

Notes:
- *J = estimated value*
- *mg/kg = milligrams per kilogram*
- *ug/kg = micrograms per kilogram*
- ** = result is from cleanup run*

N
0 200 Ft
Coordinate System: MIGeoRef(m)

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Figure 4-4a
Historical Sample Analytical Result and Proposed Sampling Locations Map - Soil Areas G-J
Quincy Mining Company Portage Operations Area
Houghton County, Michigan

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AREA G
- 1917 Standard Oil Co.
- Other historic land use and/or operations unknown.

AREA H
- Historic land use and/or operations unknown

AREA I
- 1907 Portage Boiler Works
- 1928 Lake Superior Iron and Metal Co.
- 1949 A& Scrap Iron Storage, J.H. Green Co.

DATA SOURCES

Sample IDs	Date Range
1) "GP-/MW-"	June 2012 – November 2013

- Trimedia Environmental & Engineering. *Baseline Environmental Assessment: Royce Road Marina, Royce Road, Franklin Township, Houghton County, MI 49930.* October 26, 2015.

MDEQ Part 201 Cleanup Criteria for Response Action
[1]*=Residential Drinking Water Criteria
[2]*=Nonresidential Drinking Water Criteria
[3]*=Groundwater Surface Water Interface Criteria
[4]=Water Solubility
[5]=Residential Groundwater Vol to Indoor Air Inhalation
[6]=Nonresidential Groundwater Vol to Indoor Air Inhalation
[7]=Flammability and Explosivity Screening Level
* Exceedances of criteria 1, 2, and 3 are shown for organics only
Evaluation based on MDEQ Criteria at time of Project completion

PCBs Inorganics / Cyanide
VOCs SVOCs

- At Least One Exceedance for Indicated Parameter Group
- No Exceedances for Indicated Parameter Group
- At Least One Detection of PCBs
- PCBs Not Detected
- Indicated Parameter Group Not Analyzed

Proposed Sample Location Type
- Surface Soil
- Soil Boring & Groundwater
- Sediment & Surface Water
- Sediment
- Sample Results Displayed on Another Figure
- Hancock/Ripley Trail MDNR Phase 1 ROW
- 1865 Shoreline
- Features Identified on Sanborn Maps
- Approximate Parcel Boundaries
- QMCP Study Area Boundary

Notes:
- *J = estimated value*
- *ug/l = micrograms per liter*

N
0 200 Ft
Coordinate System: MIGeoRef(m)

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Figure 4-4b
Historical Sample Analytical Result and Proposed Sampling Locations Map - Groundwater Areas G-J
Quincy Mining Company Portage Operations Area
Houghton County, Michigan

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AREA L
-Bulk Oil Storage
-Other historic land use and/or operations unknown.

AREA M
-1928 Lake Superior Smelting Co.
-1949 Ice Houses

AREA N
- 1907 Tamarack & Osceola Copper Manufacturing Co.
- 1928 John A Roebling's Sons Copper Manufacturing
- 1949 Foley Copper Products Co. Copper Wire Mill

AREA O
- 1907 Dollar Bay Land and Improvement Co.
- 1917 Dollar Bay Lumber Company
- 1949 Dollar Bay Lumber Co. Saw Mill & Lumber Yard
- 1949 Horner Flooring Co. Wood Flooring Mill

AREA P
-1917 Slag Dump, Lake Superior Melting Co.

DATA SOURCES

Sample IDs	Date Range
1) "PW#/OW#..."	August 1994 – January 1995

-Traverse Engineering Services. *1st Preliminary Report Dollar Bay Wells.* March 31, 1995.

2) "PW#/OW#..."	January 1996 – May 2010

-Michigan Department of Public Health.
Select results from periodic sampling.

3) "E-.../Lake"	September 1994

-Correspondence with Horner Flooring

MDEQ Part 201 Cleanup Criteria for Response Action
[1]*=Residential Drinking Water Criteria
[2]*=Nonresidential Drinking Water Criteria
[3]*=Groundwater Surface Water Interface Criteria
[4]=Water Solubility
[5]=Residential Groundwater Vol to Indoor Air Inhalation
[6]=Nonresidential Groundwater Vol to Indoor Air Inhalation
[7]=Flammability and Explosivity Screening Level
* Exceedances of criteria 1, 2, and 3 are shown for organics only
Evaluation based on MDEQ Criteria at time of Project completion

PCBs | Inorganics / Cyanide
VOCs | SVOCs

- At Least One Exceedance for Indicated Parameter Group
- No Exceedances for Indicated Parameter Group
- At Least One Detection of PCBs
- PCBs Not Detected
- Indicated Parameter Group Not Analyzed

Proposed Sample Location Type
- Surface Soil
- Soil Boring & Groundwater
- Sediment & Surface Water
- Sediment
- Hancock/Ripley Trail MDNR Phase 1 ROW
- 1865 Shoreline
- Features Identified on Sanborn Maps
- Approximate Parcel Boundaries
- EPA Cap Boundary
- QMCP Study Area Boundary

Notes:
- J = estimated value
- ug/l = micrograms per liter

N
0 380 Ft
Coordinate System: MIGeoRef(m)

Prepared for:
Michigan Department of Environmental Quality

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Figure 4-5
Historical Sample Analytical Result and
Proposed Sampling Locations Map - Groundwater Areas L-P
Quincy Mining Company Portage Operations Area
Houghton County, Michigan

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TABLES

Table 4-1
Sampling and Analysis Summary
Quincy Mining Company Portage Area
Houghton County, Michigan

Proposed Sampling Location	Longitude	Latitude	Proposed Sample ID	Sampling Rationale	Anticipated Sampling Method	Sample Type/Matrix						Sample Analyses							Duplicate Analyses							Trail ROW	Property Ownership	Sample Notes
						Surface Soil	Subsurface Soil	Groundwater	Surface Water	Sediment	Drums, Containers, and Building Materials/SACM	VOCs	SVOCs	PCBs	Metals	Cyanide	Asbestos	Waste Characterization	VOCs	SVOCs	PCBs	Metals	Cyanide	Asbestos	Waste Characterization			
Area A																												
QMCP-SB01	-88.5732227700	47.1254654309	QMCP-SB01 a_1-b_1"	Data Gap - Area A, proximal to historic oil house	Direct Push Boring		X					X	X	X	X	X										Y	State of Michigan	
			QMCP-SB01 a_2-b_2"	Data Gap - Area A, proximal to historic oil house			X					X	X	X	X	X										Y	State of Michigan	
QMCP-SB02	-88.5719017791	47.1256306399	QMCP-SB02 a_1-b_1"	Data Gap - Area A, proximal to historic bulk oil station, MW #9 (10/3/1990)	Direct Push Boring		X					X	X	X	X	X										Y	State of Michigan	
			QMCP-SB02 a_2-b_2"	Data Gap - Area A, proximal to historic bulk oil station, MW #9 (10/3/1990)			X					X	X	X	X	X										Y	State of Michigan	
QMCP-SB03	-88.5716498701	47.1256591368	QMCP-SB03 a_1-b_1"	Area A, proximal to historic bulk oil station, TH#5 (4/17/1990)	Direct Push Boring		X					X	X	X	X	X										Y	State of Michigan	
			QMCP-SB03 a_2-b_2"	Area A, proximal to historic bulk oil station, TH#5 (4/17/1990)			X					X	X	X	X	X										Y	State of Michigan	
QMCP-SB04	-88.5704146656	47.1257690570	QMCP-SB04 a_1-b_1"	Data Gap - Area A, proximal to historic bulk oil station, MW-113 (3/6/1997)	Direct Push Boring		X					X	X	X	X	X	X									Y	State of Michigan	
			QMCP-SB04 a_2-b_2"	Data Gap - Area A, proximal to historic bulk oil station, MW-113 (3/6/1997)			X					X	X	X	X	X										Y	State of Michigan	
QMCP-GW01	-88.5732227700	47.1254654309	QMCP-GW01 a_1-b_1"	Data Gap - Area A, proximal to historic oil house	Peristalitic Pump			X				X	X	X	X											Y	State of Michigan	
QMCP-GW02	-88.5719017791	47.1256306399	QMCP-GW02 a_1-b_1"	Data Gap - Area A, proximal to historic bulk oil station, MW #9 (10/3/1990)	Peristalitic Pump			X				X	X	X	X											Y	State of Michigan	
QMCP-GW03	-88.5716498701	47.1256591368	QMCP-GW03 a_1-b_1"	Area A, proximal to historic bulk oil station, TH#5 (4/17/1990)	Peristalitic Pump			X				X	X	X	X											Y	State of Michigan	
QMCP-GW04	-88.5704146656	47.1257690570	QMCP-GW04 a_1-b_1"	Data Gap - Area A, proximal to historic bulk oil station, MW-113 (3/6/1997)	Peristalitic Pump			X				X	X	X	X											Y	State of Michigan	
Area B																												
QMCP-SB05	-88.5693334790	47.1257886344	QMCP-SB05 a_1-b_1"	Area B (South), proximal to historic oil pump house and oil tank	Direct Push Boring		X					X	X	X	X	X										Y	State of Michigan	
			QMCP-SB05 a_2-b_2"	Area B (South), proximal to historic oil pump house and oil tank			X					X	X	X	X	X			X	X	X	X	X			Y	State of Michigan	
QMCP-SB06	-88.5683251362	47.1257669412	QMCP-SB06 a_1-b_1"	Area B (South), proximal to SS-7 (6/5/2002) and SB-113 (7/20/1995)	Direct Push Boring		X					X	X	X	X	X										Y	State of Michigan	
			QMCP-SB06 a_2-b_2"	Area B (South), proximal to SS-7 (6/5/2002) and SB-113 (7/20/1995)			X					X	X	X	X	X										Y	State of Michigan	
QMCP-SB07	-88.5675851962	47.1257392495	QMCP-SB07 a_1-b_1"	Data Gap -Area B (South), proximal to historic mining operation	Direct Push Boring		X					X	X	X	X	X	X									Y	State of Michigan	
			QMCP-SB07 a_2-b_2"	Data Gap -Area B (South), proximal to historic mining operation			X					X	X	X	X	X										Y	State of Michigan	
QMCP-SB08	-88.5655946106	47.1257096925	QMCP-SB08 a_1-b_1"	Data Gap - Area B (South), proximal to historic mining operation	Direct Push Boring		X					X	X	X	X	X										Y	State of Michigan	
			QMCP-SB08 a_2-b_2"	Data Gap - Area B (South), proximal to historic mining operation			X					X	X	X	X	X										Y	State of Michigan	
QMCP-SB67	-88.5687629030	47.1257685522	QMCP-SB67 a_1-b_1"	Data Gap - Area B (South), proximal to historic mining operation	Direct Push Boring		X					X	X	X	X	X										Y	State of Michigan	
			QMCP-SB67 a_2-b_2'	Data Gap - Area B (South), proximal to historic mining operation			X					X	X	X	X	X										Y	State of Michigan	
QMCP-SB68	-88.5679340718	47.1257384830	QMCP-SB68 a_1-b_1"	Data Gap - Area B (South), proximal to historic mining operation	Direct Push Boring		X					X	X	X	X	X										Y	State of Michigan	
			QMCP-SB68 a_2-b_2'	Data Gap - Area B (South), proximal to historic mining operation			X					X	X	X	X	X										Y	State of Michigan	
QMCP-SB69	-88.5667458763	47.1257148755	QMCP-SB69 a_1-b_1"	Data Gap - Area B (South), near historic coal dock	Direct Push Boring		X					X	X	X	X	X										Y	State of Michigan	
			QMCP-SB69 a_2-b_2'	Data Gap - Area B (South), near historic coal dock			X					X	X	X	X	X										Y	State of Michigan	
QMCP-GW05	-88.5693334790	47.1257886344	QMCP-GW05 a_1-b_1"	Area B (South), proximal to historic oil pump house and oil tank	Peristalitic Pump			X				X	X	X	X											Y	State of Michigan	
QMCP-GW06	-88.5683251362	47.1257669412	QMCP-GW06 a_1-b_1"	Area B (South), proximal to SS-7 (6/5/2002) and SB-113 (7/20/1995)	Peristalitic Pump			X				X	X	X	X											Y	State of Michigan	
QMCP-GW07	-88.5675851962	47.1257392495	QMCP-GW07 a_1-b_1"	Data Gap -Area B (South), proximal to historic mining operation	Peristalitic Pump			X				X	X	X	X											Y	State of Michigan	
QMCP-GW08	-88.5655946106	47.1257096925	QMCP-GW08 a_1-b_1"	Data Gap - Area B (South), proximal to historic mining operation	Peristalitic Pump			X				X	X	X	X											Y	State of Michigan	
QMCP-GW67	-88.5687629030	47.1257685522	QMCP-GW67 a_1-b_1"	Data Gap - Area B (South), proximal to historic mining operation	Peristalitic Pump			X				X	X	X	X											Y	State of Michigan	
QMCP-GW68	-88.5679340718	47.1257384830	QMCP-GW68 a_1-b_1"	Data Gap - Area B (South), proximal to historic mining operation	Peristalitic Pump			X				X	X	X	X											Y	State of Michigan	
QMCP-GW69	-88.5667458763	47.1257148755	QMCP-GW69 a_1-b_1"	Data Gap - Area B (South), near historic coal dock	Peristalitic Pump			X				X	X	X	X											Y	State of Michigan	

Table 4-1
Sampling and Analysis Summary
Quincy Mining Company Portage Area
Houghton County, Michigan

						Sample Type/Matrix						Sample Analyses							Duplicate Analyses									
Proposed Sampling Location	Longitude	Latitude	Proposed Sample ID	Sampling Rationale	Anticipated Sampling Method	Surface Soil	Subsurface Soil	Groundwater	Surface Water	Sediment	Drums, Containers, and Building Materials/SACM	VOCs	SVOCs	PCBs	Metals	Cyanide	Asbestos	Waste Characterization	VOCs	SVOCs	PCBs	Metals	Cyanide	Asbestos	Waste Characterization	Trail ROW	Property Ownership	Sample Notes
Area D																												
QMCP-SS01	-88.5592639887	47.1262669414	QMCP-SS01 a_1-b_1"	Data Gap - Area D	Hand Tools	X									X		X									N	Lawrence Julio	
QMCP-SS02	-88.5581544577	47.1262128222	QMCP-SS02 a_1-b_1"	Data Gap - Area D	Hand Tools	X									X		X									N	Lawrence Julio	
QMCP-SS03	-88.5594144402	47.1251512011	QMCP-SS03 a_1-b_1"	Data Gap - Area D	Hand Tools	X									X		X									N	Lawrence Julio	
QMCP-SS04	-88.5594663986	47.1246749600	QMCP-SS04 a_1-b_1"	Data Gap - Area D	Hand Tools	X									X											N	Lawrence Julio	
QMCP-SS05	-88.5588072755	47.1246664455	QMCP-SS05 a_1-b_1"	Data Gap - Area D	Hand Tools	X									X		X									N	Lawrence Julio	
QMCP-SS32	-88.5598758805	47.1260351003	QMCP-SS32 a_1-b_1"	Data Gap - Area C	Hand Tools	X									X											N	Unknown	
QMCP-SS33	-88.5595577644	47.1260383670	QMCP-SS33 a_1-b_1"	Data Gap - Area C	Hand Tools	X									X											N	Unknown	
QMCP-SS34	-88.5596363471	47.1255793039	QMCP-SS34 a_1-b_1"	Data Gap - Area C	Hand Tools	X									X											N	Unknown	
QMCP-SB09	-88.5596520688	47.1264298030	QMCP-SB09 a_1-b_1"	Data Gap - Area C, proximal to SS-20 (6/5/2002)	Direct Push Boring		X					X	X	X	X	X										Y	State of Michigan	
			QMCP-SB09 a_2-b_2"	Data Gap - Area C, proximal to SS-20 (6/5/2002)			X					X	X	X	X	X										N	Unknown	
QMCP-SB10	-88.5583399004	47.1263987326	QMCP-SB10 a_1-b_1"	Area D, proximal to SS-34 (6/5/2002)	Direct Push Boring		X					X	X	X	X	X										Y	State of Michigan	
			QMCP-SB10 a_2-b_2"	Area D, proximal to SS-34 (6/5/2002)			X					X	X	X	X	X			X	X	X	X	X			Y	State of Michigan	
QMCP-SB11	-88.5594156772	47.1258881341	QMCP-SB11 a_1-b_1"	Data Gap - Area D, within historic mining operation location	Direct Push Boring		X					X	X	X	X	X										N	Lawrence Julio	
			QMCP-SB11 a_2-b_2"	Data Gap - Area D, within historic mining operation location			X					X	X	X	X	X										N	Lawrence Julio	
QMCP-SB12	-88.5588805687	47.1257748926	QMCP-SB12 a_1-b_1"	Data Gap - Area D, within historic mining operation location	Direct Push Boring		X					X	X	X	X	X										N	Lawrence Julio	
			QMCP-SB12 a_2-b_2"	Data Gap - Area D, within historic mining operation location			X					X	X	X	X	X										N	Lawrence Julio	
QMCP-SB13	-88.5589319784	47.1252870764	QMCP-SB13 a_1-b_1"	Data Gap - Area D, proximal to historic oil house	Direct Push Boring		X					X	X	X	X	X										N	Lawrence Julio	
			QMCP-SB13 a_2-b_2"	Data Gap - Area D, proximal to historic oil house			X					X	X	X	X	X										N	Lawrence Julio	
QMCP-SB14	-88.5582853781	47.1253987905	QMCP-SB14 a_1-b_1"	Data Gap - Area D, proximal to historic coal dock	Direct Push Boring		X					X	X	X	X	X										N	Lawrence Julio	
			QMCP-SB14 a_2-b_2"	Data Gap - Area D, proximal to historic coal dock			X					X	X	X	X	X										N	Lawrence Julio	
QMCP-SB15	-88.5583802843	47.1252529955	QMCP-SB15 a_1-b_1"	Data Gap - Area D, proximal to historic coal dock	Direct Push Boring		X					X	X	X	X	X										N	Lawrence Julio	
			QMCP-SB15 a_2-b_2"	Data Gap - Area D, proximal to historic coal dock			X					X	X	X	X	X			X	X	X	X	X			N	Lawrence Julio	
QMCP-SB16	-88.5590856964	47.1248085722	QMCP-SB16 a_1-b_1"	Data Gap - Area D, within historic mining operation location	Direct Push Boring		X					X	X	X	X	X										N	Lawrence Julio	
			QMCP-SB16 a_2-b_2"	Data Gap - Area D, within historic mining operation location			X					X	X	X	X	X										N	Lawrence Julio	
QMCP-SB17	-88.5579478913	47.1260111582	QMCP-SB17 a_1-b_1"	Data Gap Area D, within historic mining operation location	Direct Push Boring		X					X	X	X	X	X										N	Lawrence Julio	
			QMCP-SB17 a_2-b_2"	Data Gap Area D, within historic mining operation location			X					X	X	X	X	X										N	Lawrence Julio	
QMCP-SB51	-88.5597140012	47.1261530303	QMCP-SB51 a_1-b_1"	Data Gap - Area C, proximal to historic mine operation	Direct Push Boring		X					X	X	X	X	X										N	Unknown	
			QMCP-SB51 a_2-b_2"	Data Gap - Area C, proximal to historic mine operation			X					X	X	X	X	X										N	Unknown	
QMCP-SB52	-88.5597114618	47.1257491256	QMCP-SB52 a_1-b_1"	Data Gap - Area C, proximal to historic mine operation	Direct Push Boring		X					X	X	X	X	X										N	Unknown	
			QMCP-SB52 a_2-b_2"	Data Gap - Area C, proximal to historic mine operation			X					X	X	X	X	X										N	Unknown	
QMCP-GW09	-88.5596520688	47.1264298030	QMCP-GW09 a_1-b_1"	Data Gap - Area C, proximal to SS-20 (6/5/2002)	Peristalitic Pump			X				X	X	X	X											Y	State of Michigan	
QMCP-GW10	-88.5583399004	47.1263987326	QMCP-GW10 a_1-b_1"	Area D, proximal to SS-34 (6/5/2002)	Peristalitic Pump			X				X	X	X	X				X	X	X	X				N	Lawrence Julio	
QMCP-GW11	-88.5594156772	47.1258881341	QMCP-GW11 a_1-b_1"	Data Gap - Area D, within historic mining operation location	Peristalitic Pump			X				X	X	X	X											N	Lawrence Julio	
QMCP-GW12	-88.5588805687	47.1257748926	QMCP-GW12 a_1-b_1"	Data Gap - Area D, within historic mining operation location	Peristalitic Pump			X				X	X	X	X											N	Lawrence Julio	
QMCP-GW13	-88.5589319784	47.1252870764	QMCP-GW13 a_1-b_1"	Data Gap - Area D, proximal to historic oil house	Peristalitic Pump			X				X	X	X	X											N	Lawrence Julio	
QMCP-GW14	-88.5582853781	47.1253987905	QMCP-GW14 a_1-b_1"	Data Gap - Area D, proximal to historic coal dock	Peristalitic Pump			X				X	X	X	X											N	Lawrence Julio	
QMCP-GW15	-88.5583802843	47.1252529955	QMCP-GW15 a_1-b_1"	Data Gap - Area D, proximal to historic coal dock	Peristalitic Pump			X				X	X	X	X											N	Lawrence Julio	
QMCP-GW16	-88.5590856964	47.1248085722	QMCP-GW16 a_1-b_1"	Data Gap - Area D, within historic mining operation location	Peristalitic Pump			X				X	X	X	X											N	Lawrence Julio	
QMCP-GW17	-88.5579478913	47.1260111582	QMCP-GW17 a_1-b_1"	Data Gap Area D, within historic mining operation location	Peristalitic Pump			X				X	X	X	X											N	Lawrence Julio	
QMCP-GW51	-88.5597140012	47.1261530303	QMCP-GW51 a_1-b_1"	Data Gap - Area C, proximal to historic mine operation	Peristalitic Pump			X				X	X	X	X											N	Unknown	
QMCP-GW52	-88.5597114618	47.1257491256	QMCP-GW52 a_1-b_1"	Data Gap - Area C, proximal to historic mine operation	Peristalitic Pump			X				X	X	X	X											N	Unknown	

Table 4-1
Sampling and Analysis Summary
Quincy Mining Company Portage Area
Houghton County, Michigan

Proposed Sampling Location	Longitude	Latitude	Proposed Sample ID	Sampling Rationale	Anticipated Sampling Method	Sample Type/Matrix: Surface Soil	Subsurface Soil	Groundwater	Surface Water	Sediment	Drums, Containers, and Building Materials/SACM	Sample Analyses: VOCs	SVOCs	PCBs	Metals	Cyanide	Asbestos	Waste Characterization	Duplicate Analyses: VOCs	SVOCs	PCBs	Metals	Cyanide	Asbestos	Waste Characterization	Trail ROW	Property Ownership	Sample Notes
Area E																												
QMCP-SS06	-88.5568300058	47.1263511839	QMCP-SS06 a_1-b_1"	Data Gap - Area E	Hand Tools	X									X											Y	State of Michigan	
QMCP-SS07	-88.5570632739	47.1258315176	QMCP-SS07 a_1-b_1"	Data Gap - Area E	Hand Tools	X									X		X									N	Unknown	
QMCP-SS08	-88.5562906232	47.1262767610	QMCP-SS08 a_1-b_1"	Data Gap - Area E, near MDNR obsrvations of contaminated soil	Hand Tools	X									X											Y	State of Michigan	
QMCP-SS09	-88.5561137557	47.1258572514	QMCP-SS09 a_1-b_1"	Data Gap - Area E	Hand Tools	X									X		X									N	Unknown	
QMCP-SB18	-88.5574037651	47.1262781776	QMCP-SB18 a_1-b_1"	Data Gap - Area E, proximal to historic mining operation location	Direct Push Boring		X					X	X	X	X	X										Y	State of Michigan	
			QMCP-SB18 a_2-b_2"	Data Gap - Area E, proximal to historic mining operation location			X					X	X	X	X	X										Y	State of Michigan	
QMCP-SB19	-88.5567005747	47.1256310041	QMCP-SB19 a_1-b_1"	Data Gap - Area E, proximal to historic mining operation location	Direct Push Boring		X					X	X	X	X	X										N	Unknown	
			QMCP-SB19 a_2-b_2"	Data Gap - Area E, proximal to historic mining operation location			X					X	X	X	X	X										N	Unknown	
QMCP-SB20	-88.5563714590	47.1262120781	QMCP-SB20 a_1-b_1"	Data Gap - Area E, proximal to observations of soil contamination	Direct Push Boring		X					X	X	X	X	X										Y	State of Michigan	
			QMCP-SB20 a_2-b_2"	Data Gap - Area E, proximal to observations of soil contamination			X					X	X	X	X	X			X	X	X	X	X			Y	State of Michigan	
QMCP-SB21	-88.5558832643	47.1257233224	QMCP-SB21 a_1-b_1"	Data Gap - Area E, proximal to historic mining operation location	Direct Push Boring		X					X	X	X	X	X										N	Unknown	
			QMCP-SB21 a_2-b_2"	Data Gap - Area E, proximal to historic mining operation location			X					X	X	X	X	X										N	Unknown	
QMCP-SB61	-88.5560688345	47.1262113296	QMCP-SB61 a_1-b_1"	Data Gap - Area E, proximal to observations of soil contamination	Direct Push Boring		X					X	X	X	X	X										Y	State of Michigan	
			QMCP-SB61 a_2-b_2'	Data Gap - Area E, proximal to observations of soil contamination			X					X	X	X	X	X										Y	State of Michigan	
QMCP-GW18	-88.5574037651	47.1262781776	QMCP-GW18 a_1-b_1"	Data Gap - Area E, proximal to historic mining operation location	Peristalitic Pump			X				X	X	X	X											Y	State of Michigan	
QMCP-GW19	-88.5567005747	47.1256310041	QMCP-GW19 a_1-b_1"	Data Gap - Area E, proximal to historic mining operation location	Peristalitic Pump			X				X	X	X	X											N	Dianne Sprague	
QMCP-GW20	-88.5563714590	47.1262120781	QMCP-GW20 a_1-b_1"	Data Gap - Area E, proximal to observations of soil contamination	Peristalitic Pump			X				X	X	X	X				X	X	X	X				Y	State of Michigan	
QMCP-GW21	-88.5558832643	47.1257233224	QMCP-GW21 a_1-b_1"	Data Gap - Area E, proximal to historic mining operation location	Peristalitic Pump			X				X	X	X	X											N	Dianne Sprague	
QMCP-GW61	-88.5560688345	47.1262113296	QMCP-GW61 a_1-b_1"	Data Gap - Area E, proximal to observations of soil contamination	Peristalitic Pump			X				X	X	X	X											Y	State of Michigan	
Area F																												
QMCP-SB62	-88.5550291932	47.1261337546	QMCP-SB62 a_1-b_1"	Data Gap - Area F, proximal to historic filling station/tank farm	Direct Push Boring		X					X	X	X	X	X										Y	State of Michigan	
			QMCP-SB62 a_2-b_2'	Data Gap - Area F, proximal to historic filling station/tank farm			X					X	X	X	X	X										Y	State of Michigan	
QMCP-SB63	-88.5546073161	47.1261107700	QMCP-SB63 a_1-b_1"	Data Gap - Area F, proximal to historic filling station/tank farm	Direct Push Boring		X					X	X	X	X	X										Y	State of Michigan	
			QMCP-SB63 a_2-b_2'	Data Gap - Area F, proximal to historic filling station/tank farm			X					X	X	X	X	X										Y	State of Michigan	
QMCP-SB64	-88.5544818765	47.1261150665	QMCP-SB64 a_1-b_1"	Data Gap - Area F, proximal to historic filling station/tank farm	Direct Push Boring		X					X	X	X	X	X										Y	State of Michigan	
			QMCP-SB64 a_2-b_2'	Data Gap - Area F, proximal to historic filling station/tank farm			X					X	X	X	X	X										Y	State of Michigan	
QMCP-GW62	-88.5550291932	47.1261337546	QMCP-GW62 a_1-b_1"	Data Gap - Area F, proximal to historic filling station/tank farm	Peristalitic Pump			X				X	X	X	X											Y	State of Michigan	
QMCP-GW63	-88.5546073161	47.1261107700	QMCP-GW63 a_1-b_1"	Data Gap - Area F, proximal to historic filling station/tank farm	Peristalitic Pump			X				X	X	X	X											Y	State of Michigan	
QMCP-GW64	-88.5544818765	47.1261150665	QMCP-GW64 a_1-b_1"	Data Gap - Area F, proximal to historic filling station/tank farm	Peristalitic Pump			X				X	X	X	X											Y	State of Michigan	

Proposed Sampling Location	Longitude	Latitude	Proposed Sample ID	Sampling Rationale	Anticipated Sampling Method	Sample Type/Matrix						Sample Analyses							Duplicate Analyses							Trail ROW	Property Ownership	Sample Notes
						Surface Soil	Subsurface Soil	Groundwater	Surface Water	Sediment	Drums, Containers, and Building Materials/SACM	VOCs	SVOCs	PCBs	Metals	Cyanide	Asbestos	Waste Characterization	VOCs	SVOCs	PCBs	Metals	Cyanide	Asbestos	Waste Characterization			
Area G																												
QMCP-SS10	-88.5513148091	47.1249347936	QMCP-SS10 a_1-b_1"	Data Gap - Area G	Hand Tools	X									X		X					X				N	Lawrence Julio	
QMCP-SS11	-88.5512413770	47.1252266518	QMCP-SS11 a_1-b_1"	Data Gap - Area G	Hand Tools	X									X		X									N	Lawrence Julio	
QMCP-SS12	-88.5509669462	47.1252042319	QMCP-SS12 a_1-b_1"	Data Gap - Area G	Hand Tools	X									X											N	Lawrence Julio	
QMCP-SS13	-88.5508667605	47.1252530971	QMCP-SS13 a_1-b_1"	Data Gap - Area G	Hand Tools	X									X											N	Lawrence Julio	
QMCP-SS14	-88.5503878410	47.1250823209	QMCP-SS14 a_1-b_1"	Data Gap - Area G	Hand Tools	X									X											N	Lawrence Julio	
QMCP-SS15	-88.5499614082	47.1248974216	QMCP-SS15 a_1-b_1"	Data Gap - Area G	Hand Tools	X									X		X									N	Lawrence Julio	
QMCP-SB22	-88.5517112289	47.1255258983	QMCP-SB22 a_1-b_1"	Data Gap - Area G, within historic mining operation location	Direct Push Boring		X					X	X	X	X	X		X								Y	State of Michigan	
			QMCP-SB22 a_2-b_2"	Data Gap - Area G, within historic mining operation location			X					X	X	X	X	X										Y	State of Michigan	
QMCP-SB23	-88.5512533076	47.1254582341	QMCP-SB23 a_1-b_1"	Data Gap - Area G, within historic mining operation location	Direct Push Boring		X					X	X	X	X	X										Y	State of Michigan	
			QMCP-SB23 a_2-b_2"	Data Gap - Area G, within historic mining operation location			X					X	X	X	X	X										Y	State of Michigan	
QMCP-SB24	-88.5506484730	47.1253732513	QMCP-SB24 a_1-b_1"	Area G, proximal to SS-26 (6/5/2002)	Direct Push Boring		X					X	X	X	X	X										Y	State of Michigan	
			QMCP-SB24 a_2-b_2"	Area G, proximal to SS-26 (6/5/2002)			X					X	X	X	X	X										Y	State of Michigan	
QMCP-SB25	-88.5499303901	47.1252829225	QMCP-SB25 a_1-b_1"	Area G, proximal to SS-27 (6/5/2002)	Direct Push Boring		X					X	X	X	X	X										Y	State of Michigan	
			QMCP-SB25 a_2-b_2"	Area G, proximal to SS-27 (6/5/2002)			X					X	X	X	X	X			X	X	X	X	X			Y	State of Michigan	
QMCP-SB26	-88.5516002744	47.1250295258	QMCP-SB26 a_1-b_1"	Data Gap - Area G, within historic mining operation location	Direct Push Boring		X					X	X	X	X	X										N	Lawrence Julio	
			QMCP-SB26 a_2-b_2"	Data Gap - Area G, within historic mining operation location			X					X	X	X	X	X										N	Lawrence Julio	
QMCP-SB27	-88.5510677639	47.1248495748	QMCP-SB27 a_1-b_1"	Data Gap - Area G, within historic mining operation location	Direct Push Boring		X					X	X	X	X	X										N	Lawrence Julio	
			QMCP-SB27 a_2-b_2"	Data Gap - Area G, within historic mining operation location			X					X	X	X	X	X										N	Lawrence Julio	
QMCP-SB28	-88.5503835049	47.1249113883	QMCP-SB28 a_1-b_1"	Data Gap - Area G, within historic mining operation location	Direct Push Boring		X					X	X	X	X	X										N	Lawrence Julio	
			QMCP-SB28 a_2-b_2"	Data Gap - Area G, within historic mining operation location			X					X	X	X	X	X										N	Lawrence Julio	
QMCP-SB29	-88.5498260528	47.1247656715	QMCP-SB29 a_1-b_1"	Data Gap - Area G, within historic mining operation location	Direct Push Boring		X					X	X	X	X	X										N	Lawrence Julio	
			QMCP-SB29 a_2-b_2"	Data Gap - Area G, within historic mining operation location			X					X	X	X	X	X										N	Lawrence Julio	
QMCP-SB65	-88.5518559812	47.1260205380	QMCP-SB65 a_1-b_1"	Data Gap - Area G, proximal to historic oil company	Direct Push Boring		X					X	X	X	X	X										N	Lawrence Julio	
			QMCP-SB65 a_2-b_2'	Data Gap - Area G, proximal to historic oil company			X					X	X	X	X	X			X	X	X	X	X			N	Lawrence Julio	
QMCP-SB66	-88.5516199990	47.1258949548	QMCP-SB66 a_1-b_1"	Data Gap - Area G, proximal to historic oil company	Direct Push Boring		X					X	X	X	X	X										N	Lawrence Julio	
			QMCP-SB66 a_2-b_2'	Data Gap - Area G, proximal to historic oil company			X					X	X	X	X	X										N	Lawrence Julio	
QMCP-GW22	-88.5517112289	47.1255258983	QMCP-GW22 a_1-b_1"	Data Gap - Area G, within historic mining operation location	Peristalitic Pump			X				X	X	X	X											Y	State of Michigan	
QMCP-GW23	-88.5512533076	47.1254582341	QMCP-GW23 a_1-b_1"	Data Gap - Area G, within historic mining operation location	Peristalitic Pump			X				X	X	X	X											Y	State of Michigan	
QMCP-GW24	-88.5506484730	47.1253732513	QMCP-GW24 a_1-b_1"	Area G, proximal to SS-26 (6/5/2002)	Peristalitic Pump			X				X	X	X	X											Y	State of Michigan	
QMCP-GW25	-88.5499303901	47.1252829225	QMCP-GW25 a_1-b_1"	Area G, proximal to SS-27 (6/5/2002)	Peristalitic Pump			X				X	X	X	X											Y	State of Michigan	
QMCP-GW26	-88.5516002744	47.1250295258	QMCP-GW26 a_1-b_1"	Data Gap - Area G, within historic mining operation location	Peristalitic Pump			X				X	X	X	X											N	Lawrence Julio	
QMCP-GW27	-88.5510677639	47.1248495748	QMCP-GW27 a_1-b_1"	Data Gap - Area G, within historic mining operation location	Peristalitic Pump			X				X	X	X	X											N	Lawrence Julio	
QMCP-GW28	-88.5503835049	47.1249113883	QMCP-GW28 a_1-b_1"	Data Gap - Area G, within historic mining operation location	Peristalitic Pump			X				X	X	X	X											N	Lawrence Julio	
QMCP-GW29	-88.5498260528	47.1247656715	QMCP-GW29 a_1-b_1"	Data Gap - Area G, within historic mining operation location	Peristalitic Pump			X				X	X	X	X											N	Lawrence Julio	
QMCP-GW65	-88.5518559812	47.1260205380	QMCP-GW65 a_1-b_1"	Data Gap - Area G, proximal to historic oil company	Peristalitic Pump			X				X	X	X	X											N	Lawrence Julio	
QMCP-GW66	-88.5516199990	47.1258949548	QMCP-GW66 a_1-b_1"	Data Gap - Area G, proximal to historic oil company	Peristalitic Pump			X				X	X	X	X											N	Lawrence Julio	

Table 4-1
Sampling and Analysis Summary
Quincy Mining Company Portage Area
Houghton County, Michigan

Proposed Sampling Location	Longitude	Latitude	Proposed Sample ID	Sampling Rationale	Anticipated Sampling Method	Sample Type/Matrix						Sample Analyses							Duplicate Analyses							Trail ROW	Property Ownership	Sample Notes
						Surface Soil	Subsurface Soil	Groundwater	Surface Water	Sediment	Drums, Containers, and Building Materials/SACM	VOCs	SVOCs	PCBs	Metals	Cyanide	Asbestos	Waste Characterization	VOCs	SVOCs	PCBs	Metals	Cyanide	Asbestos	Waste Characterization			
Area H																												
QMCP-SS35	-88.5484120337	47.1239115525	QMCP-SS35 a_1-b_1"	Data Gap - Area H	Hand Tools	X									X											N	Wuebben Properties	
QMCP-SS36	-88.5479794613	47.1244432316	QMCP-SS36 a_1-b_1"	Data Gap - Area H	Hand Tools	X									X											N	Wuebben Properties	
QMCP-SB53	-88.5488115617	47.1252471724	QMCP-SB53 a_1-b_1"	Data Gap - Area H, proximal to GP-1 (6/13/2002)	Direct Push Boring		X					X	X	X	X	X										N	Wuebben Properties	
			QMCP-SB53 a_2-b_2"	Data Gap - Area H, proximal to GP-1 (6/13/2002)			X					X	X	X	X	X										N	Wuebben Properties	
QMCP-SB54	-88.5488835872	47.1244346390	QMCP-SB54 a_1-b_1"	Data Gap - Area H, proximal to GP-4, GP-5 (6/13/2002)	Direct Push Boring		X					X	X	X	X	X										N	Wuebben Properties	
			QMCP-SB54 a_2-b_2"	Data Gap - Area H, proximal to GP-4, GP-5 (6/13/2002)			X					X	X	X	X	X										N	Wuebben Properties	
QMCP-SB55	-88.5479865058	47.1238866782	QMCP-SB55 a_1-b_1"	Data Gap - Area H	Direct Push Boring		X					X	X	X	X	X										N	Wuebben Properties	
			QMCP-SB55 a_2-b_2"	Data Gap - Area H			X					X	X	X	X	X			X	X	X	X	X			N	Wuebben Properties	
QMCP-GW53	-88.5488115617	47.1252471724	QMCP-GW53 a_1-b_1"	Data Gap - Area H, proximal to GP-1 (6/13/2002)	Peristalitic Pump			X				X	X	X	X											N	Wuebben Properties	
QMCP-GW54	-88.5488835872	47.1244346390	QMCP-GW54 a_1-b_1"	Data Gap - Area H, proximal to GP-4, GP-5 (6/13/2002)	Peristalitic Pump			X				X	X	X	X											N	Wuebben Properties	
QMCP-GW55	-88.5479865058	47.1238866782	QMCP-GW55 a_1-b_1"	Data Gap - Area H	Peristalitic Pump			X				X	X	X	X											N	Wuebben Properties	
Area I																												
QMCP-SS16	-88.5472122687	47.1244527772	QMCP-SS16 a_1-b_1"	Data Gap - Area I	Hand Tools	X									X		X							X		N	Lawrence Julio	
QMCP-SS17	-88.5474455776	47.1238988350	QMCP-SS17 a_1-b_1"	Data Gap - Area I	Hand Tools	X									X											N	Lawrence Julio	
QMCP-SS18	-88.5473870553	47.1235485716	QMCP-SS18 a_1-b_1"	Data Gap - Area I	Hand Tools	X									X		X									N	Lawrence Julio	
QMCP-SS19	-88.5457997616	47.1239852811	QMCP-SS19 a_1-b_1"	Data Gap - Area I, near historic slag pile	Hand Tools	X									X											N	Lawrence Julio	
QMCP-SS20	-88.5451439632	47.1241084010	QMCP-SS20 a_1-b_1"	Data Gap - Area I, near historic slag pile	Hand Tools	X									X							X				N	Lawrence Julio	
QMCP-SS21	-88.5451813787	47.1236616929	QMCP-SS21 a_1-b_1"	Data Gap - Area I	Hand Tools	X									X		X									N	Lawrence Julio	
QMCP-SB30	-88.5465875622	47.1242608138	QMCP-SB30 a_1-b_1"	Data Gap - Area I, proximal to historic fuel building	Direct Push Boring		X					X	X	X	X	X										N	Lawrence Julio	
			QMCP-SB30 a_2-b_2"	Data Gap - Area I, proximal to historic fuel building			X					X	X	X	X	X			X	X	X	X	X			N	Lawrence Julio	
QMCP-SB31	-88.5467896264	47.1239305053	QMCP-SB31 a_1-b_1"	Data Gap - Area I, proximal to historic boiler house	Direct Push Boring		X					X	X	X	X	X										N	Lawrence Julio	
			QMCP-SB31 a_2-b_2"	Data Gap - Area I, proximal to historic boiler house			X					X	X	X	X	X										N	Lawrence Julio	
QMCP-SB32	-88.5469390693	47.1233741346	QMCP-SB32 a_1-b_1"	Data Gap - Area I, within historic mining operation location	Direct Push Boring		X					X	X	X	X	X										N	Lawrence Julio	
			QMCP-SB32 a_2-b_2"	Data Gap - Area I, within historic mining operation location			X					X	X	X	X	X										N	Lawrence Julio	
QMCP-SB33	-88.5462891135	47.1236200346	QMCP-SB33 a_1-b_1"	Data Gap - Area I, within historic mining operation location	Direct Push Boring		X					X	X	X	X	X										N	Lawrence Julio	
			QMCP-SB33 a_2-b_2"	Data Gap - Area I, within historic mining operation location			X					X	X	X	X	X										N	Lawrence Julio	
QMCP-SB34	-88.5459213878	47.1241655149	QMCP-SB34 a_1-b_1"	Data Gap - Area I, within historic mining operation location, slag pile	Direct Push Boring		X					X	X	X	X	X										N	Lawrence Julio	
			QMCP-SB34 a_2-b_2"	Data Gap - Area I, within historic mining operation location, slag pile			X					X	X	X	X	X										N	Lawrence Julio	
QMCP-SB35	-88.5451215168	47.1239002488	QMCP-SB35 a_1-b_1"	Data Gap - Area I, proximal to H&Ymarina-19 (9/12/2007)	Direct Push Boring		X					X	X	X	X	X										N	Lawrence Julio	
			QMCP-SB35 a_2-b_2"	Data Gap - Area I, proximal to H&Ymarina-19 (9/12/2007)			X					X	X	X	X	X			X	X	X	X	X			N	Lawrence Julio	
QMCP-SB36	-88.5454351590	47.1234502883	QMCP-SB36 a_1-b_1"	Data Gap - Area I, within historic mining operation location, slag pile	Direct Push Boring		X					X	X	X	X	X										N	Lawrence Julio	
			QMCP-SB36 a_2-b_2"	Data Gap - Area I, within historic mining operation location, slag pile			X					X	X	X	X	X										N	Lawrence Julio	
QMCP-GW30	-88.5465875622	47.1242608138	QMCP-GW30 a_1-b_1"	Data Gap - Area I, proximal to historic fuel building	Peristalitic Pump			X				X	X	X	X				X	X	X	X				N	Lawrence Julio	
QMCP-GW31	-88.5467896264	47.1239305053	QMCP-GW31 a_1-b_1"	Data Gap - Area I, proximal to historic boiler house	Peristalitic Pump			X				X	X	X	X											N	Lawrence Julio	
QMCP-GW32	-88.5469390693	47.1233741346	QMCP-GW32 a_1-b_1"	Data Gap - Area I, within historic mining operation location	Peristalitic Pump			X				X	X	X	X											N	Lawrence Julio	
QMCP-GW33	-88.5462891135	47.1236200346	QMCP-GW33 a_1-b_1"	Data Gap - Area I, within historic mining operation location	Peristalitic Pump			X				X	X	X	X											N	Lawrence Julio	
QMCP-GW34	-88.5459213878	47.1241655149	QMCP-GW34 a_1-b_1"	Data Gap - Area I, within historic mining operation location, slag pile	Peristalitic Pump			X				X	X	X	X											N	Lawrence Julio	
QMCP-GW35	-88.5451215168	47.1239002488	QMCP-GW35 a_1-b_1"	Data Gap - Area I, proximal to H&Ymarina-19 (9/12/2007)	Peristalitic Pump			X				X	X	X	X											N	Lawrence Julio	
QMCP-GW36	-88.5454351590	47.1234502883	QMCP-GW36 a_1-b_1"	Data Gap - Area I, within historic mining operation location, slag pile	Peristalitic Pump			X				X	X	X	X											N	Lawrence Julio	

Table 4-1
Sampling and Analysis Summary
Quincy Mining Company Portage Area
Houghton County, Michigan

Proposed Sampling Location	Longitude	Latitude	Proposed Sample ID	Sampling Rationale	Anticipated Sampling Method	Sample Type/Matrix: Surface Soil	Subsurface Soil	Groundwater	Surface Water	Sediment	Drums, Containers, and Building Materials/SACM	Sample Analyses: VOCs	SVOCs	PCBs	Metals	Cyanide	Asbestos	Waste Characterization	Duplicate Analyses: VOCs	SVOCs	PCBs	Metals	Cyanide	Asbestos	Waste Characterization	Trail ROW	Property Ownership	Sample Notes
Area L																												
QMCP-SB56	-88.5121188181	47.1183266513	QMCP-SB56 a_1-b_1"	Data Gap - Area L	Direct Push Boring		X					X	X	X	X	X										N	Lawrence Julio	
			QMCP-SB56 a_2-b_2"	Data Gap - Area L			X					X	X	X	X	X										N	Lawrence Julio	
QMCP-SB57	-88.5088152053	47.1190732559	QMCP-SB57 a_1-b_1"	Data Gap - Area L	Direct Push Boring		X					X	X	X	X	X										N	Lawrence Julio	
			QMCP-SB57 a_2-b_2"	Data Gap - Area L			X					X	X	X	X	X										N	Lawrence Julio	
QMCP-SB58	-88.5102435932	47.1184590360	QMCP-SB58 a_1-b_1"	Data Gap - Area L	Direct Push Boring		X					X	X	X	X	X										N	Lawrence Julio	
			QMCP-SB58 a_2-b_2"	Data Gap - Area L			X					X	X	X	X	X										N	Lawrence Julio	
QMCP-SB59	-88.5109629244	47.1191559824	QMCP-SB59 a_1-b_1"	Data Gap - Area L	Direct Push Boring		X					X	X	X	X	X										N	Lawrence Julio	
			QMCP-SB59 a_2-b_2"	Data Gap - Area L			X					X	X	X	X	X										N	Lawrence Julio	
QMCP-SB60	-88.5095513126	47.1196517076	QMCP-SB60 a_1-b_1"	Data Gap - Area L	Direct Push Boring		X					X	X	X	X	X										N	Lawrence Julio	
			QMCP-SB60 a_2-b_2'	Data Gap - Area L			X					X	X	X	X	X			X	X	X	X	X			N	Lawrence Julio	
QMCP-SB70	-88.5108065425	47.1173148135	QMCP-SB70 a_1-b_1"	Data Gap - Downgradient from Area L	Direct Push Boring		X					X	X	X	X	X										N	Houghton County ROW	
			QMCP-SB70 a_2-b_2"	Data Gap - Downgradient from Area L			X					X	X	X	X	X			X	X	X	X	X			N	Houghton County ROW	
QMCP-SB71	-88.5100712834	47.1172716330	QMCP-SB71 a_1-b_1"	Data Gap - Downgradient from Area L	Direct Push Boring		X					X	X	X	X	X										N	Houghton County ROW	
			QMCP-SB71 a_2-b_2"	Data Gap - Downgradient from Area L			X					X	X	X	X	X										N	Houghton County ROW	
QMCP-SB72	-88.5095795939	47.1176712415	QMCP-SB72 a_1-b_1"	Data Gap - Downgradient from Area L	Direct Push Boring		X					X	X	X	X	X										N	Houghton County ROW	
			QMCP-SB72 a_2-b_2"	Data Gap - Downgradient from Area L			X					X	X	X	X	X										N	Houghton County ROW	
QMCP-SB73	-88.5086970915	47.1180534867	QMCP-SB73 a_1-b_1"	Data Gap - Downgradient from Area L	Direct Push Boring		X					X	X	X	X	X										N	Houghton County ROW	
			QMCP-SB73 a_2-b_2'	Data Gap - Downgradient from Area L			X					X	X	X	X	X										N	Houghton County ROW	
QMCP-GW56	-88.5121188181	47.1183266513	QMCP-GW56 a_1-b_1"	Data Gap - Area L	Peristalitic Pump			X				X	X	X	X											N	Lawrence Julio	
QMCP-GW57	-88.5088152053	47.1190732559	QMCP-GW57 a_1-b_1"	Data Gap - Area L	Peristalitic Pump			X				X	X	X	X											N	Lawrence Julio	
QMCP-GW58	-88.5102435932	47.1184590360	QMCP-GW58 a_1-b_1"	Data Gap - Area L	Peristalitic Pump			X				X	X	X	X											N	Lawrence Julio	
QMCP-GW59	-88.5109629244	47.1191559824	QMCP-GW59 a_1-b_1"	Data Gap - Area L	Peristalitic Pump			X				X	X	X	X											N	Lawrence Julio	
QMCP-GW60	-88.5095513126	47.1196517076	QMCP-GW60 a_1-b_1"	Data Gap - Area L	Peristalitic Pump			X				X	X	X	X				X	X	X	X				N	Lawrence Julio	
QMCP-GW70	-88.5108065425	47.1173148135	QMCP-GW70 a_1-b_1"	Data Gap - Downgradient from Area L	Peristalitic Pump			X				X	X	X	X				X	X	X	X				N	Houghton County ROW	
QMCP-GW71	-88.5100712834	47.1172716330	QMCP-GW71 a_1-b_1"	Data Gap - Downgradient from Area L	Peristalitic Pump			X				X	X	X	X											N	Houghton County ROW	
QMCP-GW72	-88.5095795939	47.1176712415	QMCP-GW72 a_1-b_1"	Data Gap - Downgradient from Area L	Peristalitic Pump			X				X	X	X	X											N	Houghton County ROW	
QMCP-GW73	-88.5086970915	47.1180534867	QMCP-GW73 a_1-b_1"	Data Gap - Downgradient from Area L	Peristalitic Pump			X				X	X	X	X											N	Houghton County ROW	
Area M																												
QMCP-SS22	-88.5030824990	47.1173416029	QMCP-SS22 a_1-b_1"	Data Gap - Area M	Hand Tools	X									X											N	Lois Stout	
QMCP-SS23	-88.5033041426	47.1167079816	QMCP-SS23 a_1-b_1"	Data Gap - Area M	Hand Tools	X									X											N	Lois Stout	
QMCP-SS24	-88.5027590330	47.1157937887	QMCP-SS24 a_1-b_1"	Data Gap - Area M	Hand Tools	X									X											N	Osceola Twp.	
QMCP-SS25	-88.5020079592	47.1154900064	QMCP-SS25 a_1-b_1"	Data Gap - Area M	Hand Tools	X									X		X									N	Lois Stout	
QMCP-SS26	-88.5013573329	47.1162314106	QMCP-SS26 a_1-b_1"	Data Gap - Area M, near historic smelter building	Hand Tools	X									X		X									N	Lois Stout	
QMCP-SB37	-88.5034322393	47.1157448467	QMCP-SB37 a_1-b_1"	Data Gap - Area M, within historic mining operation location	Direct Push Boring		X					X	X	X	X	X										N	Lois Stout	
			QMCP-SB37 a_2-b_2"	Data Gap - Area M, within historic mining operation location			X					X	X	X	X	X										N	Lois Stout	
QMCP-SB38	-88.5022595914	47.1152596907	QMCP-SB38 a_1-b_1"	Data Gap - Area M, within historic mining operation location	Direct Push Boring		X					X	X	X	X	X										N	Lois Stout	
			QMCP-SB38 a_2-b_2"	Data Gap - Area M, within historic mining operation location			X					X	X	X	X	X										N	Lois Stout	
QMCP-SB39	-88.5020364405	47.1159543043	QMCP-SB39 a_1-b_1"	Data Gap - Area M, proximal to underground oil house	Direct Push Boring		X					X	X	X	X	X										N	Osceola Twp.	
			QMCP-SB39 a_2-b_2"	Data Gap - Area M, proximal to underground oil house			X					X	X	X	X	X										N	Osceola Twp.	
QMCP-SB40	-88.5012057355	47.1158847251	QMCP-SB40 a_1-b_1"	Data Gap - Area M, within historic footprint of smelter building	Direct Push Boring		X					X	X	X	X	X										N	Lois Stout	
			QMCP-SB40 a_2-b_2"	Data Gap - Area M, within historic footprint of smelter building			X					X	X	X	X	X			X	X	X	X	X			N	Lois Stout	
QMCP-SB41	-88.5010087926	47.1166892956	QMCP-SB41 a_1-b_1"	Data Gap - Area M, within historic mining operation location	Direct Push Boring		X					X	X	X	X	X										N	Lois Stout	
			QMCP-SB41 a_2-b_2"	Data Gap - Area M, within historic mining operation location			X					X	X	X	X	X										N	Lois Stout	
QMCP-SB42	-88.5014653235	47.1173805789	QMCP-SB42 a_1-b_1"	Data Gap - Area M, within historic mining operation location	Direct Push Boring		X					X	X	X	X	X										N	Lois Stout	
			QMCP-SB42 a_2-b_2"	Data Gap - Area M, within historic mining operation location			X					X	X	X	X	X										N	Lois Stout	
QMCP-GW37	-88.5034322393	47.1157448467	QMCP-GW37 a_1-b_1"	Data Gap - Area M, within historic mining operation location	Peristalitic Pump			X				X	X	X	X											N	Lois Stout	
QMCP-GW38	-88.5022595914	47.1152596907	QMCP-GW38 a_1-b_1"	Data Gap - Area M, within historic mining operation location	Peristalitic Pump			X				X	X	X	X											N	Lois Stout	
QMCP-GW39	-88.5020364405	47.1159543043	QMCP-GW39 a_1-b_1"	Data Gap - Area M, proximal to underground oil house	Peristalitic Pump			X				X	X	X	X											N	Osceola Twp.	
QMCP-GW40	-88.5012057355	47.1158847251	QMCP-GW40 a_1-b_1"	Data Gap - Area M, within historic footprint of smelter building	Peristalitic Pump			X				X	X	X	X				X	X	X	X				N	Lois Stout	
QMCP-GW41	-88.5010087926	47.1166892956	QMCP-GW41 a_1-b_1"	Data Gap - Area M, within historic mining operation location	Peristalitic Pump			X				X	X	X	X											N	Lois Stout	
QMCP-GW42	-88.5014653235	47.1173805789	QMCP-GW42 a_1-b_1"	Data Gap - Area M, within historic mining operation location	Peristalitic Pump			X				X	X	X	X											N	Lois Stout	

Table 4-1
Sampling and Analysis Summary
Quincy Mining Company Portage Area
Houghton County, Michigan

Proposed Sampling Location	Longitude	Latitude	Proposed Sample ID	Sampling Rationale	Anticipated Sampling Method	Sample Type/Matrix						Sample Analyses							Duplicate Analyses							Trail ROW	Property Ownership	Sample Notes
						Surface Soil	Subsurface Soil	Groundwater	Surface Water	Sediment	Drums, Containers, and Building Materials/SACM	VOCs	SVOCs	PCBs	Metals	Cyanide	Asbestos	Waste Characterization	VOCs	SVOCs	PCBs	Metals	Cyanide	Asbestos	Waste Characterization			
Area N																												
QMCP-SS27	-88.5005659087	47.1146143562	QMCP-SS27 a_1-b_1"	Data Gap - Area N	Hand Tools	X									X											N	Lawrence Julio	
QMCP-SS28	-88.5007497764	47.1140082377	QMCP-SS28 a_1-b_1"	Data Gap - Area N	Hand Tools	X									X											N	Lawrence Julio	
QMCP-SS29	-88.4994807646	47.1140891621	QMCP-SS29 a_1-b_1"	Data Gap - Area N	Hand Tools	X									X		X									N	Lawrence Julio	
QMCP-SS30	-88.4984132625	47.1146611141	QMCP-SS30 a_1-b_1"	Data Gap - Area N	Hand Tools	X									X		X					X				N	Lawrence Julio	
QMCP-SS31	-88.4984945720	47.1152081183	QMCP-SS31 a_1-b_1"	Data Gap - Area N	Hand Tools	X									X											N	Lawrence Julio	
QMCP-SB43	-88.4989900186	47.1160167044	QMCP-SB43 a_1-b_1"	Data Gap - Area N, within historic mining operation location	Direct Push Boring		X					X	X	X	X	X										N	Lawrence Julio	
			QMCP-SB43 a_2-b_2"	Data Gap - Area N, within historic mining operation location			X					X	X	X	X	X										N	Lawrence Julio	
QMCP-SB44	-88.5012170121	47.1142114931	QMCP-SB44 a_1-b_1"	Data Gap - Area N, within historic mining operation location	Direct Push Boring		X					X	X	X	X	X										N	Lawrence Julio	
			QMCP-SB44 a_2-b_2"	Data Gap - Area N, within historic mining operation location			X					X	X	X	X	X										N	Lawrence Julio	
QMCP-SB45	-88.5007035340	47.1137348581	QMCP-SB45 a_1-b_1"	Data Gap - Area N, within historic mining operation location	Direct Push Boring		X					X	X	X	X	X										N	Lawrence Julio	
			QMCP-SB45 a_2-b_2"	Data Gap - Area N, within historic mining operation location			X					X	X	X	X	X			X	X	X	X	X			N	Lawrence Julio	
QMCP-SB46	-88.5003186957	47.1141014456	QMCP-SB46 a_1-b_1"	Data Gap - Area N, within historic mining operation location	Direct Push Boring		X					X	X	X	X	X										N	Lawrence Julio	
			QMCP-SB46 a_2-b_2"	Data Gap - Area N, within historic mining operation location			X					X	X	X	X	X										N	Lawrence Julio	
QMCP-SB47	-88.4997684210	47.1137932848	QMCP-SB47 a_1-b_1"	Data Gap - Area N, within historic mining operation location	Direct Push Boring		X					X	X	X	X	X										N	Lawrence Julio	
			QMCP-SB47 a_2-b_2"	Data Gap - Area N, within historic mining operation location			X					X	X	X	X	X										N	Lawrence Julio	
QMCP-SB48	-88.4998729663	47.1145989247	QMCP-SB48 a_1-b_1"	Data Gap - Area N, within historic mining operation location	Direct Push Boring		X					X	X	X	X	X										N	Lawrence Julio	
			QMCP-SB48 a_2-b_2"	Data Gap - Area N, within historic mining operation location			X					X	X	X	X	X										N	Lawrence Julio	
QMCP-SB49	-88.4986757832	47.1143048115	QMCP-SB49 a_1-b_1"	Data Gap - Area N, proximal to historic oil house	Direct Push Boring		X					X	X	X	X	X										N	Lawrence Julio	
			QMCP-SB49 a_2-b_2"	Data Gap - Area N, proximal to historic oil house			X					X	X	X	X	X										N	Lawrence Julio	
QMCP-SB50	-88.4981734807	47.1138279218	QMCP-SB50 a_1-b_1"	Data Gap - Area N, within historic mining operation location	Direct Push Boring		X					X	X	X	X	X										N	Lawrence Julio	
			QMCP-SB50 a_2-b_2"	Data Gap - Area N, within historic mining operation location			X					X	X	X	X	X			X	X	X	X	X			N	Lawrence Julio	
QMCP-GW43	-88.4989900186	47.1160167044	QMCP-GW43 a_1-b_1"	Data Gap - Area N, within historic mining operation location	Peristalitic Pump			X				X	X	X	X											N	Lawrence Julio	
QMCP-GW44	-88.5012170121	47.1142114931	QMCP-GW44 a_1-b_1"	Data Gap - Area N, within historic mining operation location	Peristalitic Pump			X				X	X	X	X											N	Lawrence Julio	
QMCP-GW45	-88.5007035340	47.1137348581	QMCP-GW45 a_1-b_1"	Data Gap - Area N, within historic mining operation location	Peristalitic Pump			X				X	X	X	X											N	Lawrence Julio	
QMCP-GW46	-88.5003186957	47.1141014456	QMCP-GW46 a_1-b_1"	Data Gap - Area N, within historic mining operation location	Peristalitic Pump			X				X	X	X	X											N	Lawrence Julio	
QMCP-GW47	-88.4997684210	47.1137932848	QMCP-GW47 a_1-b_1"	Data Gap - Area N, within historic mining operation location	Peristalitic Pump			X				X	X	X	X											N	Lawrence Julio	
QMCP-GW48	-88.4998729663	47.1145989247	QMCP-GW48 a_1-b_1"	Data Gap - Area N, within historic mining operation location	Peristalitic Pump			X				X	X	X	X											N	Lawrence Julio	
QMCP-GW49	-88.4986757832	47.1143048115	QMCP-GW49 a_1-b_1"	Data Gap - Area N, proximal to historic oil house	Peristalitic Pump			X				X	X	X	X											N	Lawrence Julio	
QMCP-GW50	-88.4981734807	47.1138279218	QMCP-GW50 a_1-b_1"	Data Gap - Area N, within historic mining operation location	Peristalitic Pump			X				X	X	X	X				X	X	X	X				N	Lawrence Julio	

Table 4-1
Sampling and Analysis Summary
Quincy Mining Company Portage Area
Houghton County, Michigan

						Sample Type/Matrix						Sample Analyses							Duplicate Analyses									
Proposed Sampling Location	Longitude	Latitude	Proposed Sample ID	Sampling Rationale	Anticipated Sampling Method	Surface Soil	Subsurface Soil	Groundwater	Surface Water	Sediment	Drums, Containers, and Building Materials/SACM	VOCs	SVOCs	PCBs	Metals	Cyanide	Asbestos	Waste Characterization	VOCs	SVOCs	PCBs	Metals	Cyanide	Asbestos	Waste Characterization	Trail ROW	Property Ownership	Sample Notes
In Lake - Surface Water																												
QMCP-SW01	-88.5693512461	47.1256429375	QMCP-SW01 a-b'	Offfshore from Area B (South)	Peristalitic Pump				X				X	X	X											N/A		
QMCP-SW02	-88.5667597784	47.1254447335	QMCP-SW02 a-b'	Offfshore from Area B (South)	Peristalitic Pump				X				X	X	X											N/A		
QMCP-SW03	-88.5590899149	47.1244246633	QMCP-SW03 a-b'	Offshore from Area D	Peristalitic Pump				X				X	X	X											N/A		
QMCP-SW04	-88.5582962942	47.1248767618	QMCP-SW04 a-b'	Offshore from Area D	Peristalitic Pump				X				X	X	X											N/A		
QMCP-SW05	-88.5580047670	47.1255539726	QMCP-SW05 a-b'	Offshore from Area D	Peristalitic Pump				X				X	X	X											N/A		
QMCP-SW06	-88.5560178921	47.1253389835	QMCP-SW06 a-b'	Offshore from Area E	Peristalitic Pump				X				X	X	X											N/A		
QMCP-SW07	-88.5521525674	47.1250306664	QMCP-SW07 a-b'	Outlet of Ripley Creek, offshore from Area G	Peristalitic Pump				X				X	X	X											N/A		
QMCP-SW08	-88.5462552240	47.1233847591	QMCP-SW08 a-b'	Offshore from Area I	Peristalitic Pump				X				X	X	X											N/A		
QMCP-SW09	-88.5029253119	47.1152425956	QMCP-SW09 a-b'	Offshore from Area M	Peristalitic Pump				X				X	X	X											N/A		
QMCP-SW10	-88.4998631739	47.1135536885	QMCP-SW10 a-b'	Offshore from Area N	Peristalitic Pump				X				X	X	X					X	X	X				N/A		
QMCP-SW11	-88.4965812424	47.1144752458	QMCP-SW11 a-b'	Offshore from Area N	Peristalitic Pump				X				X	X	X											N/A		
QMCP-SW12	-88.4959900924	47.1179606084	QMCP-SW12 a-b'	Offshore from Area O	Peristalitic Pump				X				X	X	X											N/A		
QMCP-SW13	-88.4925184282	47.1184815786	QMCP-SW13 a-b'	Outlet of creek, offshrore from Area P	Peristalitic Pump				X				X	X	X											N/A		
QMCP-SW14	-88.4963341202	47.1136150832	QMCP-SW14 a-b'	Offshore of beach area	Peristalitic Pump				X				X	X	X											N/A		
In Lake - Sediment																												
QMCP-SD01	-88.5693512461	47.1256429375	QMCP-SD01 a_1-b_1''	Offfshore from Area B (South)	Vibracore Sampler					X			X	X	X											N/A		
			QMCP-SD01 a_2-b_2'	Offfshore from Area B (South)	Vibracore Sampler					X			X	X												N/A		
QMCP-SD02	-88.5667597784	47.1254447335	QMCP-SD02 a_1-b_1''	Offfshore from Area B (South)	Vibracore Sampler					X			X	X	X											N/A		
			QMCP-SD02 a_2-b_2'	Offfshore from Area B (South)	Vibracore Sampler					X			X	X												N/A		
QMCP-SD03	-88.5590899149	47.1244246633	QMCP-SD03 a_1-b_1''	Offshore from Area D	Vibracore Sampler					X			X	X	X											N/A		
			QMCP-SD03 a_2-b_2'	Offshore from Area D	Vibracore Sampler					X			X	X												N/A		
QMCP-SD04	-88.5582962942	47.1248767618	QMCP-SD04 a_1-b_1''	Offshore from Area D	Vibracore Sampler					X			X	X	X											N/A		
			QMCP-SD04 a_2-b_2'	Offshore from Area D	Vibracore Sampler					X			X	X												N/A		
QMCP-SD05	-88.5580047670	47.1255539726	QMCP-SD05 a_1-b_1''	Offshore from Area D	Vibracore Sampler					X			X	X	X											N/A		
			QMCP-SD05 a_2-b_2'	Offshore from Area D	Vibracore Sampler					X			X	X						X	X					N/A		
QMCP-SD06	-88.5560178921	47.1253389835	QMCP-SD06 a_1-b_1''	Offshore from Area E	Vibracore Sampler					X			X	X	X											N/A		
			QMCP-SD06 a_2-b_2'	Offshore from Area E	Vibracore Sampler					X			X	X												N/A		
QMCP-SD07	-88.5521525674	47.1250306664	QMCP-SD07 a_1-b_1''	Outlet of Ripley Creek, offshore from Area G	Vibracore Sampler					X			X	X	X											N/A		
			QMCP-SD07 a_2-b_2'	Outlet of Ripley Creek, offshore from Area G	Vibracore Sampler					X			X	X												N/A		
QMCP-SD08	-88.5462552240	47.1233847591	QMCP-SD08 a_1-b_1''	Offshore from Area I	Vibracore Sampler					X			X	X	X											N/A		
			QMCP-SD08 a_2-b_2'	Offshore from Area I	Vibracore Sampler					X			X	X												N/A		
QMCP-SD09	-88.5029253119	47.1152425956	QMCP-SD09 a_1-b_1''	Offshore from Area M	Vibracore Sampler					X			X	X	X											N/A		
			QMCP-SD09 a_2-b_2'	Offshore from Area M	Vibracore Sampler					X			X	X												N/A		
QMCP-SD10	-88.4998631739	47.1135536885	QMCP-SD10 a_1-b_1''	Offshore from Area N	Vibracore Sampler					X			X	X	X											N/A		
			QMCP-SD10 a_2-b_2'	Offshore from Area N	Vibracore Sampler					X			X	X						X	X					N/A		
QMCP-SD11	-88.4965812424	47.1144752458	QMCP-SD11 a_1-b_1''	Offshore from Area N	Vibracore Sampler					X			X	X	X											N/A		
			QMCP-SD11 a_2-b_2'	Offshore from Area N	Vibracore Sampler					X			X	X												N/A		
QMCP-SD12	-88.4959900924	47.1179606084	QMCP-SD12 a_1-b_1''	Offshore from Area O	Vibracore Sampler					X			X	X	X											N/A		
			QMCP-SD12 a_2-b_2'	Offshore from Area O	Vibracore Sampler					X			X	X												N/A		
QMCP-SD13	-88.4925184282	47.1184815786	QMCP-SD13 a_1-b_1''	Outlet of creek, offshrore from Area P	Vibracore Sampler					X			X	X	X											N/A		
			QMCP-SD13 a_2-b_2'	Outlet of creek, offshrore from Area P	Vibracore Sampler					X			X	X												N/A		
QMCP-SD14	-88.4963341202	47.1136150832	QMCP-SD14 a_1-b_1''	Offshore of beach area	Vibracore Sampler					X			X	X	X											N/A		
			QMCP-SD14 a_2-b_2'	Offshore of beach area	Vibracore Sampler					X			X	X												N/A		

Table 4-1
Sampling and Analysis Summary
Quincy Mining Company Portage Area
Houghton County, Michigan

Proposed Sampling Location	Longitude	Latitude	Proposed Sample ID	Sampling Rationale	Anticipated Sampling Method	Sample Type/Matrix						Sample Analyses							Duplicate Analyses							Trail ROW	Property Ownership	Sample Notes
						Surface Soil	Subsurface Soil	Groundwater	Surface Water	Sediment	Drums, Containers, and Building Materials/SACM	VOCs	SVOCs	PCBs	Metals	Cyanide	Asbestos	Waste Characterization	VOCs	SVOCs	PCBs	Metals	Cyanide	Asbestos	Waste Characterization			
Additional Sampling Nomenclature																												
QMCP-RPM01	--	--	QMCP-RPM01 a_1-b_1"	Field location to be determined following physical hazard reconnaissance	Hand Tools						X	X	X	X	X	X		X										
QMCP-ASBBLK01	--	--	QMCP-ASBBLK01 a_1-b_1"	Field location to be determined following physical hazard reconnaissance	Hand Tools						X						X											
QMCP-DM01	--	--	QMCP-DM01 a_2-b_2'	Field location to be determined following physical hazard reconnaissance	Hand Tools						X	X	X	X	X	X		X										
QMCP-SDM01	--	--	QMCP-SDM01 a_1-b_1"	Field location to be determined following physical hazard reconnaissance	AUV Arm						X	X	X	X	X	X		X										
					Total Sample Count	36	146	73	14	28	4	222	264	264	286	149	19	4	21	24	24	25	14	1	0			

Notes:
QMCP = Quincy Mining Company Mason Operations Area
PCBs = Polychlorinated Biphenyls
SACM = Suspect Asbestos Containing Material
SVOCs = Semi-Volatile Organic Compounds
VOCs = Volatile Organic Compounds
AUV = Automonous Underwater Vehicle
ROW = Right of Way
X = Planned analyte based on the sampling rationale and the horizontal and vertical location of the sample

Laboratory Quality Assurance/Quality Control Matrix Spike and Matrix Spike Duplicate samples will be a batch quality control sample prepared by the laboratory.
All sampling locations are subject to change based on visual observations or actual field conditions.
Additional analytes may be selected at the descretion of the field sampling team based on visual observations or field conditions.
Surface water and sediment sampling locations area subject to change based on underwater assessment activities.
For the purposes of this investigation, sediments include residues and waste material associated with chemical containers and deposits on the lake bottom historically discarded in Torch Lake and the Canal.
In areas that have been resurfaced or capped, analytical samples will be collected from directly beneath the cap/resurfacing medium (i.e. soil cap, beach sand, gravel, etc...) so that samples are representative of historical waste deposits.