

**SITE INVESTIGATION REPORT
FOR
ABANDONED MINING WASTES TORCH LAKE
NON-SUPERFUND SITE
CALUMET AND HECLA – LAKE LINDEN OPERATIONS
HOUGHTON COUNTY, MICHIGAN
SITE IDENTIFICATION NO. 31000098**

Prepared for:

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

Remediation and Redevelopment Division

55195 US Highway 41

Calumet, Michigan 49913



Prepared by:

WESTON SOLUTIONS OF MICHIGAN, INC.

P.O. Box 577

Houghton, MI 49931



March 2016

Work Order No. 20177.001.001.0010

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EXECUTIVE SUMMARY

Weston Solutions of Michigan, Inc. (WESTON®) has prepared this Site Investigation (SI) Report to provide a comprehensive summary of investigative activities completed at the Abandoned Mining Wastes – Torch Lake non-Superfund Site (Project) in Houghton County, Michigan. The SI Report has been prepared in accordance with the *Scope of Work, Schedule, and Budget Estimate - Abandoned Mining Wastes – Torch Lake non-Superfund Site, Calumet and Hecla (C&H) Lake Linden Operations Geographic Area, Houghton County Michigan, December 16, 2013* and the subsequent *Scope of Work, Schedule, and Budget Estimate for Modification 1 and 4 (August 2014 and February 2015)* prepared by WESTON in response to a request from the Michigan Department of Environmental Quality (MDEQ), Remediation and Redevelopment Division (RRD), under the Indefinite Scope, Indefinite Delivery (ISID) Professional Services contract between WESTON and the MDEQ (Contract No. 00477).

The Project is characterized by the risks posed by chemical containers and residues historically discarded in or near Torch Lake. These concerns are distinct and separate from the risks historically addressed under the U.S. Environmental Protection Agency's (EPA's) Superfund program. According to the RRD Superfund Section (RRD SFS), 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 at Torch Lake and the surrounding areas identified by the MDEQ include known or suspected impacts to groundwater, surface water, sediments, and upland media that were not addressed under the Superfund program. Environmental impacts that were evaluated as part of the SI were assessed under the guidance of the following objectives:

- Investigate and document unidentified, significant in-lake and/or terrestrial sources of contamination including polychlorinated biphenyls (PCBs);
- Investigate and document uncharacterized waste deposits, including more than 750 uncharacterized drums, reportedly, on the lake bottom;
- Investigate and document bulk disposal areas, including stamp sand deposits, slag dumps, and landfills; and,

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- Investigate and document industrial ruins including coal storage areas, underground storage tanks (USTs), asbestos containing materials (ACM), and any other waste materials identified in future investigations.

Taking into account the specific objectives outlined above, the principal goal of the Project was to support a comprehensive management approach that will guide MDEQ's decision making process in addressing potential human health and environmental risks present in the C&H Lake Linden Operations Area (CHLL). 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, and sediments), residual process materials, and waste materials.

The CHLL consists of approximately 155 acres of land extending approximately two miles along the shoreline of Torch Lake. The CHLL also incorporates over 40 different parcels with multiple property owners. The CHLL was divided into six smaller study areas based on the historical industrial operations in each area. The investigative areas and their respective former industrial sites are summarized as follows:

- Torch Lake Backwater Area
 - Traprock Dump; and,
 - Torch Lake Backwater.
- Lake Linden Sands Area
 - No Industrial Sites identified;
 - Stamp Sands; and,
 - Reported disposal areas.
- Lake Linden Recreation Area
 - Campground;
 - Lake Linden Beach;
 - Village Park; and,
 - Marina.
- Lake Linden Processing Area
 - Calumet Stamp Mill; and,
 - C&H Power Plant (exclusive of EPA efforts).
- Hubbell Processing Area
 - Hubbell Coal Dock;
 - Mineral Building; and,
 - Hubbell Smelter.

- Hubbell Slag Dump and Beach Area
 - Hubbell Red Slags; and,
 - Hubbell Slag Dump (including the public beach, the boat launch, and the bay).

This SI Report has been developed to assimilate information from multiple data sources into a logical and thorough narrative focused on the northern most portion of Torch Lake, defined in the document as CHLL. The findings presented herein were developed using the conclusions derived from archival research, historical investigation and response activities, and the investigation of data gaps or known or suspected impacts to groundwater, surface water, sediments, and upland media in and around Torch Lake.

Due to the sizeable nature of the CHLL, this SI Report has been organized to present organizational and procedural steps that were common to multiple areas of investigation in the first four sections of the document. Following these discussions that are broadly applicable to the Project as a whole, this SI Report transitions to a presentation of detailed findings specific to individual study areas within the CHLL. The “Detailed Findings Reports” are presented as stand-alone sections, complete with summary tables and figures and conclusions and recommendations that can be detached from the main document. The SI Report then closes with a comprehensive summary of conclusions and recommendations for the CHLL as a whole, compiling the information presented in the individual reports. The following provides a brief overview of the SI Report’s organization.

Section 1 of this SI Report defines the overall objectives and the organizational structure of the Project. **Section 2** provides Project background information and its significance as it relates to each of the study areas included in the CHLL. **Section 3** provides a summary of the stepwise approach used to evaluate historical operational and analytical data, and its incorporation into the field procedures and sample collection activities prescribed in the Sampling and Analysis Plan for the Project. **Section 4** includes a summary of the relevant exposure criteria and pathways used to evaluate the analytical findings from the investigation of each study area. A detailed findings report, including figures and tables for the individual study areas as follows:

- **Section 5** Torch Lake Backwater Area
- **Section 6** Lake Linden Recreation Area
- **Section 7** Lake Linden Sands Area
- **Section 8** Lake Linden Processing Area
- **Section 9** Hubbell Processing Area

- **Section 10** Hubbell Slag Dump and Beach Area
- **Section 11** Torch Lake

Section 12 includes a summary of conclusions and recommendations that are gleaned from the individual detailed findings reports with an emphasis on impacts to the CHLL as a whole.

Section 13 includes references utilized in the development of this SI Report.

The submittal of the CHLL SI Report marks a significant milestone in the assessment of environmental impairments within Torch Lake and industrial areas along the shoreline caused by historical mining and industrial operations not addressed under the EPA Superfund Program that are limiting the recovery of the Torch Lake ecosystem and reuse of former industrial areas.

The Project provided a comprehensive evaluation of the terrestrial and Torch Lake portions of the study area. By copy of this SI report, the Project findings have been provided to the other governmental stakeholders responsible for implementation and monitoring EPA's remedy for the Torch Lake Superfund Site so they can determine if any remedy modifications are necessary in Torch Lake or terrestrial areas previously addressed by EPA in light of the additional information provided by the Project. The stakeholders include various EPA programs, health agencies, other MDEQ divisions, and the Torch Lake Public Advisory Council.

Specific next Project steps include:

- Identify remedial alternatives and mitigate concerns related to human health and/or the environment in areas not previously addressed by EPA including, but not limited to:
 - Coal Dock and Mineral Building properties in the Hubbell Processing Area - Terrestrial PCBs (potentially migrating to Torch Lake), asbestos, direct contact to soil contaminants, and abandoned containers.
 - Throughout the study area – miscellaneous abandoned containers.
- Continue assessment of areas not previously addressed by the EPA in the Quincy Mining Company Mason Operations Area.
- Request that responsible stakeholders confirm that administrative controls for areas that have been previously remediated by the EPA have been employed to ensure that the selected remedy is performing as designed and those institutional controls, where required, have been recorded and are being enforced.

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- Continue to provide new study data to governmental stakeholders responsible for implementation and monitoring EPA's remedy for the terrestrial and lake portion of the Torch Lake Superfund Site.
- Continue to provide new study data to governmental stakeholders responsible for assessing potential public health impacts and making recommendations to the public, property owners and other state agencies.

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LIST OF ABBREVIATIONS AND ACRONYMS

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µg/L	Microgram per Liter
ACM	Asbestos Containing Materials
AMSL	Above Mean Sea Level
ASTM	ASTM International
AUV	Autonomous Underwater Vehicle
bgs	Below Ground Surface
BUI	Beneficial Use Impairments
C&H	Calumet and Hecla
CARB	California Air Resource Board
CFR	Code of Federal Regulation
CHLL	Calumet and Hecla Lake Linden Operations Area
COC	Contaminant of Concern
DCC	Direct Contact Criteria
DO	Dissolved Oxygen
DRO	Diesel Range Organics
DWC	Drinking Water Criteria
DWPC	Drinking Water Protection Criteria
EDD	Electronic Data Deliverable
EPA	U.S. Environmental Protection Agency
ESL	Ecological Screening Levels
Ft	Feet
GIS	Geographic Information System
GLNPO	Great Lakes National Program Office
GPS	Global Positioning System
GSIC	Groundwater/Surface Water Interface Criteria
GSIPC	Groundwater/Surface Water Interface Protection Criteria
GSU	Geological Services Unit
ID	Identification
IDW	Investigative Derived Waste
In	Inches
ISID	Indefinite Scope Indefinite Delivery
KNHP	Keweenaw National Historical Park
MDCH	Michigan Department of Community Health
MDEQ	Michigan Department of Environmental Quality
MDHHS	Michigan Department of Health and Human Services
Mg/kg	Microgram per Kilogram

LIST OF ABBREVIATIONS AND ACRONYMS

Michigan Tech	Michigan Technological University
MS	Matrix Spike
MSD	Matrix Spike Duplicate
MTRI	Michigan Tech Research Institute
MWRC	Michigan Water Resources Commission
NESHAP	National Emission Standards for Hazardous Air Pollutants
NREPA	Natural Resources and Environmental Protection Act
ORP	Oxidation-Reduction Potential
OU	Operable Unit
PA	Public Act
PCB	Polychlorinated Biphenyls
PEC	Probable Effect Concentration
PID	Photoionization Detector
PLM	Polarized Light Microscopy
PPE	Personal Protective Equipment
ppm	Parts Per Million
PSIC	Particulate Soil Inhalation Criteria
QA	Quality Assurance
QC	Quality Control
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
ROV	Remotely Operated Vehicle
RP	Responsible Party
RPM	Residual Process Materials
RRD	Remediation and Redevelopment Division
RRD SFS	RRD Superfund Section
SACM	Suspect Asbestos Containing Material
SAP	Sampling and Analysis Plan
SCS	Soil Conservation Service
SFS	Superfund Section
SI	Site Investigation
SOO	Statement of Objectives
SOP	Standard Operating Procedure
SPMD	Semi-permeable Membrane Device
SVOC	Semi-volatile Organic Compound
TCLP	Toxicity Characteristic Leaching Procedure
TEC	Threshold Effect Concentration
TSI	Thermal System Insulating
USC	United States Code

LIST OF ABBREVIATIONS AND ACRONYMS

USCS	Unified Soil Classification System
USDA	United States Department of Agriculture
UST	Underground Storage Tank
VOC	Volatile Organic Compound
VSIC	Volatile Soil Inhalation Criteria
WESTON	Weston Solutions of Michigan, Inc.
WRD	Water Resources Division
XRF	X-ray Fluorescence

1. INTRODUCTION

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INTRODUCTION

Section 1 of the SI Report defines the overall objectives and the organizational structure of the project. **Section 2** provides Project background information and its significance as it relates to each of the study areas included in the CHLL. **Section 3** provides a summary of the stepwise approach used to evaluate historical operational and analytical data, and its incorporation into the field procedures and sample collection activities prescribed in the Sampling and Analysis Plan for the project. **Section 4** includes a summary of the relevant exposure criteria and pathways used to evaluate the analytical findings from the investigation of each study area. **Section 5** through **Section 11** include detailed finding reports for each of the study areas included in the CHLL. The detailed finding reports, including figures and tables summarizing analytical results and are summarized as follows with regard to their respective study area:

- **Section 5** - Torch Lake Backwater Area;
- **Section 6** - Lake Linden Recreation Area
- **Section 7** - Lake Linden Sands Area;
- **Section 8** - Lake Linden Processing Area;
- **Section 9** - Hubbell Processing Area;
- **Section 10** - Hubbell Slag Dump and Beach Area; and,
- **Section 11** - Torch Lake.

Section 12 includes a summary of conclusions and recommendations that are gleaned from the individual detailed findings reports with an emphasis on impacts to the CHLL as a whole. **Section 13** includes references utilized in the development of the SI Report.

1.1 PROBLEM DEFINITION

The Project is characterized by the risks posed by chemical containers and residues historically discarded in or near Torch Lake. These concerns are distinct and separate from the risks historically addressed under the U.S. Environmental Protection Agency's (EPA's) Superfund program. The RRD Superfund Section has stated that the EPA defines the Torch Lake Superfund Site as the upper six inches (in.) 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 at Torch Lake and the surrounding areas identified by the MDEQ include known or suspected impacts to groundwater, surface water, sediments, and upland media that were

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not addressed under the Superfund program. Environmental impacts that were evaluated as part of the SI were assessed under the guidance of the following objectives:

- Investigate and document unidentified, significant in-lake and/or terrestrial sources of contamination including polychlorinated biphenyls (PCBs);
- Investigate and document uncharacterized waste deposits, including more than 750 drums on the lake bottom as reported in the *Final Drum Removal Report Torch Lake Drum Removal, Houghton County, Michigan March 24, 1992* prepared by Geraghty & Miller, Inc.;
- Investigate and document bulk disposal areas, including stamp sand deposits, slag dumps, and landfills; and,
- Investigate and document industrial ruins including coal storage areas, underground storage tanks (USTs), asbestos containing materials (ACM), and any other waste materials identified in future investigations.

The risks posed to environmental media, sediment in particular, by the aforementioned waste deposits and continuing sources of contamination contribute to the limited recovery of the Torch Lake ecosystem. As such, the investigation was largely driven by documented observations of drum and/or other debris locations in the lake, supported by documented historic operations and detected PCB concentrations in upland areas.

Taking into account the specific objectives outlined above, the principal goal of the Project was to support a comprehensive management approach that will guide MDEQ's decision making process in addressing potential human health and environmental risks present in the CHLL. 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, and sediments) within Torch Lake, including former C&H-operated industrial areas along the shoreline, summarized as follows:

- Traprock Dump;
- Torch Lake Backwater;
- Lake Linden Recreation Area (including Sands, the Campground, the Lake Linden Beach, the Village Park, and the Marina);
- Calumet Stamp Mill;
- C&H Power Plant (exclusive of EPA efforts);

- Hubbell Coal Dock;
- Mineral Building;
- Hubbell Smelter;
- Hubbell Red Slags; and,
- Hubbell Slag Dump (including the Public Beach, the Boat Launch, and the Bay).

1.2 PROJECT ORGANIZATION

Performance of the proposed work required that both the Project team and the Project structure were focused and deliberate. The phased approach of the work required that data was processed and reported in a timely manner, between team members, to facilitate the next phase of work. The following subsections describe the Project team and the Project structure, as it relates to management and implementation.

1.2.1 Project Team

The Project was developed and implemented by the MDEQ, building on the existing partnerships and stakeholder engagement in the local community. Similarly, the MDEQ also sought to develop a collaborative management approach that included staff and resources from Michigan Technological University (Michigan Tech). Field activities were completed by the MDEQ Geological Services Unit (GSU) and WESTON. Analytical services were provided by the MDEQ's Environmental Laboratory or approved laboratories within the Contract Laboratory program.

1.2.2 Project Structure

The Project includes properties remote from Torch Lake proper, such as the Centennial Mine, a 270 acre operation just north of Calumet, the Michigan Smelter, operations in Freda and Redridge, the Tamarack City industrial ruins, Mason - Quincy Mill and leach plant, and other areas congruent with the Torch Lake Superfund Site where response actions have generally been limited to the application of soil cap and vegetative cover or eliminating the area from further consideration.

The vast distribution of these former mining operations throughout the region (spanning multiple townships, villages and cities in Houghton County along the Portage Canal, Lake Superior,

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Slaughterhouse Creek, and Torch Lake) required that operational areas of the mining companies be divided into geographic areas. Dividing the regional operations into smaller manageable geographic areas allowed for prioritization of the proposed investigative approach, while also establishing a phased process for assessing environmental concerns regionally.

The CHLL, depicted on **Figure 1-1**, is centralized around the company's copper mining and processing operations in the vicinity of Lake Linden and Hubbell, Michigan. The CHLL is further subdivided into smaller study areas that were established based on historical industrial operations. The following study areas were created within the CHLL:

- Torch Lake Backwater Area;
- Lake Linden Recreation Area;
- Lake Linden Sands Area;
- Lake Linden Processing Area;
- Hubbell Processing Area; and,
- Hubbell Slag Dump and Beach Area.

The aforementioned study areas that comprise the CHLL are depicted on **Figure 1-2** and described further in **Section 2**.

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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. The following subsections summarize both the operational and investigative history within the CHLL while also presenting the underlying rationale for the performance of the investigative activities.

2.1 SITE BACKGROUND

This Section provides an overview of the historical industrial operations, the local topography, geology, and hydrogeology, and past investigations and response actions in the CHLL.

2.1.1 Site History

C&H generally operated in the region between 1867 and 1956 erecting and operating various industrial facilities including, but not limited to copper ore processing facilities such as stamp mills, smelters, reprocessing, flotation, and leaching plants, and laboratories. In addition to recovering and processing copper ore, C&H also reprocessed and smelted scrap metals from surplus World War II equipment, cables, and munitions, which included both PCB- and lead-containing materials. Consistent with past industrial practices, mining and plant operation wastes were used as fill material along the shoreline of Torch Lake. The company also used portions of the CHLL for the direct disposal of plant wastes. A primary component of these wastes includes tailings, or stamp sands that are a byproduct of the mineral processing activities conducted at the stamp mills. Stamp sands can generally be described as pulverized, “sand-sized”, source-rock that was considered a waste material as copper ore was retained for processing. The stamp sands were generally discharged to Torch Lake via a launder or sluice. The most significant stamp sand deposit within the CHLL is located within Torch Lake, known as the Lake Linden Sands Area. Other known waste disposal areas include slag disposal areas in the vicinity of the smelter operations and sludge disposal near the Lake Linden Beach and Marina. Wastes were also reportedly buried in the Lake Linden Stamp Sands deposit, north/northeast of the Lake Linden Beach. Two municipal waste landfills also reportedly operated in the CHLL. One landfill was reportedly

located with the slag deposits near the Hubbell Smelter and the second was located at the north end of the CHLL located adjacent to the Trap Rock River.

2.1.2 Topography and Local Geology

The CHLL is located along the northwest and northern-most shoreline of Torch Lake, extending from the northern limits of Torch Lake Township north and east to the Trap Rock River. The shoreline in this area was historically characterized by industrial operations that included large-scale dock and shipping facilities. As stated previously waste materials, including slag and stamp sand, were also deposited along the shoreline, dramatically changing the natural shoreline and lake bottom of Torch Lake.

At a mean elevation of approximately 602 feet (ft) Above Mean Sea Level (AMSL) at the shoreline of Torch Lake, the land rises vertically to the west/northwest from the shoreline to an approximate elevation of 630 ft AMSL along Highway M-26. The vicinity of Highway M-26 is generally characterized by the villages of Hubbell and Lake Linden which feature residential and commercial developments that are generally built up along the toe of the hillside. Beyond these centrally developed areas, the grade continues to increase towards the west/northwest, away from the lake, reaching elevations up to 1,200 ft AMSL along U.S. 41. To the north of the Torch Lake Backwater, the elevations generally remain below 700 ft AMSL, representative of the Trap Rock River Valley.

CHLL is located within the Lake Superior Basin and the Keweenaw Peninsula Watershed. There are small creeks and streams that discharge to Torch Lake within the CHLL, the largest of which is the Trap Rock River.

According to the *Soil Survey of Houghton County Area, Michigan* issued in October 1991 by the United States Department of Agriculture (USDA) – Soil Conservation Service (SCS), the near surface geology in the CHLL generally consists of soils that have been covered by fill in upland areas in the vicinity of Highway M-26. Closer to the shore of Torch Lake, areas of stamp sand and similar wastes are more predominant.

- For soils in the developed areas of the CHLL the USDA generally describes the soils as being in “...areas that have been covered with fill. In some areas the upper one to two feet of the original soil material has been removed for use as topsoil. The texture ranges from sand to clay loam. In most areas the soils are somewhat excessively drained to moderately

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well drained, but in some areas they are somewhat poorly drained or poorly drained. Many of these areas are old copper mill sites and contain numerous foundations and abandoned railroad grades.”

- Along the shoreline in areas where wastes and stamps sands have been deposited the USDA generally describes the soils as “...waste material from past copper mining. The material consists of sand-sized waste material from copper stamping mills. Most of the sand was deposited in Torch Lake, Portage Lake, and Lake Superior by pipeline and formed delta-like deposits. Individual areas of this unit are oval or irregular in shape and range from 5 to 100 acres in size. This unit is poorly suited to most uses. It is very susceptible to wind erosion.”

Underlying these near surface soils are native soils described in the *Draft Site Inspection Report for C&H Lake Linden Operations, Lake Linden, Michigan, 49945 - March 2013* prepared by the MDEQ-RRD, Superfund Section, Pre-remedial Group, Site Evaluation Unit (Pre-remedial Group) as “ground moraine with coarse-textured, reddish brown, sandy loam, glacial till. The deposits vary in composition and thickness and do not appear to be laterally extensive over the CHLL. The deposits range in thickness from approximately 11 to 50 ft below the ground surface (bgs), but have been observed in thicker deposits with interbedded clay, silt, and gravel units. The bedrock geology underlying the glacial deposits in the area is comprised of Jacobsville Sandstone.”

2.1.3 Local Hydrogeology

The *Draft Site Inspection Report for C&H Lake Linden Operations, Lake Linden, Michigan, 49945 - March 2013* prepared by the MDEQ-RRD Superfund Section, Pre-remedial Group states that drinking water within a four-mile radius of the CHLL is obtained entirely from groundwater sources. A radial search completed by the Pre-remedial Group identified 247 water well records within the area; 152 were identified as bedrock wells, 89 were identified as drift wells and the remaining six wells were unknown or unclassified. Eighty-four of the 89 drift wells are located in the Trap Rock River watershed north of the CHLL, along the east side of Torch Lake, and along the Keweenaw Waterway. Please note that the search results are not a detailed representation of every potential groundwater receptor in the CHLL.

The report also noted that many of the residential properties located along Highway M-26 in the villages of Hubbell and Lake Linden receive municipal water service provided by a public water supply well located beyond the limits of their search area. Please note that the report did not include a comprehensive assessment of water service in the CHLL. The Pre-remedial group concluded that,

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based on geological composition, that the drift aquifers and bedrock aquifers were likely interconnected. As noted in the preceding subsection, the Trap Rock River and several other creeks drain to Torch Lake in the CHLL. Torch Lake drains to Portage Lake and the Keweenaw Waterway connecting the inland lake to Lake Superior. The Pre-remedial Group noted that the nearest known surface water intakes used for public drinking water supplies are located approximately 11 miles south of the Portage Lake connection to Lake Superior, making these public drinking water supplies approximately 25 miles south of the Project.

2.1.4 Overview of Regulatory Investigations and Response Actions

The Project area, including the lands and waterways throughout the Keweenaw Peninsula that were the location of copper milling and beneficiation activities beginning in circa 1868 were collectively identified by the EPA as the Torch Lake Superfund Site in 1986. Through a series of studies EPA concluded the Torch Lake Site posed actual or threatened releases of hazardous substances that may present an imminent and substantial endangerment to public health, welfare, or the environment. Given the complexity of the region wide issue, the EPA's 1992 Record of Decision (ROD) divided the Torch Lake Site into three Operable Units (OUs):

- **OU 1** includes surface tailings, drums, and slag pile/beach on the western shore of Torch Lake. These tailing piles include stamp sands in Lake Linden, Hubbell/Tamarack City, and Mason, while a slag pile/beach is located in Hubbell;
- **OU 2** includes groundwater, surface water, submerged tailings and sediments in Torch Lake, Portage Lake, the Portage Canal, and other water bodies; and,
- **OU 3** includes tailings and slag deposits located in the north entry of Lake Superior, Michigan Smelter, Quincy Smelter, Calumet Lake, Isle-Royale, Boston Pond, and Grosse-Point.

Ultimately the OU 1 and OU 3 remedy selected and implemented by the EPA required that stamp sands, tailings and slag piles be covered with soil and vegetation, and that use restrictions are put in place to protect the covered materials' long-term integrity. Through these measures it was concluded that the following Remedial Actions Objectives (RAO) would be met:

- Reduce or minimize potential future risks to human health associated with the inhalation of airborne contaminants from the tailings and/or slag;

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- Reduce or minimize potential future risks to human health associated with direct contact with and/or the ingestion of the tailings and/or the slag;
- Reduce or minimize the release of contaminants in tailings to the groundwater through leaching; and,
- Reduce or minimize the release of contaminants in tailings to the surface water and sediment by soil erosion and/or air deposition.

The EPA selected a "No Action" remedy in their 1994 ROD for OU 2. To meet the RAO, the remedy selected for OU 2 took into consideration and relied upon:

- The reduction of stamp sand loading to surface water bodies expected as a result of the remedial action taken at OU 1 and OU 3;
- Ongoing natural sedimentation and detoxification such as that which is occurring in other surface water bodies in the area;
- Institutional programs and practices controlling potential future exposure to site-affected groundwater which are 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.

The Project area is located within the Torch Lake Superfund Site footprint; however, the properties identified for assessment were generally not included in the Torch Lake Superfund Site OU1, nor were remedies in place to mitigate environmental conditions on the properties. The only properties included in the SI that underwent previous remedial activities by the EPA are the capped portions of the Lake Linden Sands Area, the Lake Linden Recreation Area, the Hubbell Processing Area, and the Hubbell Slag Dump and Beach Area. OU2, for which EPA selected a no-action alternative, includes groundwater, surface water, submerged tailings (stamp sands), and sediment that were also investigated.

Historically, numerous environmental investigations and response activities have been completed within the CHLL by state and federal agencies as well as private parties. The investigations were conducted on and along the shoreline of Torch Lake with various purposes, often specific to a particular property or investigative focus. Although often referenced in individual reports, a comprehensive approach consolidating the findings of these investigations had not been completed to date.

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The data and information derived from these investigations were assimilated and compiled by the MDEQ and summarized by WESTON in a document entitled *Compilation and Interpretation of Key Historic Studies Abandoned Mining Wastes – Torch Lake non-Superfund Site* dated November 2014 and discussed further in **Section 3**. The findings of these investigations and the conclusions derived from the performance of each assessment were selected to assist in the identification of historic areas of contamination or data gaps requiring further assessment.

Response actions completed in the CHLL include the aforementioned capping activities completed by the EPA. Unless otherwise “delisted”, these capped areas of the Torch Lake Superfund Site remain under the management and monitoring of the EPA. The MDEQ has taken responsibility for operation and maintenance activities in those areas where remedial actions have been implemented and subsequently delisted.

Other response activities completed within the CHLL included the EPA’s emergency removal of contaminated soil and sediment from the shoreline of Torch Lake near the Village of Lake Linden’s Village Park and Beach. EPA also facilitated, through an identified responsible party (RP), the cleanup activities at the C&H Power Plant Site, both located in the Lake Linden Processing Area. More recently, a grant funded Nonpoint Source Pollution Reduction Project was completed in 2011 in the Village of Lake Linden that included the placement of an asphalt parking lot in the Lake Linden Recreation Area.

The C&H Power Plant Site was determined by the EPA to pose immediate risks to human health and the environment due to residual contamination as a result of mining era operations. These contaminants, primarily inorganic COCs and asbestos were determined to be present in near surface soils. Further, the dilapidated condition of the former power plant building, which was known to contain PCB-contaminated sludge in the basement, presented a significant physical hazard as well as a source for the migration of contaminated building materials. The resultant remedial actions at the property included the razing of the power plant building, the collection and disposal of bulk ACM, the excavation and disposal of contaminated soil, and the capping of contaminated surface soils at the property.

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Response actions and investigations have determined that elevated levels of metals in surficial soils, and in some cases, asbestos; lead and arsenic in sludges; semi-volatile organic compounds (SVOCs) and PCBs in waste materials; volatile organic compounds (VOCs) venting into Torch Lake from contaminated groundwater; and metals in groundwater are present at the properties in the CHLL. Further, the findings also confirm that significant quantities of waste are present at terrestrial and offshore locations in and around Torch Lake. Analytical results indicate that shallow and subsurface soils, groundwater, and sediments have become contaminated with heavy metals, especially arsenic, chromium, copper, and lead.

2.2 SITE LOCATION AND DESCRIPTION

The CHLL consists of approximately 155 acres of land extending approximately two miles along the shoreline of Torch Lake. The Project area also incorporates over 40 different parcels with multiple property owners. Building on the organization of the Preliminary Assessment completed by the MDEQ in October 2009, the CHLL was divided into six smaller study areas based on the historical industrial operations in each area. For consistency, WESTON has expanded upon the study area identification established by the MDEQ, while focusing on the identified industrial sites defined in the Statement of Objectives (SOO) prepared by the MDEQ.

The investigative areas and their respective former industrial sites are summarized as follows:

- Torch Lake Backwater Area
 - Traprock Dump; and,
 - Torch Lake Backwater.
- Lake Linden Sands Area
 - No Industrial Sites identified;
 - Stamp Sands; and,
 - Reported disposal areas.

- Lake Linden Recreation Area
 - Campground;
 - Lake Linden Beach;
 - Village Park; and,
 - Marina.
- Lake Linden Processing Area
 - Calumet Stamp Mill; and,
 - C&H Power Plant (exclusive of EPA efforts).
- Hubbell Processing Area
 - Hubbell Coal Dock;
 - Mineral Building; and,
 - Hubbell Smelter.
- Hubbell Slag Dump and Beach Area
 - Hubbell Red Slags; and,
 - Hubbell Slag Dump (including the public beach, the boat launch, and the bay).

The study areas defined above are depicted on **Figure 1-2**. The following subsections provide additional detail related to the study areas identified above.

2.2.1 Torch Lake Backwater Area

The Torch Lake Backwater Area is located along the northern limits of the CHLL. The Torch Lake Backwater Area includes three areas of interest that were potentially negatively impacted by former industrial operations in the region, including the Traprock Dump and the Torch Lake Backwater Area.

Historically, the area did not appear to feature large industrial complexes as identified in several of the other areas. Sanborn Fire Insurance maps from the area show a facility identified as Houghton County Electric Light and Power located along 9th Street. Similarly, the website www.coppercountryexplorer.com (Copper Country Explorer) identifies this facility as an electrical generating station for the Houghton County Traction Company, an electric street car line that served Lake Linden and Calumet. Refer to **Appendix A** for a historical account of the Traprock Dump and the Torch Lake Backwater areas prepared by Michigan Tech.

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The Torch Lake Backwater Area comprises the central and western portion of the study area featuring over 3,000 ft of shoreline and includes a former municipal dump. The Traprock Dump makes up approximately 1,000 ft of the Torch Lake Backwater Area shoreline and generally comprises the eastern portion of the study area. The Traprock Dump is bordered on the east by the Trap Rock River.

The areas of interest are generally bound to the north by 9th Street, which transitions to Bootjack Road in the vicinity of the Trap Rock River along the eastern boundary of the Torch Lake Backwater Area. Properties within the Torch Lake Backwater Area are generally privately owned. Current land use in the study area includes both residential and commercial uses. Residential properties with private water wells are located within the study area.

The Torch Lake Backwater Area is generally characterized as being a clinker disposal area and a former municipal dump. The limits of waste deposits and the approximated extent of surface contamination observed during previous investigations are shown on **Figure 2-1**.

2.2.2 Lake Linden Sands Area

The Lake Linden Sands Area is located north, east, and adjacent to the Lake Linden Recreation Area. The Lake Linden Sands Area is located east of downtown Lake Linden along the shoreline of Torch Lake. The area is generally accessible to vehicular and pedestrian traffic; however, there were no areas of former industrial operation identified on the approximately 115 acre stamp sand deposit. The southern portion of the Lake Linden Sands Area is owned by the Torch Lake Sewage Authority which operates two waste water treatment lagoons on the property. Areas that were characterized included reported disposal areas within the capped stamp sand deposit north/northeast of the Lake Linden Beach. Although, no homes are located within the study area, the current land use in the study area would generally be characterized as residential; however, specific uses of the properties within the study area are recreational. The location of the Lake Linden Sands Area is depicted on **Figure 2-2**.

2.2.3 Lake Linden Recreation Area

The Lake Linden Recreation Area is located south of and adjacent to the Torch Lake Backwater Area. The Lake Linden Recreation Area is located east of downtown Lake Linden along the shoreline

of Torch Lake. The properties in the Lake Linden Recreation Area are municipally owned and include areas that are accessible by the public. Public access within the area includes the Lake Linden Village Park, the Lake Linden Beach, Campground, and Marina. The area was once the location of the C&H Reclamation Plant operations. Although, no homes are located within the study area, the properties are generally used for recreational purposes; therefore, current land use in the study area would generally be characterized as residential.

In approximately 1915, C&H began reclaiming stamp sand and constructed two regrinding plants (No. 1 and No. 2), a flotation plant, a leaching plant, and a distillation plant. All or portions of these facilities were located in the Lake Linden Recreation Area. Sand reclamation operations at the property were terminated in approximately 1968. As reported by the EPA, “in June 1972, a discharge of 27,000 gallons of cupric ammonium carbonate leaching liquor occurred into the north end of Torch Lake from the storage vats at the Lake Linden Leaching Plant. The Michigan Water Resources Commission (MWRC) investigated the spill. The 1973 MWRC report discerned no deleterious effects associated with the spill, but did observe that discoloration of several acres of lake bottom indicated previous discharges” (EPA, 1992).

In addition, the 2007 removal of hazardous sludge from the Lake Linden Village Park was believed to be associated with wastes generated by the reclamation activities. The location of the Lake Linden Recreation Area is depicted on [Figure 2-3](#).

2.2.4 Lake Linden Processing Area

The Lake Linden Processing Area is located west, south, and adjacent to the Lake Linden Recreation Area. The Lake Linden Processing Area features one of the largest industrial complexes in all of C&H’s operations. The Lake Linden Processing Area includes two industrial areas of interest, including the C&H Power Plant and the Calumet Stamp Mill.

The Lake Linden Processing Area includes the C&H stamp mill complex that historically included two stamp mills and a reclamation plant. C&H reportedly also operated a laboratory near the complex. One stamp mill was named Calumet and the second was named Hecla. The mills “stamped” the ore bearing source rock so that the copper could be recovered. The waste rock, commonly referred to as

stamp sand or tailings, generated by the stamping process was discharged into Torch Lake (Lake Linden Sands Area).

The C&H Power Plant was located within the same complex, west of the stamp mills. The C&H Power Plant was established in 1905 to meet the electrical demands of the evolving industrial complex and mining operations. The power plant was one of two electrical generating stations that operated in parallel and supplied electricity throughout the region. By 1931, the power plant was connected to the electrical grid through transformers and eight outgoing feeders that exited the west side of the building overhead.

The properties in the Lake Linden Processing Area are privately owned and include areas that are accessible by the public. The Houghton County Historical Society operates a museum on the northern portion of the stamp mill complex, specifically in the footprint of the Calumet stamp mill. The industrial areas of interest in the Lake Linden Processing Area are generally bound to the west by Highway M-26. The EPA recently completed oversight of remedial actions at the power plant and former Hecla Stamp Mill property, located south and adjacent to the historical museum property.

The current land use in the study area would generally be characterized as commercial. The general locations of the aforementioned industrial facilities are depicted on [Figure 2-4](#).

2.2.5 Hubbell Processing Area

The Hubbell Processing Area is located south and adjacent to the Lake Linden Processing Area in the Village of Hubbell. The Hubbell Coal Dock, the Mineral Building, and the Hubbell Smelter are included in this study area.

The Hubbell Coal Dock is located along the shoreline of Torch Lake, between the stamp mill complex (Lake Linden Processing Area) and the C&H smelter complex (Hubbell Processing Area). “The C&H Coal Dock featured a large coal shed, reportedly measuring approximately 650 ft by 400 ft. C&H maintained a large storage shed to allow coal to be stored over the winter and to protect against uncertainties associated with the coal industry. The coal dock featured massive shovel, boom, and rail systems that allowed for the unloading and storage of the bituminous coal and anthracite being shipped from Pennsylvania and West Virginia” (Kahn, 1898). The coal dock operations featured an electrical substation in the northern portion of the property.

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The coal dock property is privately owned and includes roughly 2,000 ft of the Torch Lake shoreline. The property is bound to the west by Highway M-26. A chain link fence has been established along the western property boundary. The property is generally vacant and runoff into the lake has been observed during previous investigative activities. Abandoned drum carcasses were also observed in the southern portion of the property. A review of aerial photographs also shows the development of apparent erosion channels in the south-central portion of the property.

The Mineral Building and the Hubbell Smelter property are located south and adjacent to the Hubbell Coal Dock property and are the location of the former C&H smelter complex. “The C&H smelter complex was one of the most technologically advanced smelters in the region, and the only one to utilize an electrolytic plant to refine copper using electricity. The facility was used to smelt only low-grade ore; while the high grade material was smelted in Buffalo at C&H’s other smelting complex. By the 1930’s the complex had already managed to build up a rather sizable slag pile just south of the main facility, with no sign of its output slowing anytime soon. Today most of the plant has been demolished save for the old electrolytic plant, mineral house, and a few other smaller structures” (Copper Country Explorer, 2014).

The Mineral Building would have received the processed copper ore from the stamp mills located in the Lake Linden Processing Area. The copper ore was sorted and stored in the mineral house prior to transfer to the smelter for additional processing. The Hubbell Smelter property, currently operated by Koppers, utilizes buildings associated with the former smelter complex, with the majority of operations being housed in the former electrolytic plant.



Photograph procured by Michigan Tech and provided by the KNHP of reported secondary metal recovery.

Historical research conducted by Michigan Tech, detailed in **Section 3**, concluded that the smelter yard as well as the neighboring mineral building and coal dock facilities were likely used in C&H’s secondary copper recovery processes. As excerpted from Michigan Tech’s report, C&H launched

its “Secondary Metal Department” in 1945 — an indication that reclamation of copper from scrap metal and similar copper-containing wastes had become an important part of the company’s operations. The July 1945 issue of *C&H News and Views*, an employee periodical, includes photographs of burning of secondary waste materials, specifically the outer sheathings, insulation, and coatings on copper-rich materials, prior to treating the recovered copper in the smelter.

Materials including, co-axial telephone cable, armored “Navy cable”, motor parts, were common sources of copper, known to contain hydrocarbon-based oils and greases as well as PCBs. In addition to periodical documentation, Michigan Tech interviewed former employees who corroborated these activities, noting that the smelter yard was used as a site for burning copper wire to remove the insulation prior to smelting. The photograph above, provided by the Keweenaw National Historical Park (KNHP), is reportedly representative of secondary metal recovery in the smelter yard.

Current land use in the study area includes both residential and commercial uses with residential properties located in the northern half of the study area and industrial/commercial properties to the south. The location of the Hubbell Processing Area is depicted on [Figure 2-5](#).

2.2.6 Hubbell Slag Dump and Beach Area

The Hubbell Slag Dump and Beach Area is the southern-most area in CHLL. The Hubbell Slag Dump and Beach Area is located south and adjacent to the Hubbell Processing Area. The Hubbell Slag Dump and Beach Area include several former industrial areas of interest including the Hubbell Red Slags, the Hubbell Slag Dump, and a reported municipal landfill that was co-located with the slag dump.

The Hubbell Red Slags and the Hubbell Slag Dump were likely smelting waste generated by the C&H smelter complex. The slag dumps and the reported municipal landfill are located along the shoreline of Torch Lake. Further, these waste disposal areas are located near public access areas, including a Lake Linden Beach and Marina. Properties within the study area are generally open areas that are used for recreational purposes; as such, the current land use in the study area would generally be characterized as residential. The extent of contamination and slag deposits identified in the Hubbell Slag Dump and Beach Area are shown on [Figure 2-6](#).

2.2.7 Torch Lake

The study areas described in the preceding subsections are all located along the shoreline of Torch Lake. Each of these former industrial operations relied on the waters of Torch Lake for shipping, process water, and waste discharge. In addition, the communities established around these industrial facilities also used the lake for similar purposes, historically discharging sewage and other wastes into the lake.

Historically, containers, drums, and building materials have been identified in Torch Lake. Some of these items were characterized and recovered as part of previous removal actions; however, many areas of similar waste deposits remain submerged or partially submerged along the shoreline of the lake. In addition, the abandoned or vacant state of the properties in several locations make Torch Lake susceptible to the erosion or discharge of contaminated environmental media emanating from properties along the shoreline.

Numerous investigations have been completed in Torch Lake to evaluate sediment and water quality within the lake. PCBs have been detected in sediment and surface water in the lake and have resulted in the placement of the following beneficial use impairments (BUIs):

- **Restrictions on fish and wildlife consumption** - When contaminant levels in fish or wildlife populations exceed current standards, objectives or guidelines, or public health advisories are in effect for human consumption of fish and wildlife.
- **Degradation of benthos** - When the benthic macroinvertebrate community structure significantly diverges from un-impacted control sites of comparable physical and chemical characteristics. In addition, this use will be considered impaired when toxicity (as defined by relevant, field-validated bioassays with appropriate quality assurance/quality controls) of sediment associated contaminants at a site is significantly higher than controls.

Despite the effectiveness of these prior investigations in identifying sediment contamination; the investigations were not focused on identifying and characterizing the sources of contamination. As such, the goals of the SI were to verify the presence of these abandoned containers and wastes on the bottom of the lake and to more fully characterize the nature and extent of these likely contaminant sources. The evaluation of potential PCB sources and PCB “hot spots” in and around Torch Lake were an integral component of the SI that will support the long-term protection and rehabilitation of the lake.

3. FIELD PROCEDURES AND SAMPLE COLLECTION

The field procedures and sample collection activities that were implemented in the CHLL were used to evaluate the presence of contaminated environmental media in the study areas described in **Section 2**. This Section describes the phased approach for reviewing and assessing each area and the subsequent field sampling and laboratory analysis that followed.

3.1 PLANNING AND COORDINATION

The assessment and investigation of each study area in the CHLL included several research oriented steps that served as the foundation for the *Draft Sampling and Analysis Plan for the Abandoned Mining Wastes Torch Lake Non-Superfund Site, Houghton County, Michigan* (SAP) prepared by WESTON in May 2014 and the *Addendum No. 1 to Draft Sampling and Analysis Plan for the Abandoned Mining Wastes Torch Lake Non-Superfund Site, Houghton County, Michigan* prepared by WESTON in April 2015. The following subsections describe the research, mapping, and testing procedures that were utilized during SAP development to ensure that the investigative activities were not redundant and focused on the goals and objectives established by the MDEQ.

3.1.1 Historical Research and Data Compilation

The implementation of the investigative portion of the SI was closely linked to the collaborative efforts of the Project team, described in **Section 1**. The historical archive research and mapping completed by Michigan Tech was critical to the development of the SAP since the findings specifically identified the location of facilities and operational areas that were historically utilized by C&H. The following provides a summary of the activities completed by Michigan Tech and the associated research and documentation that was used to support SAP development:

- Identification of potential sources of contaminants of concern (COCs), including PCBs, through the evaluation of waste streams from industrial buildings and processes including, but not limited to, chemicals used in reclamation processes; process sludges; process slag; coal-related wastes such as fly-ash; and leaching reagents.
- Investigation of archives related to building function, production processes, chemical processes, and waste streams by building location.

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- Production of building narratives for buildings within the geographic Area that include details related to operational periods, production activities, operational processes, building use, and information on chemicals, metals, and wastes used in or generated at the facility.
- Completion of mapping activities based on collected archival data and field inspections noting the location of foundations and building remnants.

The findings of the archival research including the elements summarized above were compiled by Carol A. MacLennan, Professor of Anthropology in the Michigan Tech Social Sciences Department with the support of graduate students in the Industrial Archaeology Graduate Program, including Emma Schwaiger, John Baeten, and Brendan Pelto. The Michigan Tech Research Institute (MTRI) supported these efforts by geospatially referencing data sources for visualization in a Geographic Information System (GIS).

A summary of the historical findings reported by Michigan Tech is presented on [Table 3-1](#). A detailed summary report and supplemental information including building narratives, maps, and documentation is included in **Appendix A**.

3.1.2 Data Compilation Technical Memorandum

As outlined in **Section 2**, the comprehensive nature of the SI entailed not only a historical operational perspective, but also required that the results of previous investigative activities be incorporated. The evaluation and interpretation of analytical results and findings from previous key investigations was completed to create a baseline understanding of conditions in the CHLL and Torch Lake. The incorporation of these findings into the sampling program minimized redundancies in data collection, but also created a more comprehensive approach for assessing potential environmental impacts.

The following is a summary of the key documents summarized in the *Compilation and Interpretation of Key Historic Studies Abandoned Mining Wastes – Torch Lake non-Superfund Site* dated November 2014:

- *Final Report, PCB Study Using Semipermeable Membrane Devices in Torch Lake, Houghton County – March 2006*. Prepared by the Great Lakes Environmental Center.
- *Letter Report for Lake Linden Emergency Response Site, Lake Linden, Houghton County, Michigan – November 2007*. Prepared by WESTON.

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- *Summary Report for the Torch Lake Area Assessment, Torch Lake NPL Site and Surrounding Areas, Keweenaw Peninsula, Michigan – December 2007.* Prepared by WESTON.
- *A Sediment Chemistry Survey of Torch Lake, Houghton County, Michigan, MDEQ Water Bureau – February 2008.* Prepared by the MDEQ Water Bureau.
- *PCB Concentrations in Walleye Collected from Torch Lake (Houghton County) and Lake Superior - June 2008.* Prepared by the MDEQ Water Bureau.
- *Groundwater Sampling Investigation Report for Village of Lake Linden, Torch Lake Superfund Site, Lake Linden, Michigan - March 2009.* Prepared by the MDEQ- RRD, Superfund Section, Geological Support Unit.
- *Aroclor Sediment Investigation, Torch Lake Area of Concern, Houghton County, Michigan – June 2009.* Prepared by the EPA Great Lakes National Program Office (GLNPO).
- *Draft Site Inspection (SI) Report for C&H Lake Linden Operations, Lake Linden, Michigan, 49945 - March 2013.* Prepared by the MDEQ-RRD, Superfund Section, Pre-remedial Group, Site Evaluation Unit (Pre-remedial Group).
- Correspondence, narratives, and analytical results from other studies including the following:
 - Summary of multi-level monitoring well investigation completed in Lake Linden by the MDEQ;
 - Summary of sediment and groundwater analytical results collected from the former PCI Property located in Hubbell provided by others.
 - Summary of groundwater analytical results from the Hubbell Smelter property which includes an existing monitoring well network and regular reporting to the MDEQ.
- Post development of the Key Historic Studies document, MDEQ obtained the *Draft Lake Linden Calumet and Hecla Power Plant Site, Post-Construction Report, Building Demolition and Soil Removal - January 2015.* This document was prepared by Amec Environment & Infrastructure to document removal action activities completed at the C&H Power Plant by RP Honeywell Specialty Materials, LLC.

In support of developing a comprehensive approach for evaluating risks, the analytical results from the investigations summarized above were compiled and compared to the same regulatory criteria. Consistent with this approach, the same regulatory criteria were used to evaluate the analytical results collected during the SI. The regulatory criteria utilized for evaluating analytical results from surface soil, subsurface soil, groundwater, sediment, surface water, building materials, and waste deposits are discussed in detail in **Section 4**.

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The analytical results from these key investigations were used to characterize the study areas of the CHLL and contributed to the horizontal and vertical placement of the proposed sampling locations presented in the SAP. Consequently, the review and evaluation of the summarized reports resulted in the preparation of a SAP and SAP Addendum No. 1 that built upon existing analytical results and focuses on potential risks posed to human health and ecological receptors. In addition, the SI was also guided by the documented observations of drum and/or other debris locations in the lake as well as consideration related to historic operations and detected PCB concentrations.

3.1.3 Offshore Mapping and Procedural Testing

During 2007 and 2011 the analytical results from surface water and sediment samples indicated that contaminants emanating from documented contamination on land may be impacting the nearshore aquatic environment of Torch Lake. In addition, historical investigations in the lake have documented the presence of submerged drums, containers, and waste deposits on the bottom of Torch Lake. The visual confirmation of the underwater targets was a key component to the Project, distinguishing it from previous investigations by eliminating the concept of “blind” sampling and focusing sample locations on specific waste deposits.

Evaluation of these underwater features as part of the SI required the use of advanced technological methods to identify specific targets for sample collection. Completion of these tasks again, relied upon the collaborative efforts of the project team to conduct underwater mapping and video surveillance of the lake bottom.

In 2013 Michigan Tech demonstrated underwater research capabilities utilizing their Autonomous Underwater Vehicle (AUV). The AUV, named IVER3 was manufactured by Ocean Server Technology, Inc. in Fall River, Massachusetts. The IVER3 is equipped with various technological capabilities, including three-dimensional mapping sonar, Global Positioning System (GPS) components, wireless communication, four onboard computers, and data mass storage. Michigan Tech developed a plan for conducting an AUV assessment of the near shore environment in the CHLL. The overall intent of the assessment was to collect qualitative data that can be used to develop a plan for more traditional investigation, sampling, and assessment of potential offshore contaminant sources.

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Michigan Tech determined that the nearshore environment was not conducive to the use of the AUV due to inconsistencies in the terrain of the lake bottom and underwater obstructions. Alternatively, Michigan Tech conducted a side scan sonar survey of the lake bottom using a tow fish and interpreted the results, identifying areas where targets were most likely to be present. The side scan sonar images generated by Michigan Tech are included in **Appendix B**.

The next step of the investigation included visual confirmation of the identified targets that were identified through the interpretation of the side-scan sonar imagery. Michigan Tech was scheduled to deploy their Remotely Operated Vehicle (ROV) to investigate and provide visual evidence of the of the identified drum locations. In addition, the ROV would be equipped with sampling tools to assist with the collection of samples from any confirmed containers or drums identified on the lake bottom.

On 11 June 2014, Michigan Tech with support from WESTON, conducted field testing activities using the ROV to locate and visually identify submerged targets and to test field sampling activities. Michigan Tech had moderate success in providing visual confirmation of potential underwater targets using the ROV. The movement of the ROV tends to cause significant sediment disturbance as it navigates the lake bottom. The suspended sediment limited the operator's ability to navigate around or return to an identified target. Underwater photographs and videos obtained from the ROV are included in **Appendix C**.

Similarly, Michigan Tech was unable to collect a sediment sample from the lake bottom using the ROV. Soft sediment sampling methods, using an on-board pump and tubing attached to the ROV, was unsuccessful during the field equipment and procedure testing exercise. Dense sediment sampling using the ROV equipped with a stainless steel sampling core was also unsuccessful. The limitations resulted in Michigan Tech's withdrawal from this portion of the work.

The MDEQ's GSU also has side-scan sonar and underwater imagery capabilities. The MDEQ GSU, using the results of Michigan Tech's side-scan sonar in addition to side-scan sonar imagery that they collected was able to visually identify submerged drums in the nearshore environment using an ROV. Underwater photographs and videos obtained from the ROV are included in **Appendix C**.

3.1.4 Sampling and Analysis Plan Development

The development of the SAP and SAP Addendum No. 1 for the CHLL was focused on ensuring that it considered relevant historic operational and investigative findings. Identification of buildings and facility operations provided an understanding of potential chemicals and waste streams that may have been used or disposed of on a given property. For example, PCBs are often regarded as an oil or fluid used in electrical generating facilities, but PCBs were also used for their fire retardant properties in electrical cables.

With an understanding of the historical operations, the findings of previous terrestrial and offshore analytical data were evaluated. Data was assessed with regard to the historical operations, but also to evaluate whether concentrations of specific COCs were present. If identified, the horizontal and vertical distribution was then evaluated. The evaluation considered whether additional data was needed to further delineate the extent of contamination or evaluate whether a potential source of contamination was contributing to the detection of contaminants. Similarly, the lack of analytical data in a given study area was also considered to determine if data gaps were present.

The risks posed to environmental media, sediment in particular, by these waste deposits and continuing sources of contamination contribute to the limited recovery of the Torch Lake ecosystem. As such, the investigation was largely driven by documented observations of drum and/or other debris locations in the lake as well as consideration related to historic operations and detected PCB concentrations in terrestrial portions of the CHLL.

The prevailing contaminants of concern in the CHLL generally include organic and inorganic contaminants in surface and subsurface soils, groundwater, sediment, and surface water. In addition, observed waste deposits and building materials were suspected to contain asbestos in addition to organic and inorganic contaminants. As a result, the SAP identified key analytes in environmental media for assessment during the SI. Although PCBs were prescribed for analysis in all environmental media, the selection of remaining analytes were subject to field observations and the judgment of the field teams collecting the samples. The following provides a summary of the target analytes defined in the SAP with respect to the investigated environmental media:

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Surface Soils/Waste Deposits (0 to 6 in. bgs)

- Inorganic COCs (Metals and Cyanide) by SW-846 including 3000 Series, 7000 Series 6010, and ASTM International (ASTM) D 7511-09 Analyses;
- VOCs by SW-846 Method 5035A;
- PCBs by SW-846 Method 8082A; and,
- SVOCs by SW-846 Method 8310.
- Asbestos by Polarizing Light Microscopy (PLM) – California Air Resource Board (CARB) 435 – 1,000 point count – analytical sensitivity 0.1%.

Subsurface Soils (Greater than (>) 6 in. bgs)

- Inorganic COCs (Metals and Cyanide) by SW-846 including 3000 Series, 7000 Series 6010, and ASTM D 7511-09 Analyses;
- VOCs by SW-846 Method 5035A;
- PCBs by SW-846 Method 8082A; and,
- SVOCs by SW-846 Method 8310.

Groundwater

- Inorganic COCs (Metals) by SW-846 including 3000 Series Analysis 7000 Series and 6010;
- VOCs by SW-846 Method 5035A;
- PCBs by SW-846 Method 8082A; and,
- SVOCs by SW-846 Method 8310.

Sediment

- Inorganic COCs (Metals and Cyanide) by SW-846 including 3000 Series, 7000 Series 6010, and ASTM D 7511-09 Analyses;
- VOCs by SW-846 Method 5035A;
- PCBs by SW-846 Method 8082A; and,
- SVOCs by SW-846 Method 8310.

FIELD PROCEDURES AND SAMPLE COLLECTION*Drums, Containers, Building Materials, and Waste Deposits*

- Inorganic COCs (Metals and Cyanide) by SW-846 including 3000 Series, 7000 Series 6010, and ASTM D 7511-09 Analyses;
- VOCs by SW-846 Method 5035A;
- PCBs by SW-846 Method 8082A;
- SVOCs by SW-846 Method 8310; and,
- Bulk Asbestos by PLM Method 600/R-93/116.

Inorganic COCs were selected for analysis based on an assessment of historical exceedances of applicable regulatory criteria. Seventeen inorganic COCs and cyanide were initially selected for analyses. The following provides a list of the selected inorganic analytes evaluated during the SI:

- | | | |
|--------------|-----------------------|----------------|
| ▪ Aluminum; | ▪ Chromium (Trivalent | ▪ Manganese; |
| ▪ Antimony, | and Hexavalent); | ▪ Mercury; |
| ▪ Arsenic; | ▪ Cobalt; | ▪ Nickel; |
| ▪ Barium; | ▪ Copper; | ▪ Selenium; |
| ▪ Beryllium; | ▪ Cyanide; | ▪ Silver; and, |
| ▪ Cadmium; | ▪ Iron; | ▪ Zinc. |
| | ▪ Lead; | |

The list of inorganic COCs was refined during later mobilizations based on the findings from initial investigative activities. Similarly, soil samples were initially evaluated to determine the aforementioned COCs, including total chromium. While the species of chromium, trivalent versus hexavalent, had not been determined for environmental media during previous investigations in the CHLL, the *Public Health Assessment for Evaluation of Inhalation of Airborne Stamp sands in the Torch Lake Superfund Site and Surrounding Area* (MDCH, 2013); noted that “one would not expect the hexavalent chromium form to occur in stamp sands because the trivalent chromium is typically the predominant form of chromium in the environment.” Select samples collected during the SI were analyzed for hexavalent chromium to verify the conclusions of the MDCH assessment. Hexavalent chromium was not detected in the any of the SI samples and as a result, regulatory criteria for trivalent chromium were utilized in the subsequent evaluation of data (both historical and current) derived from the CHLL.

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Similar to SAP development, the implementation of field activities in the CHLL were conducted in several terrestrial and offshore phases to ensure that sufficient data was available to adequately characterize the potential human health and environmental risks present in each study area. Field sampling activities were generally completed during three mobilizations during 2014 and two mobilizations during 2015.

The following subsections summarize the procedures and methodologies used during the SI.

3.2.1 Potential Physical and Health Hazard Inventory

The evaluation of each study area in the CHLL included a physical inspection of the properties within the area. Field inspections were conducted on properties where written access was granted to the MDEQ. In the cases where access was not requested based on historic operational and investigative findings, property conditions were evaluated from a neighboring property or public right of way where access was permitted. The inspections included the locating and inventory of historical structures and artifacts associated with the former mining era operations within each study area. In addition, each study area was also inspected for potential physical and health hazards. Such hazards may include potentially abandoned drums and containers, suspect asbestos containing materials (SACM), stained or oily soils, and similar observed environmental conditions. Potential physical hazards, including waste deposits, metal debris, and similar conditions were also recorded in areas accessed.

The effort included the development of two field inspection check lists that incorporated photographic documentation and written descriptions of identified features. Reconnaissance activities were completed at all of the properties in the CHLL. A Reconnaissance Log was used to document the general characteristics of the property including the inventory and documentation of mining era features for each property. The form was also used to document potential physical and health hazards identified on the property that warranted further inspection or sampling to adequately characterize potential risks. Completed Reconnaissance Logs are included in **Appendix D**.

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The findings of the reconnaissance activities were used to facilitate the next phase of inspection. Targeted inspections included revisiting documented hazards and collecting samples to better characterize the perceived risks documented during reconnaissance. The following provides a summary of the various media that was sampled during the targeted inspection activities:

- Documented abandoned containers were not sampled due to health and safety considerations; however, surface soil adjacent to the containers was sampled.
- Documented SACM was sampled by a licensed asbestos inspector in the State of Michigan. Sampled media included asphaltic roofing material, fibrous materials, paper-like materials, transite, and cementitious plaster-like material. A total of 128 bulk asbestos samples were collected from the CHLL.
- Documented waste materials on the ground surface were sampled.
- Surface soils in documented surface water drainage pathways that discharge to Torch Lake were sampled.
- Documented debris piles were sampled using a five-point composite sample. The purpose of compositing the sample was to obtain a representative sample of the entire pile or piles of similar materials.

Each of the sampled perceived hazards listed above was located with a GPS unit with sub-meter accuracy and photographed. Sample identification and time of collection and a description of the sampled material were documented on a Targeted Inspection Form. Completed Targeted Inspection Forms are included in **Appendix E**. A summary of the samples collected during the targeted inspection, including their descriptions, requested analyses, and other relevant information is included on **Table 3-2**.

Findings specific to individual study areas within the CHLL are included in the “Detailed Findings Reports” in **Section 5** through **Section 11** of the SI Report.

3.2.2 Surface Soil and Waste Deposit Sampling

Proposed surface soil sampling locations were predetermined in the SAP and SAP Addendum No. 1 based on the evaluations and assessments presented in **Section 3.1**. Based on these findings it was prescribed in the SAP that all surface soil and waste deposit samples be analyzed for PCBs with a select subset analyzed for the following target analytes:

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- VOCs;
- SVOCs;
- Inorganic COCs; and,
- Asbestos.

Grab soil sample were collected from proposed surface soil (0-6 in.) sampling locations. In sampling areas where waste deposits or historical surface soils were capped or covered in accordance with the EPA ROD for OU2 in the Lake Linden Recreation Area, the Hubbell Processing Area, and the Hubbell Slag Dump and Beach Area, surface soil samples were collected from directly beneath the cover media. These conditions were encountered in EPA-capped areas, but also in areas that have been redeveloped or improved such as the beach areas, public parks, and private property. The following provides a summary of the sampling procedures used during the SI.

- Rocks and organic matter (including grasses, shallow vegetation roots, and leaves) were removed from the surface of each location before a surface soil sample was collected.
- Hand tools and direct-push boring techniques were used to collect soil samples from each sampling location. Grab surface soil samples were collected from the 0 to 6 inch interval of the extracted soil core.
- Soil samples were transferred directly into laboratory-provided sample jars. Sample jars were then labeled and placed in a cooler on ice for transportation to the analytical laboratory under chain of custody.
- Surface soil and waste material sampling utilized the following nomenclature:
 - SS – Generally describes as hand-tool collected surface soil sample;
 - SB – Generally describes as direct-push boring collected surface soil sample;
 - RPM – Describes a waste material, or residual process material sample; and,
 - WP – Describes a composite soil sample collected from a waste or debris pile.

Surface soil samples were collected from all of the study areas. A total of 135 surface soil samples (SS or SB designation), including quality assurance (QA)/quality control (QC) samples, were collected from the CHLL. Four residual process material samples (RPM designation) and three waste pile samples (WP designation) were also collected. Each of the sample locations were located with a GPS unit with sub-meter accuracy and a description of the sampled material was documented on a field log. Completed targeted inspection logs documenting waste material samples are included in **Appendix E**. A photographic log, documenting sample collection

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activities, is included in **Appendix F**. Completed boring logs are included in **Appendix G**. A summary of the samples collected during the targeted inspection, including their descriptions, requested analyses, and other relevant information is included on **Table 3-2**.

Sampling locations, analytical results, and findings specific to individual study areas within the CHLL are included in the detailed findings reports in **Section 5** through **Section 11** of the SI Report.

3.2.3 Subsurface Soil Sampling

Proposed subsurface soil sampling locations were predetermined in the SAP based on the evaluations and assessments presented in **Section 3.1**. Based on these findings it was prescribed in the SAP that all subsurface soil samples be analyzed for PCBs with a select subset analyzed for the following target analytes:

- VOCs;
- SVOCs; and,
- Inorganic COCs.

The MDEQ's GSU utilized a track-mounted direct-push drill rig to retrieve continuous soil cores from the subsurface. Borings were advanced into the groundwater table. Subsurface soil samples collected for laboratory analysis were selected based on field screening results and visual or olfactory indication that contamination may be present. The soil borings were logged and screened with a photoionization detector (PID). Subsurface soil samples were collected from the vadose zone and select borings were chosen for the collection of groundwater samples based on field observations. A stainless steel slotted screen was advanced into the boring and groundwater samples were collected using disposable plastic tubing and a peristaltic pump. The following provides a summary of the sampling procedures used during the SI:

- Prior to advancement of soil borings, Michigan's one-call system was notified of the schedule work in accordance with *Public Act 174, Miss Dig Underground Facility Damage Prevention and Safety Act*.
- The lithology for each boring was classified by the field geologist in accordance with the Unified Soil Classification System (USCS) and recorded on the field log.

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- Borings were 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 were transferred directly into laboratory-provided sample jars. Sample jars were then labeled and placed in a cooler on ice for transportation to the analytical laboratory under chain of custody.
- Subsurface soil samples were named with an SB descriptor in the sample name.

Subsurface soil samples were collected from all of the study areas. A total of 186 subsurface soil samples (SB designation), including QA/QC samples, were collected from the CHLL. Each of the sample locations were located with a GPS unit with sub-meter accuracy and a description of the sampled material was documented on a field log. A photographic log, documenting sample collection activities, is included in **Appendix F**. Completed boring logs are included in **Appendix G**. A summary of the samples collected during the investigation, including their descriptions, requested analyses, and other relevant information is included on **Table 3-2**.

Sampling locations, analytical results, and findings specific to individual study areas within the CHLL are included in the detailed findings reports in **Section 5** through **Section 11** of the SI Report.

3.2.4 Groundwater Sampling

Certain soil boring locations were selected to include the installation of a temporary groundwater sampling point. Groundwater samples were collected utilizing a Screen-Point-16 stainless steel screen reusable sampling rod. Based on the historical findings, or lack thereof, it was prescribed in the SAP that all groundwater samples be analyzed for PCBs with a select subset analyzed for the following target analytes:

- VOCs;
- SVOCs; and,
- Inorganic COCs.

The following provides a summary of the sampling procedures used during the SI:

- The downhole sampling tools were advanced into the water-bearing zone in the boring and the outer rod was withdrawn to expose the internal stainless steel screen.

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- A low-flow peristaltic pump with disposable Teflon tubing was used to collect a grab groundwater sample from the screened sample interval.
- Field parameters for dissolved oxygen, pH, oxidation reduction potential (ORP), conductivity, temperature, and turbidity were measured with a water-quality monitoring instrument equipped with a flow-through cell at the time of groundwater sample collection.
- Groundwater samples were pumped directly into laboratory-provided sample jars. Sample jars were then labeled and placed in a cooler on ice for transportation to the analytical laboratory under chain of custody.
- Groundwater samples were named with an MW or GW descriptor in the sample name.

Groundwater samples were collected from all of the study areas. A total of 99 groundwater samples (MW/GW designation), including QA/QC samples, were collected from the CHLL. The total sample count includes 18 samples from the existing monitoring well network in the Hubbell Processing Area and the Hubbell Slag Dump and Beach Area and 81 samples from temporary sampling points. Each of the sample locations were located with a GPS unit with sub-meter accuracy and a description of the sample interval documented on a field log. A photographic log documenting sample collection activities is included in **Appendix F**. GSU-completed boring logs documenting the temporary well screen interval are included in **Appendix G**. A summary of the samples collected during the investigation, including their descriptions, requested analyses, and other relevant information is included on [Table 3-2](#).

Sampling locations, analytical results, and findings specific to individual study areas within the CHLL are included in the detailed findings reports in **Section 5** through **Section 11** of the SI Report.

3.2.5 Surface Water Sampling

Surface water sampling locations were predetermined in the SAP and SAP Addendum No. 1. The sampling locations were selected based on the evaluations and assessments presented in **Section 3.1** or at GSU underwater imagery targeted locations, a key element of the SI distinguishing it from previous investigations. In general, surface water samples were scheduled to be collected in locations where submerged drums or other wastes were observed with the intent of determining whether these deposits were negatively impacting the water column near the lake bottom. Based on these findings it was prescribed in the SAP that all surface water samples be

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analyzed for PCBs. Based on field observations, a subset of the samples were also analyzed for VOCs, SVOCs, and inorganics.

The surface water samples were collected from the water column within 1 foot of the lake bottom using a low-flow peristaltic pump and Teflon tubing to pump water from the lake into laboratory-provided sample containers.

Surface water samples were collected from Torch Lake off shore of some of the study areas. A total of 13 surface water samples (SW designation), including QA/QC samples, were collected from the CHLL portion of Torch Lake. Each of the sample locations were located with a GPS unit with sub-meter accuracy and a description of the sample was documented on a field log. A photographic log, documenting sample collection activities, is included in **Appendix F**. Surface water sampling information is included on the corresponding sediment sampling logs in **Appendix G**. A summary of the samples collected during the SI, including their descriptions, requested analyses, and other relevant information is included on **Table 3-2**.

Sampling locations, analytical results, and findings specific to individual study areas within the CHLL are included in the detailed findings reports in **Section 5** through **Section 11** of the SI Report.

3.2.6 Sediment Sampling

Select sediment sampling locations were predetermined in the SAP based on the evaluations and assessments presented in **Section 3.1**. Based on these findings it was prescribed in the SAP that all sediment samples be analyzed for PCBs with a select subset analyzed for the following target analytes:

- SVOCs; and,
- Inorganic COCs.

Other sediment sampling locations presented in the SAP were subject to change based on the findings of the underwater surveillance. These locations would be moved with the intent of collecting material from the interior of submerged containers or from identified waste deposits based on GSU underwater imagery targeting, a key element of the SI distinguishing it from

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previous investigations. Traditional vibracore sampling techniques were used to collect all of the sediment samples from the CHLL. The following provides a summary of the sampling procedures used during the SI:

- Sediment samples were collected utilizing the MDEQ GSU's vibracore sampler. Polycarbonate tubing was advanced into the sediment using the vibrating drive head.
- The extracted sample core was opened, the sediment column logged, samples were collected using the prescribed intervals in the SAP or visual observations, including physical characteristics and staining, or olfactory evidence of contamination within the sediment sample core.
- The lithology for each sediment core was classified by the field geologist in accordance with the USCS and recorded on the field log.
- Sediment samples were transferred directly into laboratory-provided sample jars. Sample jars were then labeled and placed in a cooler on ice for transportation to the analytical laboratory under chain of custody. Offshore samples were maintained separately from terrestrial samples.
- Sediment samples were named with an SD descriptor in the sample name.

Sediment samples were collected from Torch Lake, off shore of all of the study areas. A total of 215 sediment samples (SD designation), including QA/QC samples, were collected from the CHLL. Each of the sample locations were located with a GPS unit with sub-meter accuracy and a description of the sample core was documented on a field log. A photographic log, documenting sample collection activities, is included in **Appendix F**. Completed sediment logs are included in **Appendix G**. A summary of the samples collected during the SI, including their descriptions, requested analyses, and other relevant information is included on **Table 3-2**.

Sampling locations, analytical results, and findings specific to individual study areas within the CHLL are included in the detailed findings reports in **Section 5** through **Section 11** of the SI Report.

3.2.7 Decontamination Procedures and Management of Investigative Derived Wastes

Investigative-derived wastes (IDW) include the byproducts of the field activities, including excess sample media, spent sampling supplies, and expendable personal protective equipment (PPE). The

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following paragraphs describe the procedures used during the SI to manage IDW and decontaminate equipment used during the investigation.

During implementation of the terrestrial investigation soil cuttings, purge water, and decontamination water were generated. Soil cuttings, following logging, screening, and sampling were returned to the boring by the MDEQ. For locations where groundwater samples were collected, the soil cuttings were temporarily staged until all samples were collected and the sampling equipment was extracted from the boring. Excess groundwater generated during sample collection was discharged to the ground surface by the MDEQ. Following groundwater sample, the boring was backfilled with the staged soil cuttings. Expendable groundwater sampling materials were containerized in a trash bag for disposal as non-hazardous municipal solid waste by the MDEQ at the end of the project phase. Reusable equipment, including the stainless steel sampling screen, was decontaminated between boring locations using steam-cleaning methods. Decontamination water generated through washing and rinsing was discharged to the ground surface in the vicinity of the sampling locations. Spray bottles of wash and rinse water were used to minimize the volume of decontamination fluids generated by the soil boring and well installation activities.

Implementation of the offshore sampling activities resulted in the generation of similar waste streams. Spent polycarbonate tubing used in the collection of vibracore sediment samples, spent sampling supplies, and PPE were temporarily staged on the sampling vessel until the vessel returned to the dock. Upon returning to shore, the staged waste was transferred to a dumpster by the MDEQ for disposal. Excess sediment, debris, and surface water generated as a result of the sampling activities were returned to the lake in the vicinity of the sample location by the MDEQ.

Reusable equipment was decontaminated on board the sampling vessel using analconox wash and rinse. Spray bottles of wash and rinse water were used to minimize the volume of decontamination fluids generated during the sediment sampling activities. Decontamination water generated through washing and rinsing was discharged to the lake in the vicinity of the sample location.

3.2.8 Sample Handling, Tracking, and Custody Procedures

All samples were identified, handled, shipped, tracked, and maintained under chain of custody as prescribed in the SAP. The following paragraphs summarize the sample management and tracking activities utilized during implementation of the SI.

Samples collected during the SI were given a unique sample identification (ID) number that was project- and location- specific. A record of sample ID numbers was kept with the field records and recorded on chain-of-custody forms. Sample labels using the nomenclature defined in the SAP, were affixed to sample containers. After labeling, each sample was placed in a cooler with ice for transportation to the specified laboratory. Field documentation, including sampling forms, maps, and field logs were maintained in a field binder maintained by MDEQ and WESTON field personnel.

The field team used laboratory-provided sample custody forms to maintain and document sample integrity during sample collection, transportation, and storage. The chain of custody forms were used to document samples collected and the analyses requested. Chain of custody procedures documented the possession of individual samples from the time of collection in the field to the time of acceptance at the laboratory. Copies of the chain of custody records and the air bills (as needed) were retained and placed in the MDEQ project file.

Laboratory chain-of-custody began with sample receipt and continues until samples are discarded. Sample coolers were generally hand delivered to the laboratory where a designated sample custodian received the incoming samples. The laboratory sample custodian recorded pertinent information associated with 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).

Investigative samples were delivered by a courier or shipped under chain of custody to the laboratories listed in the table below.

FIELD PROCEDURES AND SAMPLE COLLECTION

Matrix	Laboratory Name	Laboratory Address	Laboratory Contact Name	Laboratory Phone Number
Surface Soil Subsurface Soil Groundwater Sediment Residual Process Materials Waste Materials	MDEQ Environmental Laboratory	3350 N. Martin Luther King Blvd. Lansing, MI 48906-2933	MDEQ Laboratory Services Section – Kirby Shane	(517) 335-9800
Hexavalent Chromium	ALS Environmental	3352 128 th Avenue Holland, MI 49424-9263	Project Manager – Alex Csaszar	(616) 399-6070
Bulk Asbestos and Asbestos in Soil Waste Characterization	TestAmerica, Inc.	4101 Shuffel Street Northwest North Canton, OH 44720	MDEQ Laboratory Services Section – Kris Brooks	(330) 497-9396

The MDEQ Environmental Laboratory does not perform hexavalent chromium or asbestos or waste characterization analyses. As a result, the samples were shipped under chain of custody and managed by the MDEQ Environmental Laboratory to a contract laboratory under the Contract Laboratory program.

3.2.9 QA/QC

All samples were collected and analyzed using the field and laboratory quality control procedures prescribed in the SAP. The following paragraphs summarize the field and laboratory quality control procedures utilized during implementation of the SI.

QC samples were collected to evaluate the field sampling methods and the overall reproducibility of the laboratory analytical results. Field duplicate samples were collected, processed, stored, packaged, and analyzed by the same methods as the investigative samples. QC for analytical procedures were performed in accordance with the laboratories standard operating procedures (SOP).

Matrix spike/matrix spike duplicate (MS/MSD) samples were not collected during the implementation of field activities. Alternatively, MS/MSD were selected by the laboratory and “batched”. As such, MS/MSD samples were not necessarily derived from investigative samples from the Project, but may have come from another sample set at the laboratory. MS/MSD results were reported with investigative sample results.

FIELD PROCEDURES AND SAMPLE COLLECTION

The MDEQ Environmental Laboratory and their contracted laboratories provided analytical results in electronic data deliverable (EDD) and report formats, with QA/QC data included (case narrative, investigated data results summary, and QC sample summary results). Laboratory-generated data was imported to the Project database for mapping, reporting, and archival activities. Laboratory analytical reports are included in **Appendix I**.

4. EXPOSURE ASSESSMENT

This Section presents the human health and ecological exposure criteria that are applicable to the CHLL. The discussions included in the following subsections will assist in framing the results presented in the detailed findings reports included in **Section 5** through **Section 11** with respect to the current land use and the anticipated future land use within each study area.

4.1 MDEQ FACILITY DEFINITION

As defined in Section 20101(1) (s) of Part 201 of Michigan's Natural Resources and Environmental Protection Act (NREPA), being Public Act (PA) 451 of 1994, as amended, a "Facility" means any area, place, parcel or parcels of property, or portion of a parcel of property where a hazardous substance in excess of the concentrations that satisfy the cleanup criteria for unrestricted residential use has been released, deposited, disposed of, or otherwise comes to be located. Facility does not include any area, place, parcel or parcels of property, or portion of a parcel of property where any of the following conditions are satisfied:

- (i) Response activities have been completed under this part or the comprehensive environmental response, compensation, and liability act, 42 USC 9601 to 9675, that satisfy the cleanup criteria for unrestricted residential use.
- (ii) Corrective action has been completed under the resource conservation and recovery act, 42 USC 6901 to 6992k, part 111, or part 213 that satisfies the cleanup criteria for unrestricted residential use.
- (iii) Site-specific criteria that have been approved by the department for application at the area, place, parcel of property, or portion of a parcel of property are met or satisfied and hazardous substances at the area, place, or property that are not addressed by site-specific criteria satisfy the cleanup criteria for unrestricted residential use.
- (iv) Hazardous substances in concentrations above unrestricted residential cleanup criteria are present due only to the placement, storage, or use of beneficial use by-products or inert materials at the area, place, or property in compliance with part 115.

(v) The property has been lawfully split, subdivided, or divided from a facility and does not contain hazardous substances in excess of concentrations that satisfy the cleanup criteria for unrestricted residential use.

(vi) Natural attenuation or other natural processes have reduced concentrations of hazardous substances to levels at or below the cleanup criteria for unrestricted residential use.

Note that in Section 20101(1)(x) of Part 201, hazardous substance does not include by definition stamp sands, which are defined as “finely grained crushed rock resulting from mining, milling, or smelting of copper ore and includes native substances contained within the crushed rock and any ancillary material associated with the crushed rock.” Section 20101c goes on to further state that “Property onto which stamp sands have been deposited is not subject to regulation under this part unless the property otherwise contains hazardous substances in excess of concentrations that satisfy the cleanup criteria for unrestricted residential use.”

From a terrestrial standpoint, chemical concentrations detected in soil and groundwater in each of the investigated study areas exceed residential exposure criteria for one or more COC. Further, analytical results from residual process materials and surface waste deposits also exceed residential exposure criteria in one study area. Analytical results and their implications on facility status are described further in the detailed findings reports included in **Section 5** through **Section 11** of the SI Report, which document each of the study areas as being a facility. It should be noted however, that each of the study areas are comprised of multiple land parcels and owners and investigative activities, both historical and current, were not conducted on every parcel within a given study area.

4.2 APPLICABLE EXPOSURE CRITERIA

In support of developing a comprehensive approach for evaluating risks, the analytical results from previous investigations and the SI were compiled and compared to the following regulatory screening criteria:

- Part 201 of Michigan’s NREPA, being PA 451 of 1994, as amended Residential and Non-Residential Cleanup Criteria for Response Activity (December 30, 2013).
 - Surface Soil;
 - Subsurface Soil;

- Waste Materials;
 - Residual Process Materials; and,
 - Groundwater.
- EPA, Resource Conservation and Recovery Act (RCRA), Identification and Listing of Hazardous Waste Criteria (40 Code of Federal Regulations, Part 261, Subpart C).
 - Abandoned Containers; and,
 - Waste Materials.
- EPA, National Emission Standards for Hazardous Air Pollutants (NESHAP).
 - SACM.
- EPA, Region 5, RCRA, Ecological Screening Levels (August 2003).
 - Sediment; and,
 - Surface Water.
- MDEQ – Rule 57 Water Quality Values, Surface Water Assessment Section (February 2014).
 - Surface Water.
- Sediment Quality Guidelines, Threshold Effect Concentrations (TECs) and Probable Effect Concentrations (PECs), MacDonald, et al, 2000.
 - Sediment.

The regulatory screening criteria summarized above may be applicable to all or select study areas in the CHLL. A limiting factor in the assessment of the applicability of these criteria may include, but not be limited to specific environmental media (as noted above), current and anticipated future land use categories, and relevant exposure pathways for human and ecological receptors. Assessment of these factors required that the analytical results of the SI and the respective geological and hydrogeological characteristics of the Project area be evaluated to determine generally which exposure pathways, risks, and conditions are relevant and applicable. The following subsections present the criteria assessment rationale and applicability determinations for identified exposure pathways in the CHLL.

4.2.1 Non-Evaluated Exposure Pathways

The following exposure pathway was not evaluated at the CHLL:

- Risks to aesthetic characteristics of the affected media.

Although contaminated media has the potential to have impacts on aesthetics, this pathway was not assessed because assessment of potential risks to flora, fauna, the food chain, and aesthetics was beyond the scope of the evaluation. The comprehensive evaluation presented in the SI is aimed at determining if a release has occurred in a given study area and whether or not human health and ecological risks are posed by any such release as they relate to current land use within the study area.

4.2.2 Non-Applicable Exposure Pathways

The following exposure pathways are not applicable at the CHLL:

- Risks due to free-phase liquids.

Free-phase liquids, released to the environment, have not been identified in any of the study areas.

4.2.3 Relevant Exposure Pathways Where Applicable Criteria Are Not Exceeded

The following exposure pathways are relevant at the CHLL, but the maximum detected contaminant concentrations do not exceed applicable exposure criteria:

- Risks posed by hazardous substances in groundwater that may result in the volatilization of contaminants to indoor air in both residential and nonresidential settings.
- Risks posed by hazardous substances in groundwater that may result in flammable or explosive contaminants to be present in both residential and nonresidential settings.
- Risks posed by hazardous substances in soil that may result in the volatilization of contaminants to indoor air in both residential and nonresidential settings.

4.2.4 Relevant Exposure Pathways Where Criteria Are Exceeded, But Pathway Is Incomplete

The following exposure pathways are relevant at the CHLL, but the exposure pathway is currently incomplete:

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- Risks posed by hazardous substances in debris piles.
 - The composition of debris piles were presumed to be uniform during the SI; however additional investigation could determine that additional buried hazards are present. While this exposure pathway is currently incomplete, it could become complete in the future.
- Risks posed by hazardous substances inside buildings or former building substrates.
 - Potential asbestos containing pipe insulation was observed inside the Mineral Building and beneath a foundation located in the Hubbell Processing Area. These potentially hazardous materials were not accessible during the investigative portion of the SI. While this exposure pathway is currently incomplete, it could become complete in the future.
- Risks posed by hazardous substances that are covered or capped with soil and or a vegetative cover.
 - Multiple properties in all of the study areas feature capped and vegetated areas along the shoreline of Torch Lake. These properties include vacant, residential, and industrial or commercial properties that may or may not have been included in previous remedial actions in the area. Land use on these properties varies, but may include private beaches, residential yards, or remain undeveloped. Risks may be present in these areas where cap material has covered potential hazardous materials.

4.2.5 Relevant Exposure Pathways Where Applicable Criteria Are Exceeded and Pathway is Complete

The following exposure pathways are relevant at the CHLL and the exposure pathways are complete:

- Risks posed by hazardous substances in soil and the potential for the substances to leach to groundwater that could be used as a drinking water source in both residential and nonresidential settings.
- Risks posed by hazardous substances in soil and the potential for the substances to leach to groundwater that could vent to surface water.
- Risks posed by hazardous substances in soil and the potential for the substances to be inhaled if they are emitted as particulates and dispersed in ambient air in both residential and nonresidential settings.
- Risks posed by hazardous substances in soil and the potential for direct contact with these soils in both residential and nonresidential settings.
- Risks posed by hazardous substances in soil that may result in the volatilization of contaminants to ambient air in both residential and nonresidential settings.

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- Risks posed by hazardous substances in groundwater and the potential for that groundwater to be used as a drinking water source in both residential and nonresidential settings.
- Risks posed by hazardous substances in groundwater and the potential for that groundwater to vent to surface water.
- Risks posed by hazardous substances in surface water and sediments that have the potential to have toxic effects on aquatic biota and/or enter the food chain.

Although relevant, the MDEQ drinking water/surface water pathway criteria exceedances for metals are excluded from the soil and groundwater evaluation in the detailed findings reports included in **Section 5** through **Section 10**. 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 MDEQ drinking water/surface water pathway 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 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 OU2 for which the EPA 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 as a result of the remedial action taken at OU 1 and OU 3.
 - Ongoing natural sedimentation and detoxification.
 - Institutional programs and practices controlling potential future exposure to site-affected drinking water which were intended to be administered at the county and state level.
 - 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.

Note that metals criteria for other relevant pathways, and organic and cyanide contaminants for all pathways were included in the evaluation.

4.2.6 Relevant Cleanup Criteria for Hazardous Substances in Contaminated Environmental Media Not Accounted for by Other Rules

To assure that hazardous substances in contaminated environmental media do not pose unacceptable risks not accounted for by other rules in Part 201, the concentration of a hazardous substance in a given environmental medium shall meet cleanup criteria based on sound scientific principles and determined by the MDEQ to be necessary to protect the public health, safety, and welfare and the environment.

The following, not accounted for by other rules in this part, are relevant at the CHLL:

- Risks posed by physical hazards.
- Risks posed by hazardous substances in surface soil that may result from the direct transport or runoff of hazardous substances in soil into surface water.
- Risks posed by hazardous substances in waste, residual process materials, and abandoned containers that may result from the direct transport or runoff of hazardous substances into soil, groundwater, and surface water.

4.3 CONCEPTUAL SITE MODEL

The applicable regulatory criteria and the relevant exposure pathways assessed in the preceding subsections indicate that COCs are present in various environmental media in the CHLL. COCs have been identified in surface and vadose zone soils, groundwater, surface water, sediment, residual process materials, wastes, and abandoned containers that have the potential to affect human and ecological receptors, as well as recreational users or consumers of the natural resources of Torch Lake. Further, the potential for particulate migration and dispersion through the air poses additional risks.

The current and foreseeable land use in the CHLL includes both residential and non-residential; however, historical documentation indicates that this area was highly industrialized through the first half of the 1900's. The extent of these operations included both terrestrial and offshore operations that included the discharge of wastes and debris to Torch Lake. The eventual end of mining era operations and the generally undocumented transition of these properties to residential use likely resulted in the redistribution of surface soils and potentially contaminants along the lakeshore. Further, underwater mining era equipment, structures, and abandoned containers have

been visually documented in the nearshore environment. Physical hazards are also posed by residual mining era related conditions.

Conceptual Site Models developed for the CHLL have been developed to graphically present the relevant exposure pathways summarized in **Section 4.2** and their relationship to the distribution of contaminants in the nearshore (terrestrial and offshore) environment. The cross-sectional representation on **Figure 4-1** depicts these relationships under both a residential and recreational land use scenario. The cross-sectional representation on **Figure 4-2** depicts these relationships under a nonresidential land use scenario. The cross-sectional representation on **Figure 4-3** depicts these relationships from a longitudinal perspective, looking from offshore, at the various land uses and receptors located in the CHLL.

**DETAILED FINDINGS REPORT
TORCH LAKE BACKWATER AREA****5. DETAILED FINDINGS REPORT – TORCH LAKE BACKWATER AREA**

This Section summarizes the findings derived from implementation of the sampling and analysis plan (SAP) in the Torch Lake Backwater Area. The narrative follows the investigative approach outlined in **Section 3**, while providing specific details about the study area and the potential human health and ecological risks associated with mining era operations in the study area.

5.1 SITE INSPECTION AND INVESTIGATION RESULTS

The implementation of the site inspection and investigation activities provided critical lines of evidence that link the findings of the archival research to the current environmental conditions in and around Torch Lake. The following subsections present the findings of the inspection and investigation activities and provide correlation of mining era operations and their potential impacts on the nearshore environment of Torch Lake.

5.1.1 Site Inspection

The site inspection at the Torch Lake Backwater Area included the locating and inventory of structures and similar surficial artifacts associated with the mining era industrial operations. The study area was also inspected for potential physical and health hazards which were documented, photographed, and located with a global positioning system (GPS) unit. The inventoried hazards were then qualitatively assessed for potential human health and environmental risks to determine if analytical sampling was warranted during the targeted inspection phase of the work.

5.1.1.1 Reconnaissance

On 6 October 2014, a field team comprised of Weston Solutions of Michigan, Inc. (WESTON®) and the Michigan Department of Environmental Quality (MDEQ) personnel performed reconnaissance activities at the properties in the Torch Lake Backwater Area where written access was granted to the MDEQ. In the cases where access was not requested based on historic operational and investigative findings, property conditions were evaluated from a neighboring property or public right of way where access was permitted. Sixteen properties or grouped parcels

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TORCH LAKE BACKWATER AREA**

were visually inspected and observations were recorded. The following provides a summary of the relevant findings associated with the reconnaissance activities.

Torch Lake Backwater Area – Reconnaissance Summary	
Potential Chemical or Physical Hazards	Recorded Observations
Suspect Asbestos Containing Material (SACM)	Several fragments of asphaltic roofing material were observed on the ground surface on one property in the northern portion of the study area. The roofing material was located in the vicinity of the household waste described below.
Residual Process Materials	Residual process materials, including massive non-combustible mineral deposits commonly referred to as “clinkers” were observed on one property. Stamp sands were also observed on some sparsely vegetated properties throughout the study area.
Potentially Abandoned Containers	No mining era containers were observed during the inspection of the properties.
Soil Staining/Stressed Vegetation	No barren or stressed areas of the ground surface were documented on the inspected properties.
Potential Polychlorinated Biphenyl (PCB) or Mercury Containing Equipment	No potential PCB or mercury containing equipment was observed on the inspected properties.
Other: Household Waste and Debris	Bottles, cans, and similar household debris were observed on the ground surface in the northern portion of the study area. The observed debris is believed to be related to mining era operations and a reported historical municipal landfill located along the western bank of the Trap Rock River.

In general, no significant hazards were identified in the Torch Lake Backwater Area during the reconnaissance activities. The clinker piles pose a minimal risk as a physical hazard due to their abrasive composition. It’s also likely that their chemical composition is comprised of high concentrations of inorganic contaminants, but their apparent resistance to weathering, likely minimizes risks related to transport or migration of these contaminants. The observed jars, cans, and, roofing material are consistent with the location of a reported historical landfill. Field logs documenting reconnaissance observations are included in **Appendix D** of the Site Investigation (SI) Report.

5.1.1.2 Targeted Inspection

The qualitative assessment of the reconnaissance findings in the Torch Lake Backwater Area did not warrant the performance of targeted inspection activities at any of the properties.

**DETAILED FINDINGS REPORT
TORCH LAKE BACKWATER AREA****5.1.2 Site Investigation**

The SI at the Torch Lake Backwater Area was developed based on a variety of data and information as outlined in **Section 3**. In addition to the historical accounts and documentation, current land use and potential exposure pathways were also taken into consideration when selecting the sampling locations specific to the Torch Lake Backwater Area. The following subsections present the outcomes of investigative activities completed in the area by summarizing the laboratory analytical results and characterizing their impacts on the environmental media in which they were detected.

5.1.2.1 Terrestrial Investigation

Intrusive investigation activities in the Torch Lake Backwater Area were generally guided by the findings of historical research and field observations. From a historical standpoint, the study area did not feature large industrial complexes as identified in several of the other areas; however, the 9th Street Substation located along the northern shoreline of the Torch Lake Backwater was documented to house electrical equipment. East of the substation and adjacent to the Trap Rock River, the Traprock Dump was also reported to operate as municipal landfill. As summarized in the preceding subsections, small quantities of household wastes were apparent on the ground surface in the vicinity of the dump; however no evidence of industrial wastes were observed in the vicinity of the dump. The massive clinkers do not appear to be integrated into the landfill, but generally dumped on the ground surface around the estimated landfill footprint. Consequently, the majority of the upland investigative work was completed in the vicinity of the 9th Street Substation property. The following subsections present a summary of the field observations and analytical results derived from the terrestrial sampling activities

5.1.2.1.1 Field Observations – Soil and Groundwater

Borings in the Torch Lake Backwater Area were advanced to depths between 12 and 13 feet (ft) below the ground surface (bgs). Boring locations are depicted on [Figure 5-1](#). Soil observations documented on field logs indicate that the subsurface is primarily comprised of medium grained sands, ranging from brown to gray in color. Two boring locations (CHLL-SB02 and CHLL-SB03)

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also contained gravel in the deeper soil intervals. CHLL-SB03 was reportedly comprised of fill material.

During groundwater sampling, temporary well points were generally established between 7 ft and 13 ft bgs, and at one location between 40 ft and 45 ft bgs. Saturated soil conditions were generally encountered between depths of 2 ft and 4 ft. Groundwater quality parameters, including temperature, conductivity, dissolved oxygen and pH, measured at the time of sample collection were not considered abnormal or indicative of ancillary subsurface chemical processes.

5.1.2.1.2 Soil Sampling Results

Terrestrial investigation activities were completed in the Torch Lake Backwater Area during one mobilization. Investigative work was completed between 13 June and 15 June 2014, and on 13 May 2015. During the mobilizations, a total of 10 soil samples and one duplicate soil sample were collected from five boring locations. Soil boring locations are depicted on [Figure 5-1](#). Investigative methodologies and soil sampling techniques were conducted using the procedures outlined in **Section 3**.

Soil sampling locations included five shallow soil samples, generally ranging from 0 to 6 inches (in.) in depth. The investigation also included the collection of five subsurface soil samples ranging from 2 ft to 3 ft in depth. All samples were analyzed for PCBs. Select samples were also analyzed for other contaminants of concern (COCs) including cyanide, inorganics, and semi-volatile organic compounds (SVOCs). The selection of analytical parameters was generally based upon potential environmental impacts associated with mining era operations in the vicinity of the sampling location or field observations.

The shallow and subsurface soil analytical results for the Torch Lake Backwater Area contained a variety of inorganic COCs at concentrations at or above applicable regulatory criteria. An SVOC constituent, specifically naphthalene, was detected in one subsurface sample above applicable regulatory criteria. Cyanide was also detected in two surface soil samples above applicable regulatory criteria. PCBs were not detected in any of the samples collected from the Torch Lake Backwater Area.

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TORCH LAKE BACKWATER AREA**

A detailed summary of soil analytical results collected from the Torch Lake Backwater Area are provided in **Table 5-1**. X-ray fluorescence (XRF) soil screening results and soil analytical results from the Torch Lake Backwater Area are depicted on **Figure 5-2** and **Figure 5-3**, respectively.

5.1.2.1.3 Groundwater Sampling Results

During the installation of soil borings in the Torch Lake Backwater Area three temporary groundwater sampling locations were established to characterize groundwater in the area. The monitoring wells were installed and sampled using the methodologies presented in **Section 3**. The screened intervals in the groundwater sampling locations were 7-12 ft, 8-13 ft, and 40-45 ft bgs. A total of three groundwater samples were collected from the Torch Lake Backwater Area. Temporary groundwater sampling locations are depicted on **Figure 5-1**.

All groundwater samples were analyzed for PCBs. Select samples were also analyzed for other COCs including volatile organic compounds (VOCs), SVOCs, and inorganic constituents. A detailed summary of groundwater analytical results collected from the Torch Lake Backwater Area are provided in **Table 5-2**. Groundwater analytical results from the Torch Lake Backwater Area are depicted on **Figure 5-4**.

Soil boring logs are included in **Appendix G** of the SI Report.

5.1.2.2 Offshore Investigation

Similar to the terrestrial investigation, the proposed offshore investigation activities for the Torch Lake Backwater Area were also guided by several factors. First, historical analytical data was evaluated to determine if adequate characterization data was available in the study area to assess the overall sediment and surface water quality in the backwater environment. In addition, underwater surveillance of the area, as described in **Section 3**, was used to locate and assess potential offshore waste deposits. Lastly, field observations, both terrestrial and offshore, were used to position sampling locations. The following subsections present a summary of the analytical results derived from offshore sampling activities in the Torch Lake Backwater Area.

**DETAILED FINDINGS REPORT
TORCH LAKE BACKWATER AREA****5.1.2.2.1 Sediment Sampling Results**

Sediment sampling activities were completed on 29 May 2015. A total of 12 sediment samples were collected from five sampling locations. Sediment sampling locations are depicted on [Figure 5-1](#). Investigative methodologies and sediment sampling techniques were conducted using the procedures outlined in **Section 3**.

Sediment sampling locations included five surficial sediment samples, generally ranging from 0 to 6 in. in depth. The investigation also included the collection of seven deeper sediment samples ranging from 1 ft to 3.75 ft in depth. All samples were analyzed for PCBs. A subset of samples were also analyzed for SVOCs, cyanide, and inorganic constituents.

The sediment analytical results for the Torch Lake Backwater Area contained multiple inorganic COCs and SVOCs at concentrations that exceeded applicable regulatory criteria. Total PCBs were not detected in any of the samples collected from the Torch Lake Backwater Area during the SI.

A detailed summary of sediment analytical results collected from the Torch Lake Backwater Area are provided in [Table 5-3](#). Sediment analytical results from the Torch Lake Backwater Area are depicted on [Figure 5-5](#). Sediment core logs are included in **Appendix H** of the SI Report.

5.1.2.2.2 Surface Water Sampling Results

No surface water samples were collected from the Torch Lake Backwater Area during implementation of the SI. Historically, one surface water sample, SW-02 was collected in 2011. The surface water analytical results for the sample contained two inorganic COCs above or at concentrations that exceeded applicable regulatory criteria. A detailed summary of past surface water analytical results collected from the Torch Lake Backwater Area are provided in [Table 5-4](#). PCBs were not detected in the sample collected from the Torch Lake Backwater Area. Surface water analytical results from the Torch Lake Backwater Area are depicted on [Figure 5-5](#).

5.2 NATURE AND EXTENT OF CONTAMINATION

Utilizing the established regulatory criteria presented in **Section 4** for various land use categories and exposure pathways, the laboratory analytical results summarized in the preceding section for

**DETAILED FINDINGS REPORT
TORCH LAKE BACKWATER AREA**

the Torch Lake Backwater Area were reviewed and compared to the following regulatory criteria as applicable for the sampled environmental media:

- MDEQ Cleanup Criteria Requirements for Response Activity;
- MDEQ – Rule 57 Water Quality Values;
- U.S. Environmental Protection Agency (EPA) Ecological Screening Levels (ESLs); and,
- Sediment Quality Guidelines, Threshold Effect Concentrations (TECs) and Probable Effect Concentrations (PECs), MacDonald, et al, 2000.

5.2.1 Comprehensive Exposure Assessment

The comparison was completed to determine which ecological and human exposure pathways, risks, and conditions are relevant in the Torch Lake Backwater Area. Although not inclusive of relevant pathways where regulatory criteria were not exceeded, the following exposure pathways were determined to be relevant in the Torch Lake Backwater Area:

- Risks posed by hazardous substances in soil and the potential for the substances to leach to groundwater that could vent to surface water.
- Risks posed by hazardous substances in soil and the potential for the substances to be inhaled if they are emitted as particulates and dispersed in ambient air in a nonresidential setting.
- Risks posed by hazardous substances in soil and the potential for direct contact with these soils in a residential setting.
- Risks posed by hazardous substances in surface water and sediments that have the potential to have toxic effects on aquatic biota and/or enter the food chain.

As discussed in **Section 4.2.5**, the MDEQ drinking water/surface water pathway criteria exceedances for metals were excluded from the soil and groundwater evaluation. The rationale for this exclusion is twofold:

- The Project investigation and anticipated response actions are being undertaken pursuant to Part 201 of Michigan's Natural Resources and Environmental Protection Act (NREPA), being Public Act (PA) 451 of 1994, as amended. The concentrations of metals in excess of the MDEQ drinking water/surface water pathway 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 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,

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- The study area is part of OU2 for which the EPA 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 as a result of the remedial action taken at OU 1 and OU 3.
 - Ongoing natural sedimentation and detoxification.
 - Institutional programs and practices controlling potential future exposure to site-affected drinking water which were intended to be administered at the county and state level.
 - 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.

Note that metals criteria for other relevant pathways, and cyanide and organic contaminants for all pathways were included in the evaluation.

5.2.1.1 Soil Exposure Pathway Assessment

Soil analytical results from the Torch Lake Backwater Area included COC concentrations in soil that were at or above concentrations that trigger a "facility" designation as defined in Section 20101(1) (s) of the NREPA.

The following tables provide an aggregate summary of the soil sample locations with respect to the total number of samples collected and how they compare to the MDEQ's Cleanup Criteria for Response Activity under both Residential and Nonresidential exposure scenarios. The tables are based solely on the total number of samples collected from the Torch Lake Backwater Area. They list only the number of samples for a specific analytical suite that contained one or more exceedance of a given criterion.

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Soil Analytical Result Summary Table	Cleanup Criteria Requirements for Response Activity – Residential											
	Analytical Summary			Groundwater Protection		Indoor Air	Ambient Air (Y) (C)				Contact	Csat
	Total Number of Samples	Detected Analytes	Total Exceedances	Residential Drinking Water Protection Criteria	Groundwater Surface Water Interface Protection Criteria	Soil Volatilization to Indoor Air Inhalation Criteria	Infinite Source Volatile Soil Inhalation Criteria (VSIC)	Finite VSIC for 5 Meter Source Thickness	Finite VSIC for 2 Meter Source Thickness	Particulate Soil Inhalation Criteria	Direct Contact Criteria	Soil Saturation Concentration Screening Levels
Inorganics	16	242	4	0	0	0	0	0	0	0	3	0
Cyanide	12	3	3	0	3	0	0	0	0	0	0	0
VOCs	0	0	0	0	0	0	0	0	0	0	0	0
SVOCs	9	27	2	0	2	0	0	0	0	0	0	0
Asbestos	0	0	0	0	0	0	0	0	0	0	0	0
Total PCBs	21	0	0	0	0	0	0	0	0	0	0	0
COCs exceeding applicable regulatory criteria in one or more samples				Cyanide, Lead, Naphthalene								

Soil Analytical Result Summary Table	Cleanup Criteria Requirements for Response Activity – Nonresidential											
	Analytical Summary			Groundwater Protection		Indoor Air	Ambient Air (Y) (C)				Contact	Csat
	Total Number of Samples	Detected Analytes	Total Exceedances	Nonresidential Drinking Water Protection Criteria	Groundwater Surface Water Interface Protection Criteria	Soil Volatilization to Indoor Air Inhalation Criteria	Infinite Source Volatile Soil Inhalation Criteria (VSIC)	Finite VSIC for 5 Meter Source Thickness	Finite VSIC for 2 Meter Source Thickness	Particulate Soil Inhalation Criteria	Direct Contact Criteria	Soil Saturation Concentration Screening Levels
Inorganics	16	242	1	0	0	0	0	0	0	1	0	0
Cyanide	12	3	3	0	3	0	0	0	0	0	0	0
VOCs	0	0	0	0	0	0	0	0	0	0	0	0
SVOCs	9	27	2	0	2	0	0	0	0	0	0	0
Asbestos	0	0	0	0	0	0	0	0	0	0	0	0
Total PCBs	21	0	0	0	0	0	0	0	0	0	0	0
COCs exceeding applicable regulatory criteria in one or more sample				Cyanide, Naphthalene								

**DETAILED FINDINGS REPORT
TORCH LAKE BACKWATER AREA****5.2.1.2 Groundwater Exposure Pathway Assessment**

Groundwater analytical results from the Torch Lake Backwater Area did not include COC concentrations in groundwater that were at or above concentrations that trigger a facility designation as defined in Section 20101(1) (s) of the NREPA.

Similar to the preceding soil tables, the following table provides summary of the aforementioned sample locations with respect to the total number of samples and how they compare to the applicable MDEQ's Cleanup Criteria for Response Activity under both Residential and Nonresidential exposure scenarios.

Groundwater Analytical Result Summary Table	Analytical Summary			Cleanup Criteria Requirements for Response Activity – Residential and Nonresidential						
	Total Number of Samples	Total Number of Detected Analytes	Total Exceedances	Residential Drinking Water Criteria	Nonresidential Drinking Water Criteria	Groundwater Surface Water Interface Criteria	Residential Groundwater Volatilization to Indoor Air Inhalation Criteria	Nonresidential Groundwater Volatilization to Indoor Air Inhalation Criteria	Water Solubility	Flammability and Explosivity Screening Levels
Inorganics	4	45	0	0	0	0	0	0	0	0
Cyanide	3	0	0	0	0	0	0	0	0	0
VOCs	5	4	0	0	0	0	0	0	0	0
SVOCs	5	0	0	0	0	0	0	0	0	0
Total PCBs	6	0	0	0	0	0	0	0	0	0
Other – General Chemistry	1	5	0	0	0	0	0	0	0	0
COCs exceeding applicable regulatory criteria in one or more sample				None						

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TORCH LAKE BACKWATER AREA****5.2.1.3 Sediment Exposure Pathway Assessment**

Sediment analytical results from the Torch Lake Backwater Area included COC concentrations that were at or above concentrations that pose potential risks to sediment dwelling species, and consequently the food chain. The following table provides a summary of the sample locations located in the Torch Lake Backwater Area. The table lists only the number of samples for a specific analytical suite that contained one or more exceedance of a given criterion.

Sediment Analytical Result Summary	Analytical Summary			EPA, Region 5, Resource Conservation and Recovery Act	Consensus Based Sediment Quality Guidelines	
	Total Number of Samples	Detected Analytes	Total Exceedances	Ecological Screening Levels	Threshold Effect Concentration (TEC)	Probable Effect Concentration (PEC)
Inorganics	6	101	23	6	6	6
Cyanide	6	3	3	3	0	0
VOCs	0	0	0	0	0	0
SVOCs	6	9	5	1	1	0
Total PCBs	13	0	0	0	0	0
COCs exceeding applicable regulatory criteria in one or more sample				Cadmium, Copper, Lead, Mercury, Nickel, Silver, Zinc, Cyanide, Benzo(a)Anthracene, Benzo(a)Pyrene, Chrysene, Phenanthrene, Pyrene		

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TORCH LAKE BACKWATER AREA****5.2.1.4 Surface Water Exposure Pathway Assessment**

The surface water analytical results from the Torch Lake Backwater Area included COC concentrations that were at or above concentrations that pose potential risks to sediment and water column dwelling species, the food chain, and consequently human health through fish consumption. The following table provides a summary of the sample locations located in the Torch Lake Backwater Area. The table lists only the number of samples for a specific analytical suite that contained one or more exceedance of a given criterion.

Surface Water Analytical Result Summary	Analytical Summary			EPA, Region 5, Resource Conservation and Recovery Act	Surface Water - Rule 57		
	Total Number of Samples	Detected Analytes	Total Exceedances	Ecological Screening Levels	Human Non-Cancer Value	Human Cancer Value	Wildlife Value
Inorganics	1	12	2	1	0	0	0
Cyanide	1	0	0	0	0	0	0
VOCs	1	0	0	0	0	0	0
SVOCs	1	0	0	0	0	0	0
Total PCBs	1	0	0	0	0	0	0
COCs exceeding applicable regulatory criteria in one or more sample				Copper, Lead			

5.2.2 Extent of Contamination

The comparison of analytical results to applicable regulatory criteria indicates that potential human health and ecological risks are present in soil, sediment, and surface water in the Torch Lake Backwater Area. Recalling that the goals and objectives of the SI, the following subsections describe the extent of contamination in environmental media in the study area.

5.2.2.1 Soil Extent of Contamination

Soil analytical results exceeded Particulate Soil Inhalation Criteria (PSIC) and Direct Contact Criteria (DCC) in one or both of the residential and nonresidential exposure scenarios for inorganic contaminants. Similarly, historical surface soil screening results also included measured inorganic contaminant concentrations that exceeded DCC for a residential exposure scenario. In addition,

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cyanide and SVOC concentrations exceeded Groundwater Surface Water Interface Protection Criteria (GSIPC) which is the same for both the residential and nonresidential exposure scenarios. All samples were collected from three general locations, specifically the 9th Street Substation, the Traprock Dump, and Frog Valley Woods properties. Further these samples were collected from a zone within 300 ft to 600 ft of the shoreline of the Torch Lake Backwater. In addition to chemical hazards, potential physical hazards including mass clinker piles were documented on the Traprock Dump property.

Although private properties, none are fenced or otherwise restricted from access to trespassers. Soils with elevated levels of inorganic COCs are ubiquitous in the area, which becomes a limiting factor when evaluating potential exposure pathways. The SVOC detection on the 9th Street Substation property may be attributable to past use or storage of fuels on the property. The potential risks associated with residential and/or public use of these properties should be a consideration in determinations related to the extent of contamination in the Torch Lake Backwater Area.

5.2.2.2 Groundwater Extent of Contamination

Groundwater analytical results did not exceed any applicable MDEQ criteria. Temporary monitoring wells or temporary sampling locations were located on the previously discussed 9th Street Substation, Traprock Dump, and Frog Valley Wood properties. The groundwater samples were collected from a zone within 50 ft to 1,000 ft of the shoreline of the Torch Lake Backwater. Further, screen intervals are within 15 feet of the ground surface indicating that groundwater is likely venting to the adjacent shoreline of the Trap Rock River and the Torch Lake Backwater.

5.2.2.3 Sediment Extent of Contamination

Sediment analytical results exceeded ESLs, TECs, and PECs for inorganic contaminants and SVOCs. Sediment samples were collected from throughout the area, including one sample collected from a zone within 10 ft of the shoreline. Elevated inorganic COCs were detected in surficial sediment samples throughout the area and SVOCs were detected near the Traprock Dump.

As stated in the preceding subsection, inorganic COCs are prevalent in the area and the related exceedances, although potentially detrimental to aquatic biota, remain a consistent finding in

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sediment samples collected from Torch Lake. The detection of SVOCs in one sediment sample, however, presents additional risks to benthic organisms and potentially human health due to its close proximity to the shoreline and its potential effect on the food chain. The potential risks associated with SVOCs in nearshore sediment may be an indication of a terrestrial source of contamination, possibly related to the Traprock Dump that should be considered when evaluating the extent of sediment contamination in the Torch Lake Backwater Area.

5.2.2.4 Surface Water Extent of Contamination

Surface water analytical results exceeded applicable regulatory criteria for inorganic contaminants. The surface water sample was collected from a zone within 10 ft of the shoreline from a depth of approximately 0 to 6 in. near the Traprock Dump.

The presence of inorganic COCs is supported by the ubiquitous presence of inorganics in study area groundwater. In addition, surface runoff and discharge may be negatively impacting the nearshore environment. Similar to the measured COC concentrations in the collocated sediment sample, COC concentrations in surface water are potentially detrimental to aquatic biota and potentially human health due to its close proximity to the shoreline. The potential risks associated with inorganic constituents, though prevalent in the region, should be considered when evaluating the extent of surface water contamination in the Torch Lake Backwater Area.

5.3 CONCLUSIONS AND RECOMMENDATIONS

The analytical results and interpretation summarized in the preceding subsections document potential human health and ecological risks that are present in the Torch Lake Backwater Area. The following subsections provide a synopsis of these findings and a recommended path forward for mitigating these risks in the Torch Lake Backwater Area.

5.3.1 Conclusions

Environmental impacts in the Torch Lake Backwater Area are generally characterized by detections of organic and inorganic contaminants in soil, sediment, and surface water; repercussions of mining era operations in the region. Although, specific sources of these contaminants may not be fully understood, historical research related to the operations, closing,

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and eventual abandonment/scraping of mining company operations provided substantive evidence for assessing specific operational areas and selecting target analytes anticipated to be present within the study area. The findings of these investigative activities are summarized as follows:

- Soil analytical results exceeded PSIC and DCC in one or both of the residential and nonresidential exposure scenarios for inorganic contaminants. In addition, cyanide and SVOC concentrations exceeded GSIPC.
- Surface soil screening results also included measured inorganic contaminant concentrations that exceeded DCC in a residential exposure scenario.
- Sediment analytical results exceeded ESLs, TECs, and PECs for inorganic contaminants and SVOCs.
- Surface water analytical results exceeded ESLs for inorganic contaminants.

The analytical results summarized above provide sufficient analytical data and lines of evidence to conclude that the study area is a facility as defined in Section 20101(1) (s) of the NREPA. The following table provides a summary of the affected environmental media, applicable regulatory criteria and potential receptors within the Torch Lake Backwater Area.

Torch Lake Backwater Area – Media, Criteria, Potential Receptor Summary															
Media	Soil			Groundwater			Air		Sediment	Surface Water		Building Materials, Asbestos, and Abandoned Containers			
Criteria	Drinking Water Protection	Groundwater Surface Water Interface	Direct Contact	Drinking Water Protection	Groundwater Surface Water Interface	Flammability and Explosivity	Volatilization	Particulate Inhalation	Ecological	Ecological	Human Health	Particulate Inhalation	Flammability and Explosivity	Environmental	Human Health
Potential Receptor															
Human Residential		✓	✓					✓							
Human Nonresidential		✓						✓							
Water Column Organism									✓	✓					
Benthic Organism									✓	✓					
COCs exceeding applicable regulatory criteria in one or more sample				Cadmium, Copper, Cyanide, Lead, Mercury, Nickel, Silver, Zinc, Naphthalene, Benzo(a)anthracene, Benzo(a)pyrene, Chrysene, Phenanthrene, Pyrene											

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In addition to the evaluation of analytical results collected from the study area, the following provides a summary of findings derived from the assessment of the Torch Lake Backwater Area with respect to the goals and objectives for the Project:

- In-lake and terrestrial sources of contamination are present in the form of inorganic COCs cyanide, and SVOCs in the study area. PCBs were not detected in environmental media sampled in the study area;
- No in-lake or terrestrial uncharacterized waste deposits were identified in the study area;
- Bulk disposal areas, including surficial “clinker” deposits and the historic Traprock Dump are present in the study area. The uncontrolled nature of these features makes them accessible to trespassers. Further, their proximal distance to surface water bodies, including the Trap Rock River and the Torch Lake Backwater are significant; and,
- Although, no industrial ruins or similar mining area containers, or building materials were identified, SACM (asphaltic roofing materials) and household waste were documented on the ground surface in the vicinity of the Traprock Dump.

5.3.2 Recommendations

The conclusions outlined in the preceding subsection establish that the Torch Lake Backwater is a Part 201 Facility. Section 20107a of Part 201 of NREPA describes the duties of owners or operators of a Facility, regardless of their liability, including: prevent unacceptable exposures, prevent exacerbation, and take reasonable precautions against the foreseeable actions of third parties. Some exceptions may apply; in any case, owners and operators of contaminated properties should become familiar with Section 20107a and the associated Rules. To date, no documented remedial measures or institutional controls are known to have been implemented to address these environmental issues.

Based on the results of the SI and to ensure compliance with regulatory statutes, potential human health and ecological risks should minimally be qualitatively evaluated with property-specific data to determine if risks to the public health, safety, or welfare or to the environment are likely within the study area. The performance of a risk assessment on select properties or groups of properties, based on current and anticipated future land-use will help identify remedial goals for properties where potential human health and ecological hazards have been identified. Assessment based on current and future land-use contributes to the beneficial and safe re-use and potential

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redevelopment of any given property by clarifying applicability of regulatory statutes, as traditional property zoning (residential versus nonresidential) is generally undefined in the study area.

MDEQ should continue to provide new study data to the Remediation and Redevelopment Division Superfund Section (RRD SFS), which is responsible for monitoring EPA's remedy for the terrestrial and lake portion of the Torch Lake Superfund Site. RRD SFS should evaluate whether any remedy modifications are necessary. The EPA and RRD SFS should verify that administrative controls for areas that have been previously remediated by the EPA have been employed to ensure that the selected remedy is performing as designed and those institutional controls, where required, have been recorded and are being enforced.

Additionally, MDEQ will continue to provide pertinent data to the Michigan Department of Health and Human Services (MDHHS) where evaluation of specific potential public health risks is warranted.

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SECTION 5

**DETAILED FINDINGS REPORT – TORCH LAKE BACKWATER AREA
TABLES**

DETAILED FINDINGS REPORT
TORCH LAKE BACKWATER AREA

TABLE 5-1
Sample Analytical Summary - Soil
Torch Lake Backwater Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Station Name	CAS Number	Residential Drinking Water Protection Criteria	Groundwater Surface Water Interface Protection Criteria	Residential Particulate Soil Inhalation Criteria	Residential Direct Contact Criteria	Nonresidential Drinking Water Protection Criteria	Nonresidential Particulate Soil Inhalation Criteria	Nonresidential Direct Contact Criteria	BootjackB-17	CHLL-SB01		CHLL-SB02		CHLL-SB03		
Field Sample ID									Bootjack B-17	CHLL-SB 01 0-6"	CHLL-SB 01 6"-36"	CHLL-SB 02 0-6"	CHLL-SB 02 6-24"	CHLL-SB 03 0-6"	CHLL-SB 03 6-24"	CHLL-SB 03 6-24" Dup
Sample Date:									9/11/2007	6/13/2014	6/13/2014	6/13/2014	6/13/2014	6/13/2014	6/13/2014	6/13/2014
Sample Interval (bgs):									0 - 6 in	0 - 0.5 ft	0.5 - 3 ft	0 - 0.5 ft	0.5 - 2 ft	0 - 0.5 ft	0.5 - 2 ft	0.5 - 2 ft
Sample Description:									--	SAND, Medium grained, gray	SAND, Medium grained, brown	SAND, Fine to Medium grained, gray	FILL, Sand and Gravel	SAND, Medium grained, gray	FILL, Sand and Gravel	Field Duplicate
Inorganics - Metals (mg/kg)																
ALUMINIUM	7429-90-5	6,900 (B)	NA	ID	50,000 (DD)	6,900 (B)	ID	370,000 (DD)	2600 J	--	--	4700	12000	8900	5400	6600
ANTIMONY	7440-36-0	4.3	1.2 (X)	13,000	180	4.3	5,900	670	--	--	--	<0.3 U	0.5	<0.3 U	0.5	0.5
ARSENIC	7440-38-2	4.6	4.6	720	7.6	4.6	910	37	1.7 J	--	--	1.9	9.5	1.7	6.9	6.3
BARIUM	7440-39-3	1,300 (G)	130	330,000	37,000	1,300	150,000	130,000	--	--	--	36	420	16	150	140
BERYLLIUM	7440-41-7	51	4.6 (G)	1,300	410	51	590	1,600	<5 UJ	--	--	0.2	1.3	0.2	0.5	0.5
CADMIUM	7440-43-9	6.0	1.6 (G,X)	1,700	550	6.0	2,200	2,100	--	--	--	<0.2 U	1.0	0.3	<0.2 U	<0.2 U
CALCIUM	7440-70-2	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
CHROMIUM	7440-47-3	1,000,000 (D,H)	1,200,000 (G,H,X)	330,000 (H)	790,000 (H)	1,000,000 (D,H)	150,000 (H)	1,000,000 (D,H)	<9.9 UJ	--	--	11	14	27	13	16
COBALT	7440-48-4	0.8	2.0	13,000	2,600	2.0	5,900	9,000	1.7 J	--	--	3.5	4.5	9.2	4.8	5.6
COPPER	7440-50-8	5,800	32 (G)	130,000	20,000	5,800	59,000	73,000	110 J	--	--	260	830	470	340	430
IRON	7439-89-6	12,000 (B)	NA	ID	160,000	12,000 (B)	ID	580,000	--	--	--	8600	10000	14000	14000	16000
LEAD	7439-92-1	700	1,900 (G,X)	100,000	400	700	44,000	900 (DD)	23 J	--	--	25	130	28	77	49
LITHIUM	7439-93-2	9.8 (B)	9.8 (B)	2,300,000	4,200 (DD)	9.8 (B)	1,000,000	31,000 (DD)	2.6	--	--	--	--	--	--	--
MAGNESIUM	7439-95-4	8,000	NA	6,700,000	1,000,000 (D)	22,000	2,900,000	1,000,000 (D)	--	--	--	--	--	--	--	--
MANGANESE	7439-96-5	440 (B)	440 (B,G,X)	3,300	25,000	440 (B)	1,500	90,000	48	--	--	180	1200	170	340	350
MERCURY	7439-97-6	1.7 (Z)	0.13 (B, Z)	20000 (Z)	160 (Z)	1.7 (Z)	8800 (Z)	580 (Z)	0.016 J	--	--	<0.06 U	0.2	<0.06 U	0.08	0.1
NICKEL	7440-02-0	100	29 (G)	13,000	40,000	100	16,000	150,000	5.3 J	--	--	8.3	10	22	12	13
POTASSIUM	7440-09-7	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
SELENIUM	7782-49-2	4.0	0.41 (B)	130,000	2,600	4.0	59,000	9,600	--	--	--	<0.2 U	0.8	<0.2 U	0.7	0.4
SILVER	7440-22-4	4.5	1.0 (M)	6,700	2,500	13	2,900	9,000	0.064 J	--	--	0.1	0.5	0.2	0.3	0.3
SODIUM	7440-23-5	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
STRONTIUM	7440-24-6	92	420	ID	330,000	260	ID	1,000,000 (D)	<250 U	--	--	--	--	--	--	--
VANADIUM	7440-62-2	72	430	ID	750 (DD)	990	ID	5,500 (DD)	--	--	--	--	--	--	--	--
ZINC	7440-66-6	2,400	62 (G)	ID	170,000	5,000	ID	630,000	26	--	--	36	200	52	56	53
Inorganics - Cyanide (mg/kg)																
CYANIDE (P,R)	57-12-5	4.0	0.1	250	12	4.0	250	250	--	--	--	<0.12 U	<0.16 U	<0.11 U	0.14	<0.12 U
Organics - PCBs																
									ND	ND	ND	ND	ND	ND	ND	ND
Organics - SVOCs (ug/kg)																
2-METHYLNAPHTHALENE (SVOC)	91-57-6S	57,000	4,200	6.7E+08	8,100,000	170,000	2.9E+08	2.6E+07	--	--	--	--	--	--	1200 J	1300
ACETOPHENONE	98-86-2	30,000	ID	3.3E+10	4.7E+07 (C)	88,000	1.4E+10	1.5E+08 (C)	--	--	--	--	--	--	--	--
BENZALDEHYDE	100-52-7	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
BENZO(A)ANTHRACENE (Q)	56-55-3	NLL	NLL	ID	20,000	NLL	ID	80,000	--	--	--	--	--	--	660 J	890
BENZO(A)PYRENE (Q)	50-32-8	NLL	NLL	1,500,000	2,000	NLL	1,900,000	8,000	--	--	--	--	--	--	660 J	910
BENZO(B)FLUORANTHENE (Q)	205-99-2	NLL	NLL	ID	20,000	NLL	ID	80,000	--	--	--	--	--	--	1000 J	1500
BENZO(G,H,I)PERYLENE (Q)	191-24-2	NLL	NLL	8E+08	2,500,000	NLL	3.5E+08	7,000,000	--	--	--	--	--	--	390 J	590
BENZO(K)FLUORANTHENE (Q)	207-08-9	NLL	NLL	ID	200,000	NLL	ID	800,000	--	--	--	--	--	--	310 J	490
CHRYSENE (Q)	218-01-9	NLL	NLL	ID	2,000,000	NLL	ID	8,000,000	--	--	--	--	--	--	820 J	1200
FLUORANTHENE	206-44-0	730,000	5,500	9.3E+09	4.6E+07	730,000	4.1E+09	1.3E+08	--	--	--	--	--	--	1500 J	2000
INDENO(1,2,3-CD)PYRENE	193-39-5	NLL	NLL	ID	20,000	NLL	ID	80,000	--	--	--	--	--	--	380 J	520
NAPHTHALENE (SVOC)	91-20-3S	35,000	730	2E+08	1.6E+07	100,000	8.8E+07	5.2E+07	--	--	--	--	--	--	870 J	940
PHENANTHRENE	85-01-8	56,000	2,100	6,700,000	1,600,000	160,000	2,900,000	5,200,000	--	--	--	--	--	--	910 J	1100
PYRENE	129-00-0	480,000	ID	6.7E+09	2.9E+07	480,000	2.9E+09	8.4E+07	--	--	--	--	--	--	1000 J	1300

Note: Analytical and Criteria Footnotes are included on the last page of the table.

TABLE 5-1
Sample Analytical Summary - Soil
Torch Lake Backwater Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

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Station Name	CAS Number	Residential Drinking Water Protection Criteria	Groundwater Surface Water Interface Protection Criteria	Residential Particulate Soil Inhalation Criteria	Residential Direct Contact Criteria	Nonresidential Drinking Water Protection Criteria	Nonresidential Particulate Soil Inhalation Criteria	Nonresidential Direct Contact Criteria	CHLL-SB04		CHLL-SB57		Lake Linden S2-8	SB-01	SB-02	SB-03
Field Sample ID									CHLL-SB 04 0'-6"	CHLL-SB 04 6"-24"	CHLL-SB 57 0"-6"	CHLL-SB 57 6"-36"	Lake Linden S2-8	SB-01	SB-02	SB-03
Sample Date:									6/13/2014	6/13/2014	6/15/2014	6/15/2014	9/12/2007	10/10/2011	10/10/2011	10/10/2011
Sample Interval (bgs):									0 - 0.5 ft	0.5 - 2 ft	0 - 0.5 ft	0.5 - 3 ft	0 - 6 in	79 - 90 in	77 - 96 in	64 - 79 in
Sample Description:									TOPSOIL, Sandy, Fine grained, gray	SAND, Medium grained, brown	SAND, Fine grained, Gray	SAND, Medium to fine grained, Brown to reddish brown	--	--	--	--
Inorganics - Metals (mg/kg)																
ALUMINIUM	7429-90-5	6,900 (B)	NA	ID	50,000 (DD)	6,900 (B)	ID	370,000 (DD)	--	--	12000	--	11000 J	4710	1840	1650
ANTIMONY	7440-36-0	4.3	1.2 (X)	13,000	180	4.3	5,900	670	--	--	<0.3 U	--	--	<6.0 UJ	<6.0 UJ	<6.0 UJ
ARSENIC	7440-38-2	4.6	4.6	720	7.6	4.6	910	37	--	--	2.1	--	1.1 J	2.1 J-	1.0 J	<1 UJ
BARIUM	7440-39-3	1,300 (G)	130	330,000	37,000	1,300	150,000	130,000	--	--	22	--	--	33.3	11.7 J	10.1 J
BERYLLIUM	7440-41-7	51	4.6 (G)	1,300	410	51	590	1,600	--	--	0.5	--	0.94 J	0.44 J	0.2 J	0.16 J
CADMIUM	7440-43-9	6.0	1.6 (G,X)	1,700	550	6.0	2,200	2,100	--	--	<0.2 U	--	--	0.44 J	0.24 J	0.27 J
CALCIUM	7440-70-2	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	1980	840	889
CHROMIUM	7440-47-3	1,000,000 (D,H)	1,200,000 (G,H,X)	330,000 (H)	790,000 (H)	1,000,000 (D,H)	150,000 (H)	1,000,000 (D,H)	--	--	27	--	20 J	15.6	5.3	5.0
COBALT	7440-48-4	0.8	2.0	13,000	2,600	2.0	5,900	9,000	--	--	15	--	14 J	4.8 J	2.3 J	1.8 J
COPPER	7440-50-8	5,800	32 (G)	130,000	20,000	5,800	59,000	73,000	--	--	890	--	2100 J	22.9	8.8	34.5
IRON	7439-89-6	12,000 (B)	NA	ID	160,000	12,000 (B)	ID	580,000	--	--	19000	--	--	7200	4280	4790
LEAD	7439-92-1	700	1,900 (G,X)	100,000	400	700	44,000	900 (DD)	--	--	8.2	--	6.9 J	1.9	<1.0 U	<1 U
LITHIUM	7439-93-2	9.8 (B)	9.8 (B)	2,300,000	4,200 (DD)	9.8 (B)	1,000,000	31,000 (DD)	--	--	--	--	6	--	--	--
MAGNESIUM	7439-95-4	8,000	NA	6,700,000	1,000,000 (D)	22,000	2,900,000	1,000,000 (D)	--	--	--	--	--	2700	1320	1040
MANGANESE	7439-96-5	440 (B)	440 (B,G,X)	3,300	25,000	440 (B)	1,500	90,000	--	--	370	--	350	91.1	49.7	48.7
MERCURY	7439-97-6	1.7 (Z)	0.13 (B, Z)	20000 (Z)	160 (Z)	1.7 (Z)	8800 (Z)	580 (Z)	--	--	<0.06 U	--	0.029	<0.1 U	<0.1 U	<0.1 U
NICKEL	7440-02-0	100	29 (G)	13,000	40,000	100	16,000	150,000	--	--	29	--	34 J	12.7	6.3	4.7
POTASSIUM	7440-09-7	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	<500 U	<500 U	<500 U
SELENIUM	7782-49-2	4.0	0.41 (B)	130,000	2,600	4.0	59,000	9,600	--	--	<0.2 U	--	--	<3.5 U	<3.5 U	<3.5 U
SILVER	7440-22-4	4.5	1.0 (M)	6,700	2,500	13	2,900	9,000	--	--	0.9	--	1.3 J	<1.0 U	<1.0 U	<1 U
SODIUM	7440-23-5	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	163 J	86 J	92.3 J
STRONTIUM	7440-24-6	92	420	ID	330,000	260	ID	1,000,000 (D)	--	--	--	--	<270 U	--	--	--
VANADIUM	7440-62-2	72	430	ID	750 (DD)	990	ID	5,500 (DD)	--	--	--	--	--	45.4	12.4	12
ZINC	7440-66-6	2,400	62 (G)	ID	170,000	5,000	ID	630,000	--	--	63	--	130	27.9	11.9	11.4
Inorganics - Cyanide (mg/kg)																
CYANIDE (P,R)	57-12-5	4.0	0.1	250	12	4.0	250	250	--	--	0.75	--	--	<0.5 UJ	<0.5 UJ	<0.5 UJ
Organics - PCBs																
									ND	ND	ND	ND	ND	ND	ND	ND
Organics - SVOCs (ug/kg)																
2-METHYLNAPHTHALENE (SVOC)	91-57-6S	57,000	4,200	6.7E+08	8,100,000	170,000	2.9E+08	2.6E+07	--	--	--	<590 U	--	<170 U	<170 U	<170 U
ACETOPHENONE	98-86-2	30,000	ID	3.3E+10	4.7E+07 (C)	88,000	1.4E+10	1.5E+08 (C)	--	--	--	--	--	470	<170 U	<170 U
BENZALDEHYDE	100-52-7	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	250 J	<170 U	<170 U
BENZO(A)ANTHRACENE (Q)	56-55-3	NLL	NLL	ID	20,000	NLL	ID	80,000	--	--	--	<230 U	--	<170 U	<170 U	<170 U
BENZO(A)PYRENE (Q)	50-32-8	NLL	NLL	1,500,000	2,000	NLL	1,900,000	8,000	--	--	--	<470 U	--	<170 U	<170 U	<170 U
BENZO(B)FLUORANTHENE (Q)	205-99-2	NLL	NLL	ID	20,000	NLL	ID	80,000	--	--	--	<470 U	--	<170 U	<170 U	<170 U
BENZO(G,H,I)PERYLENE (Q)	191-24-2	NLL	NLL	8E+08	2,500,000	NLL	3.5E+08	7,000,000	--	--	--	<470 U	--	<170 U	<170 U	<170 U
BENZO(K)FLUORANTHENE (Q)	207-08-9	NLL	NLL	ID	200,000	NLL	ID	800,000	--	--	--	<470 U	--	<170 U	<170 U	<170 U
CHRYSENE (Q)	218-01-9	NLL	NLL	ID	2,000,000	NLL	ID	8,000,000	--	--	--	<230 U	--	<170 U	<170 U	<170 U
FLUORANTHENE	206-44-0	730,000	5,500	9.3E+09	4.6E+07	730,000	4.1E+09	1.3E+08	--	--	--	<230 U	--	<170 UJ	<170 UJ	<170 UJ
INDENO(1,2,3-CD)PYRENE	193-39-5	NLL	NLL	ID	20,000	NLL	ID	80,000	--	--	--	<470 U	--	<170 U	<170 U	<170 U
NAPHTHALENE (SVOC)	91-20-3S	35,000	730	2E+08	1.6E+07	100,000	8.8E+07	5.2E+07	--	--	--	230	--	<170 U	<170 U	<170 U
PHENANTHRENE	85-01-8	56,000	2,100	6,700,000	1,600,000	160,000	2,900,000	5,200,000	--	--	--	<230 U	--	<170 U	<170 U	<170 U
PYRENE	129-00-0	480,000	ID	6.7E+09	2.9E+07	480,000	2.9E+09	8.4E+07	--	--	--	<230 U	--	<170 U	<170 U	<170 U

Note: Analytical and Criteria Footnotes are included on the last page of the table.

TABLE 5-1
Sample Analytical Summary - Soil
Torch Lake Backwater Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

DETAILED FINDINGS REPORT
TORCH LAKE BACKWATER AREA

Station Name	CAS Number	Residential Drinking Water Protection Criteria	Groundwater Surface Water Interface Protection Criteria	Residential Particulate Soil Inhalation Criteria	Residential Direct Contact Criteria	Nonresidential Drinking Water Protection Criteria	Nonresidential Particulate Soil Inhalation Criteria	Nonresidential Direct Contact Criteria	SS-02		SS-03	TraprockB-8	TraprockB-12
Field Sample ID									SS-02	SS-02D	SS-03	Traprock-8	Traprock B-12
Sample Date:									10/10/2011	10/10/2011	10/10/2011	9/11/2007	9/11/2007
Sample Interval (bgs):									0 - 3 in	0 - 3 in	0 - 4 in	0 - 6 in	0 - 6 in
Sample Description:									--	Field Duplicate	--	--	--
Inorganics - Metals (mg/kg)													
ALUMINUM	7429-90-5	6,900 (B)	NA	ID	50,000 (DD)	6,900 (B)	ID	370,000 (DD)	5210 J	5850 J	11400 J	9800 J	13000 J
ANTIMONY	7440-36-0	4.3	1.2 (X)	13,000	180	4.3	5,900	670	<6.0 U	<6.0 U	1.5 J	--	--
ARSENIC	7440-38-2	4.6	4.6	720	7.6	4.6	910	37	7.0	8.0	13.9	4.6 J	4.2 J
BARIUM	7440-39-3	1,300 (G)	130	330,000	37,000	1,300	150,000	130,000	76.3 J	90.1 J	1090 J	--	--
BERYLLIUM	7440-41-7	51	4.6 (G)	1,300	410	51	590	1,600	0.65	0.71	3.1	0.59 J	1.4 J
CADMIUM	7440-43-9	6.0	1.6 (G,X)	1,700	550	6.0	2,200	2,100	0.13 J	0.17 J	4.0	--	--
CALCIUM	7440-70-2	NA	NA	NA	NA	NA	NA	NA	3580 J	4150 J	51200 J	--	--
CHROMIUM	7440-47-3	1,000,000 (D,H)	1,200,000 (G,H,X)	330,000 (H)	790,000 (H)	1,000,000 (D,H)	150,000 (H)	1,000,000 (D,H)	1.7	2.2	23.1	4.5 J	<11 UJ
COBALT	7440-48-4	0.8	2.0	13,000	2,600	2.0	5,900	9,000	0.89 J	1.2 J	5.6 J	9.4 J	0.44 J
COPPER	7440-50-8	5,800	32 (G)	130,000	20,000	5,800	59,000	73,000	23.6 J	30 J	234 J	360 J	47 J
IRON	7439-89-6	12,000 (B)	NA	ID	160,000	12,000 (B)	ID	580,000	2300 J	2790 J	16400 J	--	--
LEAD	7439-92-1	700	1,900 (G,X)	100,000	400	700	44,000	900 (DD)	4.6	5.9	506	48 J	17 J
LITHIUM	7439-93-2	9.8 (B)	9.8 (B)	2,300,000	4,200 (DD)	9.8 (B)	1,000,000	31,000 (DD)	--	--	--	7.3	11
MAGNESIUM	7439-95-4	8,000	NA	6,700,000	1,000,000 (D)	22,000	2,900,000	1,000,000 (D)	198 J	306 J	1920	--	--
MANGANESE	7439-96-5	440 (B)	440 (B,G,X)	3,300	25,000	440 (B)	1,500	90,000	18.9 J	22 J	2920 J	390	17
MERCURY	7439-97-6	1.7 (Z)	0.13 (B, Z)	20000 (Z)	160 (Z)	1.7 (Z)	8800 (Z)	580 (Z)	<0.1 UJ	<0.1 UJ	<0.1 UJ	0.052	0.0047 J
NICKEL	7440-02-0	100	29 (G)	13,000	40,000	100	16,000	150,000	2.1 J	3.1 J	16.7	30 J	1.2 J
POTASSIUM	7440-09-7	NA	NA	NA	NA	NA	NA	NA	<500 U	<500 U	2200	--	--
SELENIUM	7782-49-2	4.0	0.41 (B)	130,000	2,600	4.0	59,000	9,600	<3.5 U	<3.5 U	0.95 J	--	--
SILVER	7440-22-4	4.5	1.0 (M)	6,700	2,500	13	2,900	9,000	<1.00 U	<1.00 U	0.72 J	1.7 J	0.18 J
SODIUM	7440-23-5	NA	NA	NA	NA	NA	NA	NA	384 J	390 J	845	--	--
STRONTIUM	7440-24-6	92	420	ID	330,000	260	ID	1,000,000 (D)	--	--	--	<250 U	440
VANADIUM	7440-62-2	72	430	ID	750 (DD)	990	ID	5,500 (DD)	9.4 J	11.1 J	38.5 J	--	--
ZINC	7440-66-6	2,400	62 (G)	ID	170,000	5,000	ID	630,000	8.9 J	10.6 J	563 J	95	14
Inorganics - Cyanide (mg/kg)													
CYANIDE (P,R)	57-12-5	4.0	0.1	250	12	4.0	250	250	<0.5 U	<0.5 U	1.9	--	--
Organics - PCBs													
									ND	ND	ND	ND	ND
Organics - SVOCs (ug/kg)													
2-METHYLNAPHTHALENE (SVOC)	91-57-6S	57,000	4,200	6.7E+08	8,100,000	170,000	2.9E+08	2.6E+07	<170 U	<170 U	<170 U	--	--
ACETOPHENONE	98-86-2	30,000	ID	3.3E+10	4.7E+07 (C)	88,000	1.4E+10	1.5E+08 (C)	<170 U	<170 U	<170 U	--	--
BENZALDEHYDE	100-52-7	NA	NA	NA	NA	NA	NA	NA	<170 U	<170 U	<170 U	--	--
BENZO(A)ANTHRACENE (Q)	56-55-3	NLL	NLL	ID	20,000	NLL	ID	80,000	<170 U	<170 U	<170 U	--	--
BENZO(A)PYRENE (Q)	50-32-8	NLL	NLL	1,500,000	2,000	NLL	1,900,000	8,000	<170 U	<170 U	<170 U	--	--
BENZO(B)FLUORANTHENE (Q)	205-99-2	NLL	NLL	ID	20,000	NLL	ID	80,000	<170 U	<170 U	<170 U	--	--
BENZO(G,H,I)PERYLENE (Q)	191-24-2	NLL	NLL	8E+08	2,500,000	NLL	3.5E+08	7,000,000	<170 U	<170 U	<170 U	--	--
BENZO(K)FLUORANTHENE (Q)	207-08-9	NLL	NLL	ID	200,000	NLL	ID	800,000	<170 U	<170 U	<170 U	--	--
CHRYSENE (Q)	218-01-9	NLL	NLL	ID	2,000,000	NLL	ID	8,000,000	<170 U	<170 U	<170 U	--	--
FLUORANTHENE	206-44-0	730,000	5,500	9.3E+09	4.6E+07	730,000	4.1E+09	1.3E+08	<170 U	<170 U	<170 UJ	--	--
INDENO(1,2,3-CD)PYRENE	193-39-5	NLL	NLL	ID	20,000	NLL	ID	80,000	<170 U	<170 U	<170 U	--	--
NAPHTHALENE (SVOC)	91-20-3S	35,000	730	2E+08	1.6E+07	100,000	8.8E+07	5.2E+07	<170 U	<170 U	<170 U	--	--
PHENANTHRENE	85-01-8	56,000	2,100	6,700,000	1,600,000	160,000	2,900,000	5,200,000	<170 U	<170 U	<170 U	--	--
PYRENE	129-00-0	480,000	ID	6.7E+09	2.9E+07	480,000	2.9E+09	8.4E+07	<170 U	<170 U	<170 U	--	--

Note: Analytical and Criteria Footnotes are included on the last page of the table.

DETAILED FINDINGS REPORT
TORCH LAKE BACKWATER AREA

TABLE 5-1
Sample Analytical Summary - Soil
Torch Lake Backwater Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Soil Table Footnotes:

- MDEQ Part 201 residential and non-residential generic cleanup criteria and screening levels criteria were originally promulgated December 21, 2002 within the Administrative Rules for Part 201, Environmental Remediation, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. This table reflects revisions to the criteria pursuant to the December 2010 Part 201 amendments and new criteria consistent with the provisions of R299.5706a.Remediation, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. Release Date: December 30, 2013.
- Only detected analytes are listed - Gray rows indicate requested analyses. If no analytes are listed below a gray row then all analytes of that group were either not analyzed or not detected. ND indicates that one or more analyte of that goup was tested and not detected and a -- indicates not analyzed.
- **Bold** values are concentrations detected above the laboratory reporting limit.
- **Shaded values indicate analyte concentration exceed applicable criteria. Color presented is the criteria with the highest value that was exceeded:**

Residential Drinking Water Protection Criteria
Groundwater Surface Water Interface Protection Criteria
Residential Particulate Soil Inhalation Criteria
Residential Direct Contact Criteria
Nonresidential Drinking Water Protection Criteria
Nonresidential Particulate Soil Inhalation Criteria
Nonresidential Direct Contact Criteria

-- = Not analyzed/Not Reported
bgs = Below ground surface
ft = Feet
in = Inches
mg/kg = Milligrams per kilogram.
PCBs = Polychlorinated biphenyls
SVOC = Semi-volatile organic compound
ug/kg = Micrograms per kilogram

Criteria Footnotes

- ID = Insufficient data to develop criterion.
- NA = A criterion or value is not available
- NLL = Hazardous substance is not likely to leach under most soil conditions.
- NLV = Hazardous substance is not likely to volatilize under most conditions.
- (B) = Background, as defined in R 299.1(b), may be substituted if higher than the calculated cleanup criterion. Background levels may be less than criteria for some inorganic compounds.
- (BB) = The state drinking water standard for asbestos (fibers greater than 10 micrometers in length) is in units of a million fibers per liter of water (MFL). Soil concentrations of asbestos are determined by polarized light microscopy.
- (C) = The criterion developed under R 299.20 to R 299.26 exceeds the chemical- specific soil saturation screening level (Csat). The person proposing or implementing response activity shall document whether additional response activity is required to control free-phase liquids or NAPL to protect against risks associated with free-phase liquids by using methods appropriate for the free-phase liquids present. Development of a site-specific Csat or methods presented in R 299.22, R 299.24(5), and R 299.26(8) may be conducted for the relevant exposure pathways.
- (D) = Calculated criterion exceeds 100 percent, hence it is reduced to 100 percent or 1.0E+9 parts per billion (ppb).
- (DD) = Hazardous substance causes developmental effects. Residential direct contact criteria are protective of both prenatal and postnatal exposure. Nonresidential direct contact criteria are protective for a pregnant adult receptor.
- (G) = Groundwater surface water interface (GSI) criterion depends on the pH or water hardness, or both, of the receiving surface water. The final chronic value (FCV) for the protection of aquatic life shall be calculated based on the pH or hardness of the receiving surface water. Where water hardness exceeds 400 mg CaCO3/L, use 400 mg CaCO3/L for the FCV calculation. The FCV formula provides values in units of ug/L or ppb. The generic GSI criterion is the lesser of the calculated FCV, the wildlife value (WV), and the surface water human non-drinking water value (HNDV). The soil GSI protection criteria for these hazardous substances are the greater of the 20 times the GSI criterion or the GSI soil-water partition values using the GSI criteria developed with the procedure described in this footnote. A spreadsheet that may be used to calculate GSI and GSI protection criteria for (G)-footnoted hazardous substances is available on the Department of Environmental Quality (DEQ) internet web site.
- (H) = Valence-specific chromium data (Cr III and Cr VI) shall be compared to the corresponding valence-specific cleanup criteria. If both Cr III and Cr VI are present in groundwater, the total concentration of both cannot exceed the drinking water criterion of 100 ug/L. If analytical data are provided for total chromium only, they shall be compared to the cleanup criteria for Cr VI. Cr III soil cleanup criterion for protection
- (I) = Hazardous substance may exhibit the characteristic of ignitability as defined in 40 C.F.R. §261.21 (revised as of July 1, 2001), which is adopted by reference in these rules and is available for inspection at the DEQ, 525 West Allegan Street, Lansing, Michigan. Copies of the regulation may be purchased, at a cost as of the time of adoption of these rules of \$45, from the Superintendent of documents, Government Printing Office, Washington, DC 20401 (stock number 869-044-00155-1), or from the DEQ, Remediation and Redevelopment Division (RRD), 525 West Allegan Street, Lansing, Michigan 48933, at cost.
- (J) = Hazardous substance may be present in several isomer forms. Isomer-specific concentrations shall be added together for comparison to criteria.
- (M) = Calculated criterion is below the analytical target detection limit, therefore, the criterion defaults to the target detection limit.
- (P) = Amenable cyanide methods or method OIA-1677 shall be used to quantify cyanide concentrations for compliance with all groundwater criteria. Total cyanide methods or method OIA-1677 shall be used to quantify cyanide concentrations for compliance with soil criteria. Nonresidential direct contact criteria may not be protective of the potential for release of hydrogen cyanide gas. Additional land or resource use restrictions may be necessary to protect for the acute inhalation concerns associated with hydrogen cyanide gas.
- (Q) = Criteria for carcinogenic polycyclic aromatic hydrocarbons were developed using relative potential potencies to benzo(a)pyrene.
- (R) = Hazardous substance may exhibit the characteristic of reactivity as defined in 40 C.F.R. §261.23 (revised as of July 1, 2001), which is adopted by reference in these rules and is available for inspection at the DEQ, 525 West Allegan Street, Lansing, Michigan. Copies of the regulation may be purchased, at a cost as of the time of adoption of these rules of \$45, from the Superintendent of Documents, Government Printing Office, Washington, DC 20401 (stock number 869-044-00155-1), or from the DEQ, RRD, 525 West Allegan Street, Lansing, Michigan 48933, at cost.
- (T) = Refer to the federal Toxic Substances Control Act (TSCA), 40 C.F.R. §761, Subpart D and 40 C.F.R. §761, Subpart G, to determine the applicability of TSCA cleanup standards. Subpart D and Subpart G of 40 C.F.R. §761 (July 1, 2001) are adopted by reference in these rules and are available for inspection at the DEQ, 525 West Allegan Street, Lansing, Michigan. Copies of the regulations may be purchased, at a cost as of the time of adoption of these rules of \$55, from the Superintendent of Documents, Government Printing Office, Washington, DC 20401, or from the DEQ, RRD, 525 West Allegan Street, Lansing, Michigan 48933, at cost. Alternatives to compliance with the TSCA standards listed below are possible under 40 C.F.R. §761 Subpart D. New releases may be subject to the standards identified in 40 C.F.R. §761, Subpart G. Use Part 201 soil direct contact cleanup criteria in the published table if TSCA standards are not applicable.
- (X) = The GSI criterion shown in the generic cleanup criteria tables is not protective for surface water that is used as a drinking water source. (See R 299.49 Footnotes for generic cleanup criteria tables for additional information.)
- (Z) = Mercury is typically measured as total mercury. The generic cleanup criteria, however, are based on data for different species of mercury. Specifically, data for elemental mercury, chemical abstract service (CAS) number 7439976, serve as the basis for the soil volatilization to indoor air criteria, groundwater volatilization to indoor air, and soil inhalation criteria. Data for methyl mercury, CAS number 22967926, serve as the basis for the GSI criterion; and data for mercuric chloride, CAS number 7487947, serve as the basis for the drinking water, groundwater contact, soil direct contact, and the groundwater protection criteria. Comparison to criteria shall be based on species-specific analytical data only if sufficient facility characterization has been conducted to rule out the presence of other species of mercury.

Laboratory Footnotes

J = Estimated result
ND = Not detected
U = Analyte analyzed for but not detected above the reported sample reporting limit.

TABLE 5-2
Sample Analytical Summary - Groundwater
Torch Lake Backwater Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

DETAILED FINDINGS REPORT
TORCH LAKE BACKWATER AREA

Station Name	CAS Number	Residential Drinking Water Criteria	Nonresidential Drinking Water Criteria	Groundwater Surface Water Interface Criteria	Residential Groundwater Volatilization to Indoor Air Inhalation Criteria	Nonresidential Groundwater Volatilization to Indoor Air Inhalation Criteria	Water Solubility	Flammability and Explosivity Screening Level	CHLL-GW01	CHLL-GW39	CHLL-GW70	MW-01	MW-02	MW-03
Field Sample ID									CHLL-GW 01 7'-12'	CHLL-GW 39 8'-13	CHLL-GW-70-40-45'	MW-01	MW-02	MW-03
Sample Date									6/13/2014	6/15/2014	5/13/2015	10/12/2011	10/12/2011	10/12/2011
Sample Interval (bgs)									7 - 12 ft	8 - 13 ft	40 - 45 ft	7.42 - 12.42 ft	1.3 - 6.3 ft	2.06 - 7.06 ft
Sample Description									--	--	--	--	--	--
Inorganics - Metals (ug/l)														
ALUMINIUM	7429-90-5	50 (V)	50 (V)	NA	NLV	NLV	NA	ID	--	--	100000	2240	1020	453
ARSENIC	7440-38-2	10 (A)	10 (A)	10	NLV	NLV	NA	ID	--	--	<20 U	3.6 J	<10 U	<10 U
BARIUM	7440-39-3	2,000 (A)	2,000 (A)	200 (G)	NLV	NLV	NA	ID	--	--	390	<200 UJ	<200 UJ	<200 UJ
BERYLLIUM	7440-41-7	4.0 (A)	4.0 (A)	0.36 (G)	NLV	NLV	NA	ID	--	--	<20 U	0.75 J	<5 U	<5 U
CADMIUM	7440-43-9	5.0 (A)	5.0 (A)	1.3 (G,X)	NLV	NLV	NA	ID	--	--	0.4	1.3 J	1 J	0.48 J
CALCIUM	7440-70-2	NA	NA	NA	NA	NA	NA	NA	--	--	--	10800 J+	42300 J+	39200 J+
CHROMIUM	7440-47-3	100 (A)	100 (A)	40 (G,X)	NLV	NLV	NA	ID	--	--	360	<10 U	<10 U	<10 U
COBALT	7440-48-4	40	100	100	NLV	NLV	NA	ID	--	--	130	1.1 J	<50 U	<50 U
COPPER	7440-50-8	1,000 (E)	1,000 (E)	4.7 (G)	NLV	NLV	NA	ID	--	--	570	15.8 J	26.7	34
IRON	7439-89-6	300 (E)	300 (E)	NA	NLV	NLV	NA	ID	--	--	130000	24400	17000	7800
LEAD	7439-92-1	4.0 (L)	4.0 (L)	11 (G,X)	NLV	NLV	NA	ID	--	--	78	2.4 J	2.9 J	2.1 J
LITHIUM	7439-93-2	170	350	440	NLV	NLV	NA	ID	--	--	150	--	--	--
MAGNESIUM	7439-95-4	400,000	1,100,000	NA	NLV	NLV	NA	ID	--	--	89000	<5000 UJ	<5000 UJ	<5000 UJ
MANGANESE	7439-96-5	50 (E)	50 (E)	1,000 (G,X)	NLV	NLV	NA	ID	--	--	2500	199 J	194 J	562 J
MERCURY	7439-97-6	2.0 (A)	2.0 (A)	0.0013	56 (S)	56 (S)	56	ID	--	--	<0.2 U	0.099 J	<0.2 U	<0.2 U
NICKEL	7440-02-0	100 (A)	100 (A)	28 (G)	NLV	NLV	NA	ID	--	--	380	4.8 J	2.4 J	1.2 J
POTASSIUM	7440-09-7	NA	NA	NA	NA	NA	NA	NA	--	--	--	<5000 U	5340	<5000 U
SILVER	7440-22-4	34	98	0.2 (M)	NLV	NLV	NA	ID	--	--	0.3	<10 U	<10 U	<10 U
SODIUM	7440-23-5	230, 000 (HH)	350,000	NA	NLV	NLV	NA	ID	--	--	--	46400 J+	<5000 U	5080 J+
ZINC	7440-66-6	2,400	5,000 (E)	63 (G)	NLV	NLV	NA	ID	--	--	620	<60 U	<60 U	<60 U
Inorganics - Cyanide (ug/l)														
									--	--	--	ND	ND	ND
Organics - PCBs (ug/l)														
									ND	ND	ND	ND	ND	ND
Organics - SVOCs (ug/l)														
									ND	--	ND	ND	ND	ND
Organics - VOCs (ug/l)														
1,1-DICHLOROETHYLENE	75-35-4	7.0 (A,I)	7.0 (A,I)	130 (I)	200 (I)	1,300 (I)	2,250,000 (I)	97,000 (I)	<1.0 UJ	--	<1.0 U	0.58 J	<5 U	0.55 J
CARBON DISULFIDE	75-15-0	800 (I,R)	2,300 (I,R)	ID	250,000 (I,R)	550,000 (I,R)	1,190,000 (I,R)	13,000 (I,R)	<1.0 UJ	--	<1.0 U	0.11 J	<5 U	<5 U
DICHLORODIFLUOROMETHANE (CFC-12)	75-71-8	1,700	4,800	ID	220,000	300,000 (S)	300,000	ID	<5.0 UJ	--	<5.0 U	0.32 J	<5 U	<5 U
Other (mg/l)														
AMMONIA	7664-41-7	10 (N)	10 (N)	(CC)	3,200	7,100	530,000	ID	--	--	--	--	--	2.1
COD	COD	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	30
TOC	7440-44-0	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	12
TOTAL KJELDAHL NITROGEN	TKN	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	2.7
TOTAL PHOSPHORUS	7723-14-0	63	240	1 (EE)	NLV	NLV	NA	ID	--	--	--	--	--	0.52
Field Measurements														
Conductivity (mS/cm)	NA	NA	NA	NA	NA	NA	NA	NA	0.75	0.318	--	--	--	--
DO (%)	NA	NA	NA	NA	NA	NA	NA	NA	6.4	1.8	--	--	--	--
pH	NA	NA	NA	NA	NA	NA	NA	NA	7.09	6.92	--	--	--	--
Temperature (°C)	NA	NA	NA	NA	NA	NA	NA	NA	8.2	7.5	--	--	--	--

Note: Analytical and Criteria Footnotes
are included on the last page of the table.

DETAILED FINDINGS REPORT
TORCH LAKE BACKWATER AREA

TABLE 5-2
Sample Analytical Summary - Groundwater
Torch Lake Backwater Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Groundwater Table Footnotes:

- MDEQ Part 201 residential and non-residential generic cleanup criteria and screening levels criteria were originally promulgated December 21, 2002 within the Administrative Rules for Part 201, Environmental Remediation, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. This table reflects revisions to the criteria pursuant to the December 2010 Part 201 amendments and new criteria consistent with the provisions of R299.5706a.Remediation, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. Release Date: December 30, 2013.
- Only detected analytes are listed - Gray rows indicate requested analyses. If no analytes are listed below a gray row then all analytes of that group were either not analyzed or not detected. ND indicates that one or more analyte of that group was tested and not detected and a – indicates not analyzed.
- Bold values are concentrations detected above the reporting limit.
- Shaded values indicate analyte concentration exceed applicable criteria. Color presented is the criteria below with the highest value that was exceeded:

Residential Drinking Water Criteria
Nonresidential Drinking Water Criteria
Groundwater Surface Water Interface Criteria
Residential Groundwater Volatilization to Indoor Air Inhalation Criteria
Nonresidential Groundwater Volatilization to Indoor Air Inhalation Criteria
Water Solubility
Flammability and Explosivity Screening Level

-- = Not analyzed/Not reported
bgs = Below ground surface
DO = Dissolved oxygen
ft = Feet
mg/l = Milligrams per liter
PCBs = Polychlorinated biphenyls
SVOC = Semi-volatile organic compound
ug/l = Micrograms per liter
VOC = Volatile organic compound
°C = Degrees Celsius
mS/cm = MilliSiemens per centimeter
% = Percent

Groundwater Table Footnotes:

- ID = Insufficient data to develop criterion.
NA = A criterion or value is not available
NLL = Hazardous substance is not likely to leach under most soil conditions.
NLV = Hazardous substance is not likely to volatilize under most conditions.
(A) Criterion is the state of Michigan drinking water standard established pursuant to Section 5 of 1976 PA 399, MCL 325.1005.
(BB) = The state drinking water standard for asbestos (fibers greater than 10 micrometers in length) is in units of a million fibers per liter of water (MFL). Soil concentrations of asbestos are determined by polarized light microscopy.
(D) = Calculated criterion exceeds 100 percent, hence it is reduced to 100 percent or 1.0E+9 parts per billion (ppb).
(E) = Criterion is the aesthetic drinking water value, as required by Section 20120a(5) of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA). A notice of aesthetic impact may be employed as an institutional control mechanism if groundwater concentrations exceed the aesthetic drinking water criterion, but do not exceed the applicable health-based drinking water value provided in a table available on the Department of Environmental Quality (DEQ) internet web site. (See R 299.49 Footnotes for generic cleanup criteria tables for additional information)
(G) = Groundwater surface water interface (GSI) criterion depends on the pH or water hardness, or both, of the receiving surface water. The final chronic value (FCV) for the protection of aquatic life shall be calculated based on the pH or hardness of the receiving surface water. Where water hardness exceeds 400 mg CaCO3/L, use 400 mg CaCO3/L for the FCV calculation. The FCV formula provides values in units of ug/L or ppb. The generic GSI criterion is the lesser of the calculated FCV, the wildlife value (WV), and the surface water human non-drinking water value (HNDV). The soil GSI protection criteria for these hazardous substances are the greater of the 20 times the GSI criterion or the GSI soil-water partition values using the GSI criteria developed with the procedure described in this footnote. A spreadsheet that may be used to calculate GSI and GSI protection criteria for (G)-footnoted hazardous substances is available on the Department of Environmental Quality (DEQ) internet web site.
(H) = Valence-specific chromium data (Cr III and Cr VI) shall be compared to the corresponding valence-specific cleanup criteria. If both Cr III and Cr VI are present in groundwater, the total concentration of both cannot exceed the drinking water criterion of 100 ug/L. If analytical data are provided for total chromium only, they shall be compared to the cleanup criteria for Cr VI. Cr III soil cleanup
(HH) = The residential criterion for sodium is 230,000 ug/l in accordance with the Sodium Advisory Council recommendation and revised Groundwater Discharge Standards.
(I) = Hazardous substance may exhibit the characteristic of ignitability as defined in 40 C.F.R. §261.21 (revised as of July 1, 2001), which is adopted by reference in these rules and is available for inspection at the DEQ, 525 West Allegan Street, Lansing, Michigan. Copies of the regulation may be purchased, at a cost as of the time of adoption of these rules of \$45, from the Superintendent of documents, Government Printing Office, Washington, DC 20401 (stock number 869-044-00155-1), or from the DEQ, Remediation and Redevelopment Division (RRD), 525 West Allegan Street, Lansing, Michigan 48933, at cost.
(J) = Hazardous substance may be present in several isomer forms. Isomer-specific concentrations shall be added together for comparison to criteria.
(L) = Criteria for lead are derived using a biologically based model, as allowed for under Section 20120a(9) of the NREPA, and are not calculated using the algorithms and assumptions specified in pathway-specific rules. The generic residential drinking water criterion of 4 ug/L is linked to the generic residential soil direct contact criterion of 400 mg/kg. A higher concentration in the drinking water, up to the state action level of 15 ug/L, may be allowed as a site-specific remedy and still allow for drinking water use, under Section 20120a(2) and 20120b of the NREPA if soil concentrations are appropriately lower than 400 mg/kg. If a site-specific criterion is approved based on this subdivision, a notice shall be filed on the deed for all property where the groundwater concentrations will exceed 4 ug/L to provide notice of the potential for unacceptable risk if soil or groundwater concentrations increase. Acceptable combinations of site-specific soil and drinking water concentrations are presented in a table available on the Department of Environmental Quality (DEQ) internet web site (See R 299.49 Footnotes for generic cleanup criteria tables for additional information).
(M) = Calculated criterion is below the analytical target detection limit, therefore, the criterion defaults to the target detection limit.
(N) = The concentrations of all potential sources of nitrate-nitrogen (e.g., ammonia-N, nitrite-N, nitrate-N) in groundwater that is used as a source of drinking water shall not, when added together, exceed the nitrate drinking water criterion of 10,000 ug/L. Where leaching to groundwater is a relevant pathway, soil concentrations of all potential sources of nitrate-nitrogen shall not, when added together, exceed the nitrate drinking water protection criterion of 2.0E+5 ug/kg.
(P) = Amenable cyanide methods or method OIA-1677 shall be used to quantify cyanide concentrations for compliance with all groundwater criteria. Total cyanide methods or method OIA-1677 shall be used to quantify cyanide concentrations for compliance with soil criteria. Nonresidential direct contact criteria may not be protective of the potential for release of hydrogen cyanide gas. Additional land or resource use restrictions may be necessary to protect for the acute inhalation concerns associated with hydrogen cyanide gas.
(Q) = Criteria for carcinogenic polycyclic aromatic hydrocarbons were developed using relative potential potencies to benzo(a)pyrene.
(R) = Hazardous substance may exhibit the characteristic of reactivity as defined in 40 C.F.R. §261.23 (revised as of July 1, 2001), which is adopted by reference in these rules and is available for inspection at the DEQ, 525 West Allegan Street, Lansing, Michigan. Copies of the regulation may be purchased, at a cost as of the time of adoption of these rules of \$45, from the Superintendent of Documents, Government Printing Office, Washington, DC 20401 (stock number 869-044-00155-1), or from the DEQ, RRD, 525 West Allegan Street, Lansing, Michigan 48933, at cost.
(S) = Criterion defaults to the hazardous substance-specific water solubility limit.
(T) = Refer to the federal Toxic Substances Control Act (TSCA), 40 C.F.R. §761, Subpart D and 40 C.F.R. §761, Subpart G, to determine the applicability of TSCA cleanup standards. Subpart D and Subpart G of 40 C.F.R. §761 (July 1, 2001) are adopted by reference in these rules and are available for inspection at the DEQ, 525 West Allegan Street, Lansing, Michigan. Copies of the regulations may be purchased, at a cost as of the time of adoption of these rules of \$55, from the Superintendent of Documents, Government Printing Office, Washington, DC 20401, or from the DEQ, RRD, 525 West Allegan Street, Lansing, Michigan 48933, at cost. Alternatives to compliance with the TSCA standards listed below are possible under 40 C.F.R. §761 Subpart D. New releases may be subject to the standards identified in 40 C.F.R. §761, Subpart G. Use Part 201 soil direct contact cleanup criteria in the published table if TSCA standards are not applicable.
(V) = Criterion is the aesthetic drinking water value as required by Section 20120(a)(5) of the NREPA. Concentrations up to 200 ug/L may be acceptable, and still allow for drinking water use, as part of a site-specific cleanup under Section 20120a(2) and 20120b of the NREPA.
(X) = The GSI criterion shown in the generic cleanup criteria tables is not protective for surface water that is used as a drinking water source. (See R 299.49 Footnotes for generic cleanup criteria tables for additional information.)
(Z) = Mercury is typically measured as total mercury. The generic cleanup criteria, however, are based on data for different species of mercury. Specifically, data for elemental mercury, chemical abstract service (CAS) number 7439976, serve as the basis for the soil volatilization to indoor air criteria, groundwater volatilization to indoor air, and soil inhalation criteria. Data for methyl mercury, CAS number 22967926, serve as the basis for the GSI criterion; and data for mercuric chloride, CAS number 7487947, serve as the basis for the drinking water, groundwater contact, soil direct contact, and the groundwater protection criteria. Comparison to criteria shall be based on species-specific analytical data only if sufficient facility characterization has been conducted to rule out the presence of other species of mercury.

Laboratory Footnotes:

ND = Not detected
J = Estimated result
U = Analyte analyzed for but not detected above the reported sample reporting limit.

DETAILED FINDINGS REPORT
TORCH LAKE BACKWATER AREA

TABLE 5-3
Sample Analytical Summary - Sediment
Torch Lake Backwater Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Station Name	CAS Number	EPA Region 5 Ecological Screening Level	Threshold Effect Concentration (TEC)	Probable Effect Concentration (PEC)	CHLL-SD01			CHLL-SD02		CHLL-SD03	
Field Sample ID					CHLL-SD-01-0-6"	CHLL-SD-01-1'-3'	CHLL-SD-01-3'-3.75'	CHLL-SD-02-0-6"	CHLL-SD-02-1'-1.5'	CHLL-SD-03-0-6"	CHLL-SD-03-1'-1.5'
Sample Date					5/29/2015	5/29/2015	5/29/2015	5/29/2015	5/29/2015	5/29/2015	5/29/2015
Sample Interval (bgs)					0 - 0.5 ft	1 - 3 ft	3 - 3.75 ft	0 - 0.5 ft	1 - 1.5 ft	0 - 0.5 ft	1 - 1.5 ft
Sample Description					SILT, Dark Brown to Black	SILT, Dark Brown to Black	SILT, Reddish-Brown	SILT, Dark Brown to Black, wood debris	SILT, Reddish-Brown, wood debris	SAND, Dark Brown to Black, fine to medium grained, silty	SAND, Tan, fine to medium grained
Inorganics - Metals (mg/kg)											
ALUMINUM	7429-90-5	NA	NA	NA	19000	--	--	14000	--	2100	--
ANTIMONY	7440-36-0	NA	NA	NA	0.7	--	--	0.5	--	<0.3 U	--
ARSENIC	7440-38-2	9.79	9.79	33.0	6.1	--	--	6.6	--	1.0	--
BARIUM	7440-39-3	NA	NA	NA	140	--	--	110	--	12	--
BERYLLIUM	7440-41-7	NA	NA	NA	0.9	--	--	0.9	--	<0.4 U	--
CADMIUM	7440-43-9	0.99	0.99	4.98	0.9	--	--	0.7	--	<0.2 U	--
CALCIUM	7440-70-2	NA	NA	NA	--	--	--	--	--	--	--
CHROMIUM	7440-47-3	43.4	43.4	111	37	--	--	31	--	6.0	--
COBALT	7440-48-4	50	NA	NA	15	--	--	14	--	2.5	--
COPPER	7440-50-8	31.6	31.6	149	1700	--	--	1600	--	210	--
IRON	7439-89-6	NA	NA	NA	41000	--	--	35000	--	7400	--
LEAD	7439-92-1	35.8	35.8	128	74	--	--	56	--	3.5	--
LITHIUM	7439-93-2	NA	NA	NA	17	--	--	13	--	2.0	--
MAGNESIUM	7439-95-4	NA	NA	NA	12000	--	--	10000	--	1600	--
MANGANESE	7439-96-5	NA	NA	NA	490	--	--	430	--	64	--
MERCURY	7439-97-6	0.174	0.18	1.06	0.6	--	--	0.4	--	<0.08 U	--
NICKEL	7440-02-0	22.7	22.7	48.6	34	--	--	30	--	4.8	--
SELENIUM	7782-49-2	NA	NA	NA	0.6	--	--	0.6	--	<0.4 U	--
SILVER	7440-22-4	0.5	NA	NA	1.8	--	--	2.1	--	0.2	--
SODIUM	7440-23-5	NA	NA	NA	--	--	--	--	--	--	--
VANADIUM	7440-62-2	NA	NA	NA	--	--	--	--	--	--	--
ZINC	7440-66-6	121	121	459	230	--	--	190	--	25	--
Inorganics - Cyanide (mg/kg)											
CYANIDE	57-12-5	0.0001	NA	NA	0.83	--	--	0.56	--	<0.17 U	--
Organics - PCBs (ug/kg)											
					ND	ND	ND	ND	ND	ND	ND
Organics - SVOCs (ug/kg)											
BENZO(A)ANTHRACENE	56-55-3	108	108	1,050	--	<8600 U	--	--	<1300 U	--	<640 U
BENZO(A)PYRENE	50-32-8	150	150	1,450	--	<17000 U	--	--	<2600 U	--	<1300 U
BENZO(B)FLUORANTHENE	205-99-2	10,400	NA	NA	--	<17000 U	--	--	<2600 U	--	<1300 U
BENZO(G,H,I)PERYLENE	191-24-2	170	NA	NA	--	<17000 U	--	--	<2600 U	--	<1300 U
BENZO(K)FLUORANTHENE	207-08-9	240	NA	NA	--	<17000 U	--	--	<2600 U	--	<1300 U
CHRYSENE	218-01-9	166	166	1,290	--	<8600 U	--	--	<1300 U	--	<640 U
FLUORANTHENE	206-44-0	423	423	2,230	--	<8600 U	--	--	<1300 U	--	<640 U
PHENANTHRENE	85-01-8	204	204	1,170	--	<8600 U	--	--	<1300 U	--	<640 U
PYRENE	129-00-0	195	195	1,520	--	<8600 U	--	--	<1300 U	--	<640 U

Note: Analytical and Criteria Footnotes
are included on the last page of the table.

DETAILED FINDINGS REPORT
TORCH LAKE BACKWATER AREA

TABLE 5-3
Sample Analytical Summary - Sediment
Torch Lake Backwater Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Station Name	CAS Number	EPA Region 5 Ecological Screening Level	Threshold Effect Concentration (TEC)	Probable Effect Concentration (PEC)	CHLL-SD04			CHLL-SD06		SD-02
Field Sample ID					CHLL-SD-04-0-6"	CHLL-SD-04-1-3'	CHLL-SD-04-3'-4'	CHLL-SD-06-0-6"	CHLL-SD-06-1'-1.25'	SD-02
Sample Date					5/29/2015	5/29/2015	5/29/2015	5/29/2015	5/29/2015	10/12/2011
Sample Interval (bgs)					0 - 0.5 ft	1 - 3 ft	3 - 4 ft	0 - 0.5 ft	1 - 1.25 ft	0 - 2 in
Sample Description					SILT, Dark Brown to Black	SILT, Dark Brown to Black to 2.2 ft; SILT, Reddish-Brown	SILT, Reddish-Brown	SAND, Dark Brown to Black, fine to medium grained, silty	SAND, Tan, fine to medium grained, silt stringers at 0.7' and 1'	--
Inorganics - Metals (mg/kg)										
ALUMINUM	7429-90-5	NA	NA	NA	16000	--	--	2400	--	1270
ANTIMONY	7440-36-0	NA	NA	NA	0.4	--	--	<0.3 U	--	2.1 J
ARSENIC	7440-38-2	9.79	9.79	33.0	5.1	--	--	<1.0 U	--	5.8 J-
BARIUM	7440-39-3	NA	NA	NA	110	--	--	11	--	29.7
BERYLLIUM	7440-41-7	NA	NA	NA	<2.0 U	--	--	<0.4 U	--	0.57
CADMIUM	7440-43-9	0.99	0.99	4.98	0.6	--	--	<0.2 U	--	1.9
CALCIUM	7440-70-2	NA	NA	NA	--	--	--	--	--	1060
CHROMIUM	7440-47-3	43.4	43.4	111	32	--	--	6.8	--	12.9
COBALT	7440-48-4	50	NA	NA	14	--	--	3.2	--	3.9 J
COPPER	7440-50-8	31.6	31.6	149	1100	--	--	150	--	131
IRON	7439-89-6	NA	NA	NA	32000	--	--	7100	--	33500
LEAD	7439-92-1	35.8	35.8	128	51	--	--	5.3	--	137
LITHIUM	7439-93-2	NA	NA	NA	18	--	--	2.7	--	--
MAGNESIUM	7439-95-4	NA	NA	NA	9100	--	--	1900	--	686
MANGANESE	7439-96-5	NA	NA	NA	440	--	--	63	--	154
MERCURY	7439-97-6	0.174	0.18	1.06	0.2	--	--	<0.07 U	--	0.042 J
NICKEL	7440-02-0	22.7	22.7	48.6	31	--	--	6.1	--	13.9
SELENIUM	7782-49-2	NA	NA	NA	<2.0 U	--	--	<0.4 U	--	<3.5 U
SILVER	7440-22-4	0.5	NA	NA	1.3	--	--	0.2	--	<1 U
SODIUM	7440-23-5	NA	NA	NA	--	--	--	--	--	274 J
VANADIUM	7440-62-2	NA	NA	NA	--	--	--	--	--	12.6
ZINC	7440-66-6	121	121	459	180	--	--	33	--	108
Inorganics - Cyanide (mg/kg)										
CYANIDE	57-12-5	0.0001	NA	NA	0.37	--	--	<0.13 U	--	<0.5 UJ
Organics - PCBs (ug/kg)										
					ND	ND	ND	ND	ND	ND
Organics - SVOCs (ug/kg)										
BENZO(A)ANTHRACENE	56-55-3	108	108	1,050	--	<1000 U	--	--	<660 U	180 J
BENZO(A)PYRENE	50-32-8	150	150	1,450	--	<2100 U	--	--	<1300 U	180 J
BENZO(B)FLUORANTHENE	205-99-2	10,400	NA	NA	--	<2100 U	--	--	<1300 U	140 J
BENZO(G,H,I)PERYLENE	191-24-2	170	NA	NA	--	<2100 U	--	--	<1300 U	130 J
BENZO(K)FLUORANTHENE	207-08-9	240	NA	NA	--	<2100 U	--	--	<1300 U	140 J
CHRYSENE	218-01-9	166	166	1,290	--	<1000 U	--	--	<660 U	200 J
FLUORANTHENE	206-44-0	423	423	2,230	--	<1000 U	--	--	<660 U	420 J
PHENANTHRENE	85-01-8	204	204	1,170	--	<1000 U	--	--	<660 U	310
PYRENE	129-00-0	195	195	1,520	--	<1000 U	--	--	<660 U	370

Note: Analytical and Criteria Footnotes
are included on the last page of the table.

DETAILED FINDINGS REPORT
TORCH LAKE BACKWATER AREA

TABLE 5-3
Sample Analytical Summary - Sediment
Torch Lake Backwater Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Sediment Table Footnotes:

- ESLs, TECs, and PECs are adapted from Appendix A and Appendix B of Michigan Department of Environmental Quality - Remediation and Redevelopment Division Operational Memorandum No. 4 Attachment 3, Interim Final August 2, 2006
- Only detected analytes are listed - Gray rows indicate requested analyses. If no analytes are listed below a gray row then all analytes of that group were either not analyzed or not detected. ND indicates that one or more analyte of that group was tested and not detected and a -- indicates not analyzed.
- **Bold** values are concentrations detected above the reporting limit.
- **Shaded values indicate analyte concentration exceed applicable criteria. Color presented is the criteria with the highest value that was exceeded:**

EPA Region 5 RCRA ESLs dated August 22, 2003
TECs from MacDonald <i>et al.</i> 2000
PECs from MacDonald <i>et al.</i> 2000

- = Not analyzed/Not Reported
- bgs = Below ground surface
- ESL = Ecological Screening Level
- ft = Feet
- in = Inches
- mg/kg = Milligrams per kilogram.
- PCBs = Polychlorindated biphenyls
- PEC = Probable Effect Concentration
- RCRA = Resource Conservation and Recovery Act
- SVOC = Semi-volatile organic compound
- TEC = Threshold Effect Concentration
- ug/kg = Micrograms per kilogram

Criteria Footnotes:

- NA = A criterion or value is not available

Laboratory Footnotes:

- J = Estimated result
- ND = Analyte analyzed for but not detected above the reported sample reporting limit.
- U = Analyte analyzed for but not detected above the reported sample reporting limit.

**DETAILED FINDINGS REPORT
TORCH LAKE BACKWATER AREA****TABLE 5-4****Sample Analytical Summary - Surface Water
Torch Lake Backwater Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site**

Station Name	CAS Number	EPA Region 5 Ecological Screening Level	Rule 57 HCV Drink	Rule 57 HNV Drink	Rule 57 WV	SW-02
Field Sample ID						SW-02
Sample Date						10/12/2011
Sample Interval						0 - 6 in
Inorganics - Metals (ug/l)						
ALUMINUM	7429-90-5	NA	NA	NA	NA	49.3 J
BARIUM	7440-39-3	220	NA	1,900	NA	102 J
CADMIUM	7440-43-9	0.15	NA	2.5	NA	0.12 J
CALCIUM	7440-70-2	NA	NA	NA	NA	28100
COPPER	7440-50-8	1.58	NA	470	NA	29.1
IRON	7439-89-6	NA	NA	NA	NA	920
LEAD	7439-92-1	1.17	NA	14	NA	4.7 J
MAGNESIUM	7439-95-4	NA	NA	NA	NA	5650
MANGANESE	7439-96-5	NA	NA	1,300	NA	46.1
NICKEL	7440-02-0	28.9	NA	2,600	NA	1 J
SODIUM	7440-23-5	NA	NA	NA	NA	55900
ZINC	7440-66-6	65.7	NA	3,300	NA	22.1 J
Inorganics - Cyanide						
						ND
Organics - PCBs						
						ND
Organics - SVOCs						
						ND
Organics - VOCs						
						ND

Surface Water Table Footnotes:

- MDEQ Rule 57 values derived from the Michigan Department of Environmental Quality, Water Bureau, Water Resources Protection, filed with the Secretary of State on January 13, 2006. Part 4 Water Quality Standards, Rule 323.1057 Toxic Substances, as amended. Updated on February 27, 2014.

- ESLs are adapted from Appendix A and Appendix B of Michigan Department of Environmental Quality - Remediation and Redevelopment Division Operational Memorandum No. 4 Attachment 3, Interim Final August 2, 2006

- Only detected analytes are listed - Gray rows indicate requested analyses. If no analytes are listed below a gray row then all analytes of that group were either not analyzed or not detected. ND indicates that one or more analyte of that group was tested and not detected and a -- indicates not analyzed.

- **Bold** values are concentrations detected above the reporting limit.

- **Shaded values indicate analyte concentration exceed applicable criteria. Color presented is the criteria with the highest value that was exceeded:**

EPA Region 5 RCRA ESLs dated August 22, 2003

MDEQ Rule 57 Water Quality Value, HCV, drinking water source, dated February 27, 2014

MDEQ Rule 57 Water Quality Value, HNV, drinking water source, dated February 27, 2014

MDEQ Rule 57 Water Quality Value, WV, dated February 27, 2014

-- = Not analyzed/Not reported

bgs = below ground surface

EPA = United States Environmental Protection Agency

ESL = Ecological Screening Level

HCV = Human Non-Cancer Value

HNV = Human Cancer Value

in = Inches

MDEQ = Michigan Department of Environmental Quality

PCBs = Polychlorinated biphenyls

RCRA = Resource Conservation and Recovery Act

SVOC = Semi-volatile organic compound

ug/l = Micrograms per liter

VOC = Volatile organic compound

WV = Wildlife Value

Criteria Footnotes:

NA = a criterion or value is not available

Laboratory Footnotes:

J = estimated result

ND = not detected

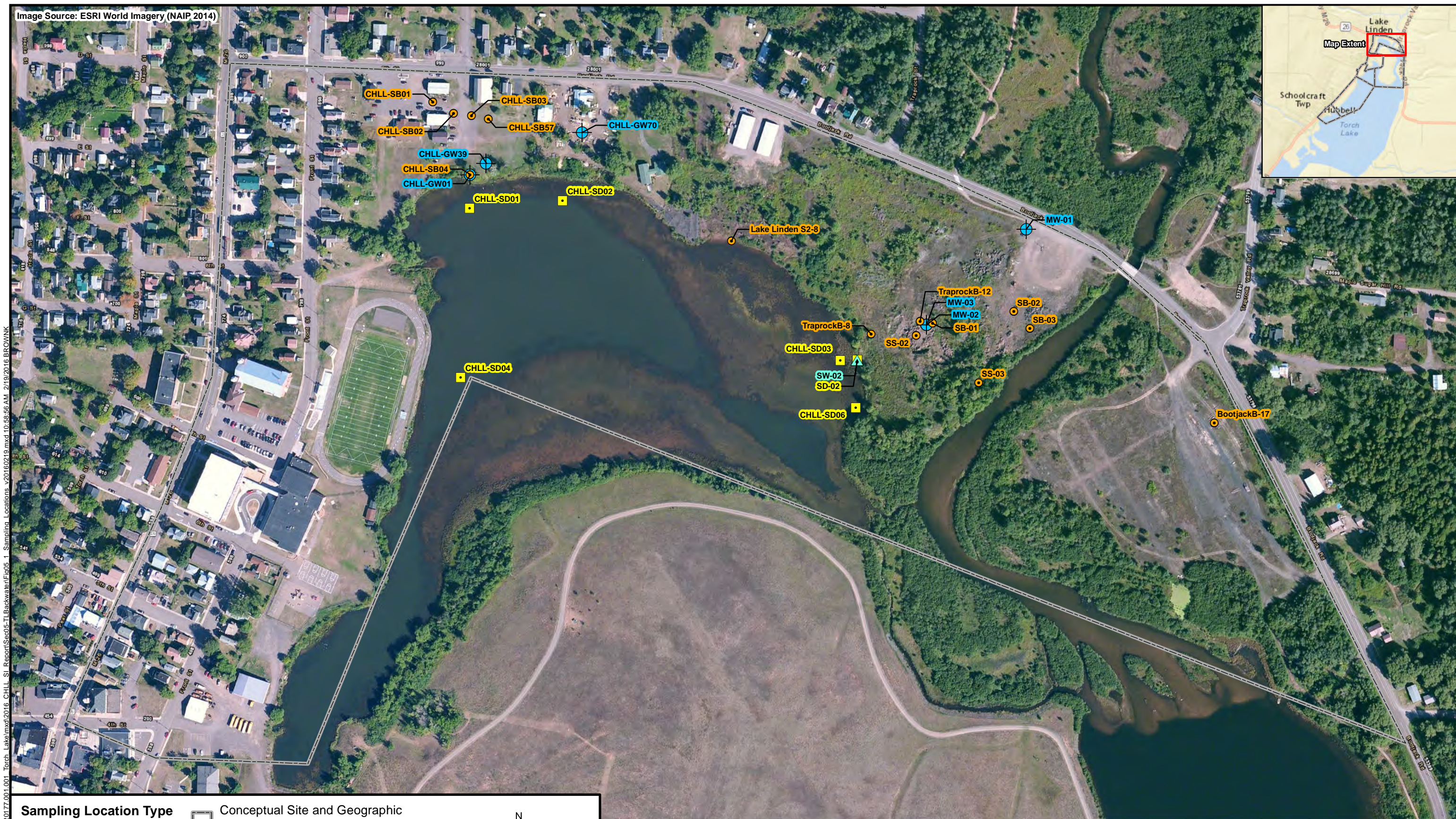
**DETAILED FINDINGS REPORT
TORCH LAKE BACKWATER AREA**

SECTION 5

**DETAILED FINDINGS REPORT – TORCH LAKE BACKWATER AREA
FIGURES**

Image Source: ESRI World Imagery (NAIP 2014)

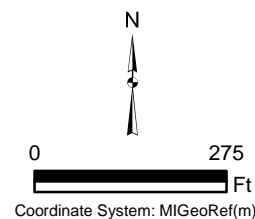
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Sampling Location Type

- Soil
- Groundwater
- Surface Water
- Sediment

Conceptual Site and Geographic Area Boundaries



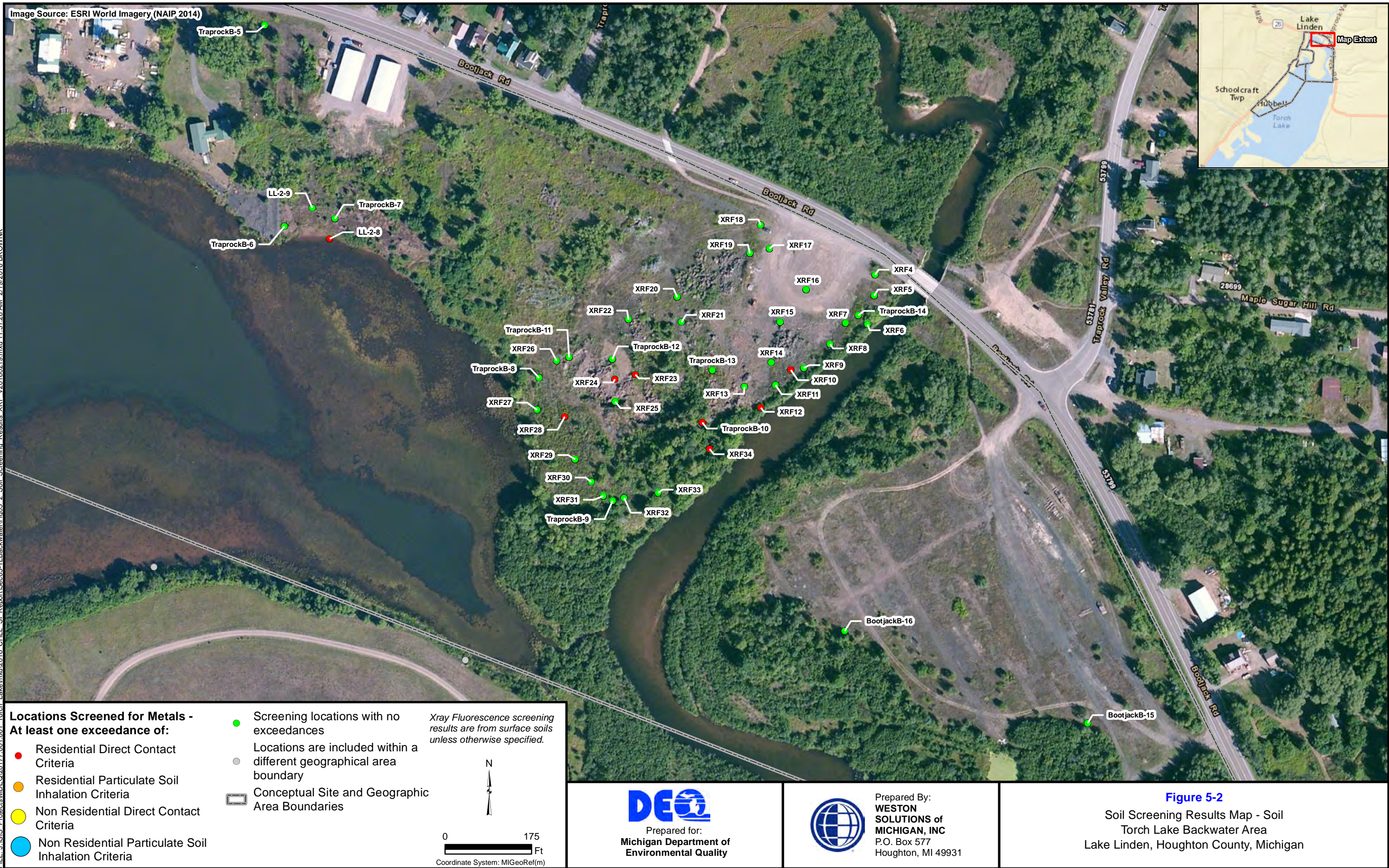
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Prepared for:
**Michigan Department of
Environmental Quality**

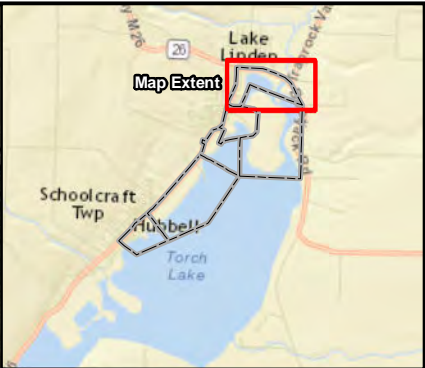


Prepared By:
**WESTON
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Figure 5-1
Sampling Location Map
Torch Lake Backwater Area
Lake Linden, Houghton County, Michigan

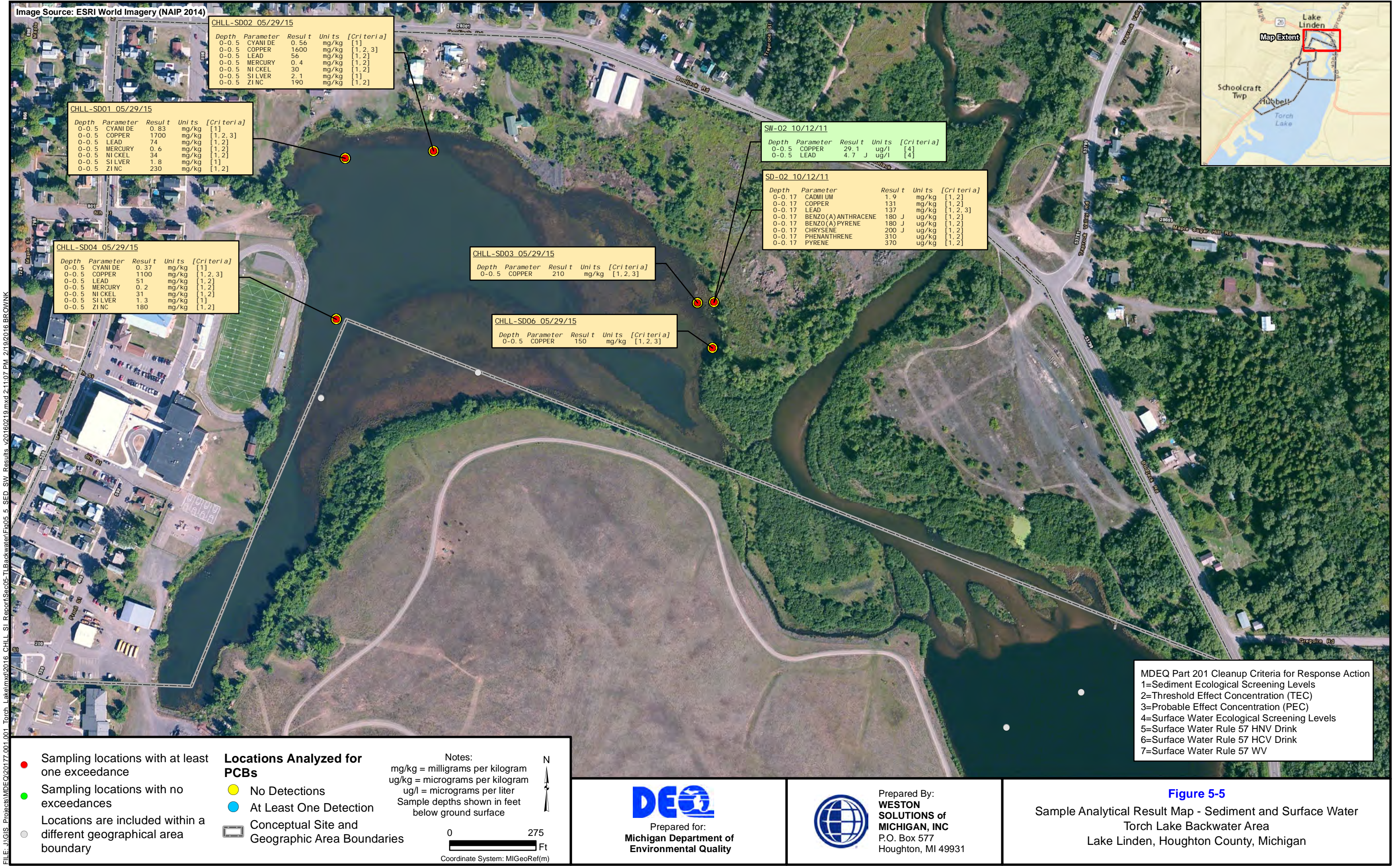
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**DETAILED FINDINGS REPORT
LAKE LINDEN SANDS AREA**

6. DETAILED FINDINGS REPORT – LAKE LINDEN SANDS AREA

This Section summarizes the findings derived from implementation of the sampling and analysis plan (SAP) in the Lake Linden Sands Area. The narrative follows the investigative approach outlined in **Section 3**, while providing specific details about the study area and the potential human health and ecological risks associated with mining era operations in the study area.

6.1 SITE INSPECTION AND INVESTIGATION RESULTS

The implementation of the site inspection and investigation activities provided critical lines of evidence that link the findings of the archival research to the current environmental conditions in and around Torch Lake. The following subsections present the findings of the inspection and investigation activities and provide correlation of mining era operations and their potential impacts on the nearshore environment of Torch Lake.

6.1.1 Site Inspection

The site inspection at the Lake Linden Sands Area included the locating and inventory of structures and similar surficial artifacts associated with the mining era industrial operations. The study area was also inspected for potential physical and health hazards which were documented, photographed, and located with a global positioning system (GPS) unit. The inventoried hazards, if identified, were then qualitatively assessed for potential human health and environmental risks to determine if analytical sampling was warranted during the targeted inspection phase of the work.

6.1.1.1 Reconnaissance

On 6 October 2014, a field team comprised of Weston Solutions of Michigan, Inc. (WESTON®) personnel performed reconnaissance activities in the Lake Linden Sands Area. The inspected areas included two parcels comprised of made lands that form a peninsula that extends south into Torch Lake from the Village of Lake Linden. The properties were visually inspected and observations were recorded on field logs. The following provides a summary of the relevant findings associated with the reconnaissance activities.

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Lake Linden Sands Area – Reconnaissance Summary	
Potential Chemical or Physical Hazards	Recorded Observations
Suspect Asbestos Containing Material (SACM)	No SACM was observed during the inspection.
Residual Process Materials	The Lake Linden Sands Area is a stamp sand deposit created during mining era operations. The stamp sand deposit, a residual process material, was capped as part of previous remedial actions completed by the U.S. Environmental Protection Agency (EPA).
Potentially Abandoned Containers	No mining era containers were observed during the inspection.
Soil Staining/Stressed Vegetation	The capped areas of the stamp sand deposit are generally well to sparsely vegetated. No barren or stressed areas of vegetation were documented. Wave action has resulted in erosion of portions of the cap along the southern shoreline.
Potential Polychlorinated Biphenyl (PCB) or Mercury Containing Equipment	No potential PCB or mercury containing equipment was observed on the inspected properties.
Other:	Observations of other hazards, not summarized above, were not recorded during the inspection.

In general, no significant hazards were identified in the Lake Linden Sands Area during the reconnaissance activities. Field logs documenting reconnaissance observations are included in **Appendix D** of the Site Investigation (SI) Report.

6.1.1.2 Targeted Inspection

The qualitative assessment of the reconnaissance findings in the Lake Linden Sands Area did not warrant the performance of targeted inspection activities in the Lake Linden Sands Area.

6.1.2 Site Investigation

The SI at the Lake Linden Sands Area was developed based on a variety of data and information as outlined in **Section 3**. In addition to the historical accounts and documentation, current land use and potential exposure pathways were also taken into consideration when selecting the sampling locations specific to the Lake Linden Sands Area. The following subsections present the outcomes of investigative activities completed in the area by summarizing the laboratory analytical results and characterizing their impacts on the environmental media in which they were detected.

**DETAILED FINDINGS REPORT
LAKE LINDEN SANDS AREA****6.1.2.1 Terrestrial Investigation**

Intrusive investigation activities in the Lake Linden Sands Area were generally guided by the findings of historical research and field observations. From a historical standpoint, the study area did not feature large industrial complexes as identified in several of the other areas. The Lake Linden Sands Area is comprised solely of made lands, formed by the deposition of stamp sands. In addition, areas of the stamp sand deposit were also used as disposal locations for other wastes generated during mining era operations. The entire Lake Linden Sands Area was capped and vegetated during previous remedial actions completed by the EPA. As such, the upland investigative work was completed in the vicinity of reported disposal areas present within the limits of the stamp sand deposit. The following subsections present a summary of the field observations and analytical results derived from the terrestrial sampling activities

6.1.2.1.1 Field Observations – Soil and Groundwater

Borings in the Lake Linden Sands Area were advanced to depths between 8 and 25 feet (ft) below the ground surface (bgs). Boring locations are depicted on [Figure 6-1](#). Soil observations documented on field logs indicate that the subsurface is primarily comprised of fine to medium grained sands that are reddish brown in color. Fine grained silt and clay soil was also documented in several borings. Only one location, (SB-14) contained concrete fill between 0.5 ft and 3 ft, but landfill wastes were not documented in any of the borings; however, it should be noted that soil recovery was diminished once most of the borings entered the saturated zone.

During groundwater sampling, temporary well points were generally established at several different intervals, primarily due to changes in topography within the area. Screened sampling intervals were generally as follows:

- 9 ft to 14 ft bgs;
- 14 to 19 ft bgs; and,
- 20 ft to 30 ft bgs.

Saturated soil conditions were encountered between depths of 4 ft and 15 ft, with the shallower groundwater table present in boring locations nearest to the shoreline. Groundwater quality parameters, including temperature, conductivity, dissolved oxygen (DO) and pH, measured at the

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time of sample collection were generally considered normal. DO measurements were greater than 40 percent (%) in three of the sample locations. Elevated DO concentrations are typically indicative of low bio-activity, indicating that oxygen is not being consumed by aerobic organisms in the subsurface. These conditions may persist in the study area due to the presence of stamp sands deposits along the shoreline of Torch Lake. Alternatively, the presence of other chemicals in soil or groundwater and inconsistencies in sample collection could also cause interference within the instrument, causing inaccurate or false measurements. Additional evaluation would be required to determine if these results are indicators of variability in sample collection or the presence of chemical interference.

6.1.2.1.2 Soil Sampling Results

Terrestrial investigation activities were completed in the Lake Linden Sands Area during one mobilization. Investigative work in the Lake Linden Sands Area was completed between 15 and 16 June 2014. During the mobilization a total of 23 soil samples and three duplicate soil samples were collected from nine boring locations. Soil boring locations are depicted on [Figure 6-1](#). Investigative methodologies and soil sampling techniques were conducted using the procedures outlined in **Section 3**.

Soil sampling locations included nine surficial soil samples and one duplicate sample, generally ranging from 0 to 6 inches (in.) in depth. The investigation also included the collection of 16 subsurface soil samples and two duplicate soil samples ranging from 4 ft to 16 ft in depth. All sample locations contained at least one sample that was analyzed for PCBs and inorganic contaminants of concern (COCs). In addition, a substantial number of samples were also analyzed for other COCs including cyanide, volatile organic compounds (VOCs), and semi-volatile organic compounds (SVOCs) since undocumented disposal areas were a focus of the investigative work in the area. More broadly, the selection of analytical parameters was generally based upon potential environmental impacts associated with mining era operations in the vicinity of the sampling location or field observations.

The surficial and subsurface soil analytical results for the Lake Linden Sands Area did not contain COCs at concentrations at or above applicable regulatory criteria. SVOCs were detected in one

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subsurface sample, but the COC concentrations were below applicable regulatory criteria. PCBs were not detected in any of the samples collected from the Lake Linden Sands Area.

A detailed summary of soil analytical results collected from the Lake Linden Sands Area are provided in [Table 6-1](#). X-ray fluorescence (XRF) soil screening results and soil analytical results from the Lake Linden Sands Area are depicted on [Figure 6-2](#) and [Figure 6-3](#), respectively. Soil boring logs are included in **Appendix G** of the SI Report.

6.1.2.1.3 Groundwater Sampling Results

During the installation of soil borings in the Lake Linden Sands Area five temporary groundwater sampling locations were established to characterize groundwater in the area. The temporary sampling locations were installed and sampled using the methodologies presented in **Section 3**. The screened intervals in the groundwater sampling locations were generally between 9-14 ft, 14-19 ft, and 20-25 ft bgs. A total of six groundwater samples, including one duplicate sample, were collected from the Lake Linden Sands Area. Temporary groundwater sampling locations are depicted on [Figure 6-1](#).

All groundwater samples were analyzed for PCBs, inorganic COCs, VOCs, and SVOCs. The duplicate groundwater sample was analyzed for PCBs only. A detailed summary of groundwater analytical results collected from the Lake Linden Sands Area are provided in [Table 6-2](#). Groundwater analytical results from the Lake Linden Sands Area are depicted on [Figure 6-4](#). Soil boring logs are included in **Appendix G** of the SI Report.

6.1.2.2 Offshore Investigation

Similar to the terrestrial investigation, the proposed offshore investigation activities for the Lake Linden Sands Area were also guided by historical information related to the study area, primarily the presence of undocumented disposal areas within the stamp sands deposit and their potential to leach COCs to sediment and surface water in the nearshore environment. Previous analytical data was evaluated to determine if adequate characterization data was available in the study area to assess the overall sediment and surface water quality in the study area. In addition, underwater surveillance of the area, as described in **Section 3**, was used to locate and assess potential offshore

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waste deposits. Lastly, field observations, both terrestrial and offshore, were used to position sampling locations. Offshore sediment samples were collected, but surface water samples were not collected from the Lake Linden Sands Area during the SI. The following subsections present a summary of the analytical results derived from offshore sampling activities in the Lake Linden Sands Area.

6.1.2.2.1 Sediment Sampling Results

Sediment sampling activities were completed during three mobilizations. The first round of investigative work was completed on 15 June 2014, the second followed between 11 and 12 August 2014, and the third was on 29 May 2015. Between the three mobilizations, a total of 15 sediment samples and two duplicate sediment samples were collected from six sampling locations. Sediment sampling locations are depicted on [Figure 6-1](#). Investigative methodologies and sediment sampling techniques were conducted using the procedures outlined in [Section 3](#).

Sediment sampling locations included six surficial sediment samples, generally ranging from 0 to 6 in. in depth. The investigation also included the collection of nine deeper sediment samples ranging from 1 ft to 5 ft in depth. All samples were analyzed for PCBs and a subset of the samples were analyzed for SVOCs and inorganic constituents. Total PCBs were not detected in any of the samples collected from the Lake Linden Sands Area.

Analytical results for the sediment sampling locations in the Lake Linden Sands Area are presented in [Table 6-3](#). Sediment analytical results from the Lake Linden Sands Area are depicted on [Figure 6-5](#). Sediment core logs are included in [Appendix H](#) of the SI Report.

6.1.2.2.2 Surface Water Sampling Results

No surface water samples were collected from the Lake Linden Sands Area during the SI. However, one previous Semi-permeable Membrane Device (SPMD) sampling location was located in the area. The SPMD sampling location in the Lake Linden Sands Area is depicted on [Figure 6-1](#). The general purpose of the collection method is to provide a time-weighted exposure that is representative of chemical uptake through fish respiration. SPMD sample results do not

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provide for a direct comparison to surface water criteria, but are an indicator of contaminants in the water column. PCB congeners were detected in the SPMD sample.

Analytical results for the SPMD sampling location in the Lake Linden Sands Area is presented in **Table 6-4**. The SPMD sampling location (SPMD Site #2) in the Lake Linden Sands Area is depicted on **Figure 6-5**.

6.2 NATURE AND EXTENT OF CONTAMINATION

Utilizing the established regulatory criteria presented in **Section 4** for various land use categories and exposure pathways, the laboratory analytical results summarized in the preceding section for the Lake Linden Sands Area were reviewed and compared to the following regulatory criteria as applicable for the sampled environmental media:

- Michigan Department of Environmental Quality (MDEQ) Cleanup Criteria Requirements for Response Activity;
- EPA Ecological Screening Levels (ESLs); and,
- Sediment Quality Guidelines, Threshold Effect Concentrations (TECs) and Probable Effect Concentrations (PECs), MacDonald, et al, 2000.

6.2.1 Comprehensive Exposure Assessment

The comparison was completed to determine which ecological and human exposure pathways, risks, and conditions are relevant in the Lake Linden Sands Area. Although not inclusive of relevant pathways where regulatory criteria were not exceeded, the following exposure pathways were determined to be relevant in the Lake Linden Sands Area:

- Risks posed by hazardous substances in groundwater and the potential for that groundwater to vent to surface water.
- Risks posed by hazardous substances sediments that have the potential to have toxic effects on aquatic biota and/or enter the food chain.

As discussed in **Section 4.2.5**, the MDEQ drinking water/surface water pathway criteria exceedances for metals were excluded from the soil and groundwater evaluation. The rationale for this exclusion is twofold:

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- The Project investigation and anticipated response actions are being undertaken pursuant to Part 201 of Michigan’s Natural Resources and Environmental Protection Act (NREPA), being Public Act (PA) 451 of 1994, as amended. The concentrations of metals in excess of the MDEQ drinking water/surface water pathway 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 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 OU2 for which the EPA Record of Decision (ROD) remedy called for No Action. The EPA’s ROD Operable Unit (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 as a result of the remedial action taken at OU 1 and OU 3.
 - Ongoing natural sedimentation and detoxification.
 - Institutional programs and practices controlling potential future exposure to site-affected drinking water which were intended to be administered at the county and state level.
 - 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.

Note that metals criteria for other relevant pathways, and cyanide and organic contaminants for all pathways were included in the evaluation.

6.2.1.1 Soil Exposure Pathway Assessment

Soil analytical results from the Lake Linden Sands Area did not include COC concentrations in soil that were at or above concentrations that trigger a “facility” designation as defined in Section 20101(1) (s) of the NREPA.

The following tables provide an aggregate summary of the soil sample locations with respect to the total number of samples and how they compare to the MDEQ’s Cleanup Criteria for Response Activity under both Residential and Nonresidential exposure scenarios. The tables are based solely on

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the total number of samples collected from the Lake Linden Sands Area. They list only the number of samples for a specific analytical suite that contained one or more exceedance of a given criterion.

Soil Analytical Result Summary Table	Cleanup Criteria Requirements for Response Activity – Residential											
	Analytical Summary			Groundwater Protection		Indoor Air	Ambient Air (Y) (C)				Contact	Csat
	Total Number of Samples	Detected Analytes	Total Exceedances	Residential Drinking Water Protection Criteria	Groundwater Surface Water Interface Protection Criteria	Soil Volatilization to Indoor Air Inhalation Criteria	Infinite Source Volatile Soil Inhalation Criteria (VSIC)	Finite VSIC for 5 Meter Source Thickness	Finite VSIC for 2 Meter Source Thickness	Particulate Soil Inhalation Criteria	Direct Contact Criteria	Soil Saturation Concentration Screening Levels
Inorganics	26	331	0	0	0	0	0	0	0	0	0	0
Cyanide	25	0	0	0	0	0	0	0	0	0	0	0
VOCs	9	0	0	0	0	0	0	0	0	0	0	0
SVOCs	18	4	0	0	0	0	0	0	0	0	0	0
Asbestos	0	0	0	0	0	0	0	0	0	0	0	0
Total PCBs	18	0	0	0	0	0	0	0	0	0	0	0
COCs exceeding applicable regulatory criteria in one or more samples				None								

Soil Analytical Result Summary Table	Cleanup Criteria Requirements for Response Activity – Nonresidential											
	Analytical Summary			Groundwater Protection		Indoor Air	Ambient Air (Y) (C)				Contact	Csat
	Total Number of Samples	Detected Analytes	Total Exceedances	Nonresidential Drinking Water Protection Criteria	Groundwater Surface Water Interface Protection Criteria	Soil Volatilization to Indoor Air Inhalation Criteria	Infinite Source Volatile Soil Inhalation Criteria (VSIC)	Finite VSIC for 5 Meter Source Thickness	Finite VSIC for 2 Meter Source Thickness	Particulate Soil Inhalation Criteria	Direct Contact Criteria	Soil Saturation Concentration Screening Levels
Inorganics	26	331	0	0	0	0	0	0	0	0	0	0
Cyanide	25	0	0	0	0	0	0	0	0	0	0	0
VOCs	9	0	0	0	0	0	0	0	0	0	0	0
SVOCs	18	4	0	0	0	0	0	0	0	0	0	0
Asbestos	0	0	0	0	0	0	0	0	0	0	0	0
Total PCBs	18	0	0	0	0	0	0	0	0	0	0	0
COCs exceeding applicable regulatory criteria in one or more sample				None								

**DETAILED FINDINGS REPORT
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Groundwater analytical results from the Lake Linden Sands Area included COC concentrations in groundwater that were at or above concentrations that trigger a facility designation as defined in Section 20101(1) (s) of the NREPA.

Shallow groundwater analytical results from the Lake Linden Sands Area included COC concentrations that were at or above concentrations that pose potential risks to human health and the environment. Similar to the preceding soil tables, the following table provides summary of the aforementioned sample locations with respect to the total number of samples and how they compare to the MDEQ's Cleanup Criteria for Response Activity under both Residential and Nonresidential exposure scenarios.

Groundwater Analytical Result Summary Table	Analytical Summary			Cleanup Criteria Requirements for Response Activity – Residential and Nonresidential						
	Total Number of Samples	Total Number of Detected Analytes	Total Exceedances	Residential Drinking Water Criteria	Nonresidential Drinking Water Criteria	Groundwater Surface Water Interface Criteria	Residential Groundwater Volatilization to Indoor Air Inhalation Criteria	Nonresidential Groundwater Volatilization to Indoor Air Inhalation Criteria	Water Solubility	Flammability and Explosivity Screening Levels
Inorganics	5	46	0	0	0	0	0	0	0	0
Cyanide	0	0	0	0	0	0	0	0	0	0
VOCs	5	0	0	0	0	0	0	0	0	0
SVOCs	5	6	1	0	0	1	0	0	0	0
Total PCBs	6	0	0	0	0	0	0	0	0	0
Other – General Chemistry	0	0	0	0	0	0	0	0	0	0
COCs exceeding applicable regulatory criteria in one or more sample				Phenanthrene						

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LAKE LINDEN SANDS AREA****6.2.1.3 Sediment Exposure Pathway Assessment**

The sediment analytical results from the Lake Linden Sands Area included COC concentrations that were at or above concentrations that pose potential risks to sediment dwelling species. The following table provides a summary of the sample locations located in the Lake Linden Sands Area. The table lists only the number of samples for a specific analytical suite that contained one or more exceedance of a given criterion.

Sediment Analytical Result Summary	Analytical Summary			EPA, Region 5, Resource Conservation and Recovery Act	Consensus Based Sediment Quality Guidelines	
	Total Number of Samples	Detected Analytes	Total Exceedances	Ecological Screening Levels	Threshold Effect Concentration (TEC)	Probable Effect Concentration (PEC)
Inorganics	2	32	4	2	2	2
Cyanide	2	0	0	0	0	0
VOCs	0	0	0	0	0	0
SVOCs	3	1	1	1	1	1
Total PCBs	18	0	0	0	0	0
COCs exceeding applicable regulatory criteria in one or more sample				Copper, Silver, Phenanthrene		

6.2.2 Extent of Contamination

The comparison of analytical results to applicable regulatory criteria indicates that potential human health and ecological risks are present in groundwater and sediment in the Lake Linden Sands Area. Recalling that the goals and objectives of the SI, the following subsections describe the extent of contamination in environmental media in the study area.

6.2.2.1 Soil Extent of Contamination

Soil analytical results, including historical surface soil screening results, did not exceed any applicable MDEQ criteria. All samples were collected from surface and subsurface soil intervals from the central and western portion of the stamp sand deposit. The boring locations were generally located within 50 ft to 1,000 ft of the shoreline of Torch Lake, the Torch Lake Backwater, and the recreational walking trail that traverses the perimeter of the capped stamp sand deposit. Although

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physical hazards were not identified during the inspection of the Lake Linden Sands Area, flooded and eroded areas of the vegetative cap, specifically along the shoreline, were documented. The Lake Linden Sands Area is open to the public.

6.2.2.2 Groundwater Extent of Contamination

Groundwater analytical results exceeded Groundwater/Surface Water Criteria (GSIC) for one SVOC constituent.

The temporary groundwater sampling locations were located within the previously discussed soil boring locations in the Lake Linden Sands Area. The groundwater samples were collected from a zone within 50 ft to 1,000 ft of the shoreline of Torch Lake and the Torch Lake Backwater. The SVOC was detected in a sampling location in an area of municipal dumping near the backwater shoreline, collected from a screen interval within 15 ft of the ground surface. Based on the horizontal and vertical placement of these sampling locations it may be presumed that groundwater is venting to the adjacent shoreline of the Torch Lake Backwater.

The potential risks associated with groundwater connectivity to nearby surface water bodies should be a consideration in determinations related to the extent of contamination in the Lake Linden Sands Area.

6.2.2.3 Sediment Extent of Contamination

Sediment analytical results exceeded ESLs, TECs, and PECs for inorganic contaminants and SVOCs. Surficial and deep sediment samples were collected from throughout the area. Elevated inorganic COCs were detected in surficial sediment samples and SVOCs were detected in a deep sediment sample in the Torch Lake Backwater Area.

As stated in the preceding subsection, inorganic COCs are prevalent in the area and the related exceedances, although potentially detrimental to aquatic biota, remain a consistent finding in sediment samples collected from Torch Lake. The detection of SVOCs in one sediment sample, however, presents additional risks to benthic organisms and potentially human health due its potential effect on the food chain. The potential risks associated with SVOCs in nearshore

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sediment may be an indication of a terrestrial source of contamination that should be considered when evaluating the extent of sediment contamination in the Torch Lake Backwater Area.

6.2.2.4 Surface Water Extent of Contamination

Although no surface water samples were collected from the Lake Linden Sands Area, it is presumed that inorganic COCs are present at concentrations that exceed applicable regulatory criteria. This assumption is supported by surface water analytical results from adjacent study areas. The potential risks associated with inorganic constituents, though prevalent in the region, should be considered when evaluating the extent of surface water contamination in the Lake Linden Sands Area.

6.3 CONCLUSIONS AND RECOMMENDATIONS

The analytical results and interpretation summarized in the preceding subsections document potential human health and ecological risks that are present in the Lake Linden Sands Area. The following subsections provide a synopsis of these findings and a recommended path forward for mitigating these risks in the Lake Linden Sands Area.

6.3.1 Conclusions

Environmental impacts in the Lake Linden Sands Area are generally characterized by detections of organic and inorganic contaminants in groundwater and sediment; repercussions of mining era operations in the region. Although, specific sources of these contaminants may not be fully understood, historical research related to the operations, closing, and eventual abandonment/scraping of mining company operations provided substantive evidence for assessing specific operational areas and selecting target analytes anticipated to be present within the study area. The findings of these investigative activities are summarized as follows:

- Soil analytical results did not exceed applicable regulatory criteria.
- Surface soil screening results did not exceed any applicable regulatory criteria.
- Groundwater analytical results exceeded GSIC for one SVOC constituent.
- Sediment analytical results exceeded ESLs, TECs, and PECs for inorganic contaminants and SVOCs.

**DETAILED FINDINGS REPORT
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The analytical results summarized above provide sufficient analytical data and lines of evidence to conclude that the study area is a facility as defined in Section 20101(1) (s) of the NREPA. The following table provides a summary of the affected environmental media, applicable regulatory criteria and potential receptors within the Lake Linden Sands Area.

Lake Linden Sands Area – Media, Criteria, Potential Receptor Summary															
Media	Soil			Groundwater			Air		Sediment	Surface Water		Building Materials, Asbestos, and Abandoned Containers			
Criteria	Drinking Water Protection	Groundwater Surface Water Interface	Direct Contact	Drinking Water Protection	Groundwater Surface Water Interface	Flammability and Explosivity	Volatilization	Particulate Inhalation	Ecological	Ecological	Human Health	Particulate Inhalation	Flammability and Explosivity	Environmental	Human Health
Potential Receptor															
Residential Human															
Nonresidential Human															
Water Column Organism															
Benthic Organism															
COCs exceeding applicable regulatory criteria in one or more sample				Copper, Silver, Phenanthrene											

In addition to the evaluation of analytical results collected from the study area, the following provides a summary of findings derived from the assessment of the Lake Linden Sands Area with respect to the goals and objectives for the Project:

- Significant in-lake and terrestrial sources of contamination are not present in the study area; however, SVOCs were detected in one groundwater sample in excess of GSIC
- PCBs were identified in an SPMD sample;
- Sediment samples did not contain detections of Total PCBs;
- No in-lake or terrestrial uncharacterized waste deposits or physical hazards were identified in the study area;
- Bulk disposal areas, including the capped stamp sand deposits are present in the study area and their proximal distance to areas of unrestricted public access are significant. Evidence of reported disposal areas was not identified through inspection and investigation methods; and,
- No industrial ruins, SACM, or similar mining area containers, building materials, or wastes were identified for future investigation in the study area.

**DETAILED FINDINGS REPORT
LAKE LINDEN SANDS AREA****6.3.2 Recommendations**

The conclusions outlined in the preceding subsection establish that the Lake Linden Sands Area is a Part 201 Facility. Section 20107a of Part 201 of NREPA describes the duties of owners or operators of a Facility, regardless of their liability, including: prevent unacceptable exposures, prevent exacerbation, and take reasonable precautions against the foreseeable actions of third parties. Some exceptions may apply; in any case, owners and operators of contaminated properties should become familiar with Section 20107a and the associated Rules. To that end, actions have been taken through the implementation of remedial measures, such as the placement of a soil and vegetative cap on the stamp sands, to address these environmental issues.

Based on the results of the SI and to ensure compliance with regulatory statutes, potential human health and ecological risks should minimally be qualitatively evaluated with property-specific data to determine if risks to the public health, safety, or welfare or to the environment are likely within the study area. The performance of a risk assessment on select properties or groups of properties, based on current and anticipated future land-use will help identify remedial goals for properties where potential human health and ecological hazards have been identified. Assessment based on current and future land-use contributes to the beneficial and safe re-use and potential redevelopment of any given property by clarifying applicability of regulatory statutes, as traditional property zoning (residential versus nonresidential) is generally undefined in the study area.

MDEQ should continue to provide new study data to the Remediation and Redevelopment Division Superfund Section (RRD SFS), which is responsible for monitoring EPA's remedy for the terrestrial and lake portion of the Torch Lake Superfund Site. RRD SFS should evaluate whether any remedy modifications are necessary. The EPA and RRD SFS should verify that administrative controls for areas that have been previously remediated by the EPA have been employed to ensure that the selected remedy is performing as designed and those institutional controls, where required, have been recorded and are being enforced.

Additionally, MDEQ will continue to provide pertinent data to the Michigan Department of Health and Human Services (MDHHS) where evaluation of specific potential public health risks is warranted.

**DETAILED FINDINGS REPORT
LAKE LINDEN SANDS AREA**

SECTION 6

**DETAILED FINDINGS REPORT – LAKE LINDEN SANDS AREA
TABLES**

DETAILED FINDINGS REPORT
LAKE LINDEN SANDS AREA

TABLE 6-1
Sample Analytical Summary - Soil
Lake Linden Sands Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Station Name	CAS Number	Residential Drinking Water Protection Criteria	Groundwater Surface Water Interface Protection Criteria	Residential Particulate Soil Inhalation Criteria	Residential Direct Contact Criteria	Nonresidential Drinking Water Protection Criteria	Nonresidential Particulate Soil Inhalation Criteria	Nonresidential Direct Contact Criteria	CHLL-SB05		CHLL-SB06		CHLL-SB08			
Field Sample ID									CHLL-SB 05 0'-6"	CHLL-SB 05 6"-48"	CHLL-SB 06 0'-6"	CHLL-SB 06 6"-48"	CHLL-SB 08 0-6"	CHLL-SB 08 0-6" Dup	CHLL-SB 08 6"-8'	CHLL-SB 08 8'-15'
Sample Date:									6/16/2014	6/16/2014	6/15/2014	6/15/2014	6/16/2014	6/16/2014	6/16/2014	6/16/2014
Sample Interval (bgs):									0 - 0.5 ft	0.5 - 4 ft	0 - 0.5 ft	0.5 - 4 ft	0 - 0.5 ft	0 - 0.5 ft	0.5 - 8 ft	8 - 15 ft
Sample Description:									CLAY, Reddish brown	SAND, Fine to medium grained .5 ft- 1 ft; SAND, fine to medium, Reddish brown 1 ft- 4 ft	SAND, Fine grained, brown	SAND, with GRAVEL, Medium grained, Reddish brown to brown	SILTY CLAY, Reddish brown	Field Duplicate	SAND, Fine to medium grained, Reddish brown .5 ft - 4 ft; CONCRETE RUBBLE 4 ft- 5 ft; SAND, Fine to medium grained, Reddish brown 5 ft - 8 ft	SAND, Fine to medium grained, Reddish brown
Inorganics - Metals (mg/kg)																
ALUMINUM	7429-90-5	6,900 (B)	NA	ID	50,000 (DD)	6,900 (B)	ID	370,000 (DD)	12000	5000	4600	18000	6300	5600	5800	--
ARSENIC	7440-38-2	4.6	4.6	720	7.6	4.6	910	37	2.1	0.9	1.1	2.8	1.0	0.9	1.3	--
BARIUM	7440-39-3	1,300 (G)	130	330,000	37,000	1,300	150,000	130,000	110	17	22	48	35	23	31	--
BERYLLIUM	7440-41-7	51	4.6 (G)	1,300	410	51	590	1,600	2.2	0.8	0.6	0.9	0.8	0.8	0.8	--
CADMIUM	7440-43-9	6.0	1.6 (G,X)	1,700	550	6.0	2,200	2,100	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	--
CHROMIUM	7440-47-3	1,000,000 (D,H)	1,200,000 (G,H,X)	330,000 (H)	790,000 (H)	1,000,000 (D,H)	150,000 (H)	1,000,000 (D,H)	13	15	12	27	9.0	12	19	--
COBALT	7440-48-4	0.8	2.0	13,000	2,600	2.0	5,900	9,000	8.7	7.6	5.4	15	4.5	6.3	8.5	--
COPPER	7440-50-8	5,800	32 (G)	130,000	20,000	5,800	59,000	73,000	73	960	520	2800	36	480	710	--
IRON	7439-89-6	12,000 (B)	NA	ID	160,000	12,000 (B)	ID	580,000	25000	10000	12000	19000	12000	11000	12000	--
LEAD	7439-92-1	700	1,900 (G,X)	100,000	400	700	44,000	900 (DD)	7.0	3.6	6.3	20	2.3	2.5	11	--
MANGANESE	7439-96-5	440 (B)	440 (B,G,X)	3,300	25,000	440 (B)	1,500	90,000	370	200	180	460	190	210	220	--
MERCURY	7439-97-6	1.7 (Z)	0.13 (B, Z)	20000 (Z)	160 (Z)	1.7 (Z)	8800 (Z)	580 (Z)	<0.06 U	<0.06 U	<0.06 U	<0.06 U	<0.06 U	<0.06 U	<0.05 U	--
NICKEL	7440-02-0	100	29 (G)	13,000	40,000	100	16,000	150,000	19	19	13	45	9.7	15	20	--
SELENIUM	7782-49-2	4.0	0.41 (B)	130,000	2,600	4.0	59,000	9,600	0.2	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	--
SILVER	7440-22-4	4.5	1.0 (M)	6,700	2,500	13	2,900	9,000	<0.1 U	1.7	0.6	1.4	<0.1 U	1.0	1.9	--
ZINC	7440-66-6	2,400	62 (G)	ID	170,000	5,000	ID	630,000	46	56	38	77	22	40	62	--
Inorganics - Chromium, Hexavalent																
									--	--	--	--	--	--	--	--
Inorganics - Cyanide																
									ND	ND	ND	ND	ND	ND	ND	--
Organics - PCBs																
									--	ND	ND	ND	--	--	ND	--
Organics - SVOCs (ug/kg)																
BENZO(A)ANTHRACENE	56-55-3	NLL	NLL	ID	20,000 (Q)	NLL	ID	80,000 (Q)	--	<240 UJ	<230 UJ	290 J	--	--	<220 UJ	--
CHRYSENE	218-01-9	NLL	NLL	ID	2,000,000 (Q)	NLL	ID	8,000,000 (Q)	--	<240 UJ	<230 UJ	320 J	--	--	<220 UJ	--
FLUORANTHENE	206-44-0	730,000	5,500	9.3E+09	4.6E+07	730,000	4.1E+09	1.3E+08	--	<240 UJ	<230 UJ	530 J	--	--	<220 UJ	--
PYRENE	129-00-0	480,000	ID	6.7E+09	2.9E+07	480,000	2.9E+09	8.4E+07	--	<240 UJ	<230 UJ	440 J	--	--	<220 UJ	--
Organics - VOCs																
									--	--	--	ND	--	--	ND	ND

Note: Analytical and Criteria Footnotes are included on the last page of the table.

DETAILED FINDINGS REPORT
LAKE LINDEN SANDS AREA

TABLE 6-1
Sample Analytical Summary - Soil
Lake Linden Sands Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Station Name	CAS Number	Residential Drinking Water Protection Criteria	Groundwater Surface Water Interface Protection Criteria	Residential Particulate Soil Inhalation Criteria	Residential Direct Contact Criteria	Nonresidential Drinking Water Protection Criteria	Nonresidential Particulate Soil Inhalation Criteria	Nonresidential Direct Contact Criteria	CHLL-SB09			CHLL-SB10			CHLL-SB11		
Field Sample ID									CHLL-SB 09 0'-6"	CHLL-SB 09 6"-6'	CHLL-SB 09 6'-12'	CHLL-SB 10 0"-6"	CHLL-SB 10 6"-48"	CHLL-SB 10 48"-96"	CHLL-SB 11 0'-6"	CHLL-SB 11 6"-8'	CHLL-SB 11 6"-8' Dup
Sample Date:									6/16/2014	6/16/2014	6/16/2014	6/16/2014	6/16/2014	6/16/2014	6/16/2014	6/15/2014	6/15/2014
Sample Interval (bgs):									0 - 0.5 ft	0.5 - 6 ft	6 - 12 ft	0 - 0.5 ft	0.5 - 4 ft	4 - 8 ft	0 - 0.5 ft	0.5 - 8 ft	0.5 - 8 ft
Sample Description:									SILTY SAND, Fine grained, Reddish brown	SAND, Fine to medium grained, Reddish brown	SAND, Fine to medium grained, Reddish brown	SILTY CLAY, Reddish brown	SAND, Reddish brown	SAND, Reddish brown	CLAY, Reddish brown	CONCRETE RUBBLE .5 ft - 3 ft; SAND, Fine to medium grained, Reddish brown 3 ft - 8 ft	Field Duplicate
Inorganics - Metals (mg/kg)																	
ALUMINUM	7429-90-5	6,900 (B)	NA	ID	50,000 (DD)	6,900 (B)	ID	370,000 (DD)	5700	6000	6900	3800	5400	4700	7400	7300	6600
ARSENIC	7440-38-2	4.6	4.6	720	7.6	4.6	910	37	0.8 J	1.1	1.0	0.6	1.1	1.1	1.7	1.5	1.3
BARIUM	7440-39-3	1,300 (G)	130	330,000	37,000	1,300	150,000	130,000	14	110	20	33 J	29	32	69	26	22
BERYLLIUM	7440-41-7	51	4.6 (G)	1,300	410	51	590	1,600	0.9	0.9	0.9	0.4	0.8	0.8	0.7	0.8	0.7
CADMIUM	7440-43-9	6.0	1.6 (G,X)	1,700	550	6.0	2,200	2,100	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	0.3	<0.2 U	<0.2 U
CHROMIUM	7440-47-3	1,000,000 (D,H)	1,200,000 (G,H,X)	330,000 (H)	790,000 (H)	1,000,000 (D,H)	150,000 (H)	1,000,000 (D,H)	16	18	22	7.3	16	15	18	20	19
COBALT	7440-48-4	0.8	2.0	13,000	2,600	2.0	5,900	9,000	8.1	8.4	10	2.7	7.9	7.3	8	9.6	9
COPPER	7440-50-8	5,800	32 (G)	130,000	20,000	5,800	59,000	73,000	770	890	1200	57	1300	1700	510	590	1100
IRON	7439-89-6	12,000 (B)	NA	ID	160,000	12,000 (B)	ID	580,000	12000	13000	14000	7800	11000	10000	14000	13000	12000
LEAD	7439-92-1	700	1,900 (G,X)	100,000	400	700	44,000	900 (DD)	3.4	12	5.9	1.9	3.0	3.0	87	24	15
MANGANESE	7439-96-5	440 (B)	440 (B,G,X)	3,300	25,000	440 (B)	1,500	90,000	210	230	260	120	210	200	240	250	230
MERCURY	7439-97-6	1.7 (Z)	0.13 (B, Z)	20000 (Z)	160 (Z)	1.7 (Z)	8800 (Z)	580 (Z)	<0.05 U	0.06	<0.06 U	<0.06 U	<0.06 U	<0.05 U	<0.06 U	<0.05 U	<0.05 U
NICKEL	7440-02-0	100	29 (G)	13,000	40,000	100	16,000	150,000	20	22	27	6.0	19	17	21	24	23
SELENIUM	7782-49-2	4.0	0.41 (B)	130,000	2,600	4.0	59,000	9,600	<0.2 U	0.4	<0.2 U	<0.2 U	0.3	<0.2 U	<0.2 U	<0.2 U	<0.2 U
SILVER	7440-22-4	4.5	1.0 (M)	6,700	2,500	13	2,900	9,000	1.3	2.7	3.1	0.1	1.8	4.4	1.0	1.6	1.7
ZINC	7440-66-6	2,400	62 (G)	ID	170,000	5,000	ID	630,000	54	110	86	13	59	61	170	68	61
Inorganics - Chromium, Hexavalent																	
									--	--	--	--	--	--	--	--	--
Inorganics - Cyanide																	
									ND	ND	ND	ND	ND	ND	ND	ND	ND
Organics - PCBs																	
									--	ND	ND	--	ND	ND	--	ND	ND
Organics - SVOCs (ug/kg)																	
BENZO(A)ANTHRACENE	56-55-3	NLL	NLL	ID	20,000 (Q)	NLL	ID	80,000 (Q)	--	<220 UJ	<230 UJ	--	<220 UJ	<220 UJ	--	<220 UJ	<220 UJ
CHRYSENE	218-01-9	NLL	NLL	ID	2,000,000 (Q)	NLL	ID	8,000,000 (Q)	--	<220 UJ	<230 UJ	--	<220 UJ	<220 UJ	--	<220 UJ	<220 UJ
FLUORANTHENE	206-44-0	730,000	5,500	9.3E+09	4.6E+07	730,000	4.1E+09	1.3E+08	--	<220 UJ	<230 UJ	--	<220 UJ	<220 UJ	--	<220 UJ	<220 UJ
PYRENE	129-00-0	480,000	ID	6.7E+09	2.9E+07	480,000	2.9E+09	8.4E+07	--	<220 UJ	<230 UJ	--	<220 UJ	<220 UJ	--	<220 UJ	<220 UJ
Organics - VOCs																	
									--	--	--	--	--	--	--	ND	ND

Note: Analytical and Criteria Footnotes
are included on the last page of the table.

DETAILED FINDINGS REPORT
LAKE LINDEN SANDS AREA

TABLE 6-1
Sample Analytical Summary - Soil
Lake Linden Sands Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Station Name	CAS Number	Residential Drinking Water Protection Criteria	Groundwater Surface Water Interface Protection Criteria	Residential Particulate Soil Inhalation Criteria	Residential Direct Contact Criteria	Nonresidential Drinking Water Protection Criteria	Nonresidential Particulate Soil Inhalation Criteria	Nonresidential Direct Contact Criteria	CHLL-SB11	CHLL-SB13		CHLL-SB15	CHLL-SB15		CHLL-SB16		
Field Sample ID									CHLL-SB 11 8'-16'	CHLL-SB 13 3"-9"	CHLL-SB 13 9"-96"	CHLL-SB 15 3-9"	CHLL-SB 15 9"-5'	CHLL-SB 15 9"-5' Dup	CHLL-SB 16 0"-6"	CHLL-SB 16 6"-6'	CHLL-SB 16 6'-12'
Sample Date:									6/15/2014	6/15/2014	6/15/2014	6/15/2014	6/15/2014	6/15/2014	6/16/2014	6/16/2014	6/16/2014
Sample Interval (bgs):									8 - 16 ft	0.25 - 0.75 ft	0.75 - 8 ft	0.25 - 0.75 ft	0.75 - 5 ft	0.75 - 5 ft	0 - 0.5 ft	0.5 - 6 ft	6 - 12 ft
Sample Description:									SAND, Fine to medium grained, Reddish brown	SAND, Fine to medium grained, Reddish brown	SAND, Fine to medium grained, Reddish brown	SAND, Fine to medium grained, Reddish brown	SAND, Fine to medium grained, Reddish brown	Field Duplicate	SILTY SAND, Fine grained, Reddish brown	SAND, Fine to medium grained, Reddish brown	SAND, Fine to medium grained, Reddish brown
Inorganics - Metals (mg/kg)																	
ALUMINUM	7429-90-5	6,900 (B)	NA	ID	50,000 (DD)	6,900 (B)	ID	370,000 (DD)	6100	6000	7800	5700	5700	6200	3300	6200	5000
ARSENIC	7440-38-2	4.6	4.6	720	7.6	4.6	910	37	1.0	0.6	0.9	1.1	1.1	1.1	<0.5 U	0.9 J	1.1
BARIUM	7440-39-3	1,300 (G)	130	330,000	37,000	1,300	150,000	130,000	23	18	21	40	19	20	17	22	25
BERYLLIUM	7440-41-7	51	4.6 (G)	1,300	410	51	590	1,600	0.9	0.7	0.8	0.7	0.9	0.9	0.4	0.9	0.9
CADMIUM	7440-43-9	6.0	1.6 (G,X)	1,700	550	6.0	2,200	2,100	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
CHROMIUM	7440-47-3	1,000,000 (D,H)	1,200,000 (G,H,X)	330,000 (H)	790,000 (H)	1,000,000 (D,H)	150,000 (H)	1,000,000 (D,H)	18	18	22	14	17	18	5.7	18	16
COBALT	7440-48-4	0.8	2.0	13,000	2,600	2.0	5,900	9,000	8.9	8.4	10	7.0	8.4	8.9	2.2	8.9	7.9
COPPER	7440-50-8	5,800	32 (G)	130,000	20,000	5,800	59,000	73,000	780	1600	1200	770	1200	1400	61	810	1100
IRON	7439-89-6	12,000 (B)	NA	ID	160,000	12,000 (B)	ID	580,000	12000	11000	14000	12000	12000	12000	5600	12000	11000
LEAD	7439-92-1	700	1,900 (G,X)	100,000	400	700	44,000	900 (DD)	2.7	4.8	10	32	5.4	4.4	1.3	2.9	8.5
MANGANESE	7439-96-5	440 (B)	440 (B,G,X)	3,300	25,000	440 (B)	1,500	90,000	230	220	270	240	230	230	79	220	210
MERCURY	7439-97-6	1.7 (Z)	0.13 (B, Z)	20000 (Z)	160 (Z)	1.7 (Z)	8800 (Z)	580 (Z)	<0.06 U	0.1	<0.05 U	0.06	<0.06 U	<0.06 U	<0.06 U	<0.06 U	<0.05 U
NICKEL	7440-02-0	100	29 (G)	13,000	40,000	100	16,000	150,000	23	22	28	16	21	22	5.2	23	20
SELENIUM	7782-49-2	4.0	0.41 (B)	130,000	2,600	4.0	59,000	9,600	<0.2 U	<0.2 U	<0.2 U	0.3	<0.2 U	0.4	<0.2 U	<0.2 U	<0.2 U
SILVER	7440-22-4	4.5	1.0 (M)	6,700	2,500	13	2,900	9,000	1.2	2.1	2.3	1.4	2.3	1.4	0.1	1.2	2.5
ZINC	7440-66-6	2,400	62 (G)	ID	170,000	5,000	ID	630,000	58	63	67	62	59	62	11	57	59
Inorganics - Chromium, Hexavalent																	
									--	--	--	--	--	--	--	ND	--
Inorganics - Cyanide																	
									ND	ND	ND	ND	ND	ND	ND	ND	ND
Organics - PCBs																	
									ND	ND	ND	ND	ND	ND	--	ND	ND
Organics - SVOCs (ug/kg)																	
BENZO(A)ANTHRACENE	56-55-3	NLL	NLL	ID	20,000 (Q)	NLL	ID	80,000 (Q)	<230 UJ	<210 UJ	<220 UJ	<210 UJ	<230 UJ	<230 UJ	--	<220 UJ	<220 UJ
CHRYSENE	218-01-9	NLL	NLL	ID	2,000,000 (Q)	NLL	ID	8,000,000 (Q)	<230 UJ	<210 UJ	<220 UJ	<210 UJ	<230 UJ	<230 UJ	--	<220 UJ	<220 UJ
FLUORANTHENE	206-44-0	730,000	5,500	9.3E+09	4.6E+07	730,000	4.1E+09	1.3E+08	<230 UJ	<210 UJ	<220 UJ	<210 UJ	<230 UJ	<230 UJ	--	<220 UJ	<220 UJ
PYRENE	129-00-0	480,000	ID	6.7E+09	2.9E+07	480,000	2.9E+09	8.4E+07	<230 UJ	<210 UJ	<220 UJ	<210 UJ	<230 UJ	<230 UJ	--	<220 UJ	<220 UJ
Organics - VOCs																	
									ND	--	ND	--	ND	ND	--	--	--

Note: Analytical and Criteria Footnotes
are included on the last page of the table.

TABLE 6-1
Sample Analytical Summary - Soil
Lake Linden Sands Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Soil Table Footnotes:

- MDEQ Part 201 residential and non-residential generic cleanup criteria and screening levels criteria were originally promulgated December 21, 2002 within the Administrative Rules for Part 201, Environmental Remediation, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. This table reflects revisions to the criteria pursuant to the December 2010 Part 201 amendments and new criteria consistent with the provisions of R299.5706a.Remediation, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. Release Date: December 30, 2013.
- Only detected analytes are listed - Gray rows indicate requested analyses. If no analytes are listed below a gray row then all analytes of that group were either not analyzed or not detected. ND indicates that one or more analyte of that goup was tested and not detected and a -- indicates not analyzed.
- **Bold** values are concentrations detected above the laboratory reporting limit.
- **Shaded values indicate analyte concentration exceed applicable criteria. Color presented is the criteria with the highest value that was exceeded:**

Residential Drinking Water Protection Criteria
Groundwater Surface Water Interface Protection Criteria
Residential Particulate Soil Inhalation Criteria
Residential Direct Contact Criteria
Nonresidential Drinking Water Protection Criteria
Nonresidential Particulate Soil Inhalation Criteria
Nonresidential Direct Contact Criteria

-- = Not analyzed/Not Reported
bgs = Below ground surface
ft = Feet
mg/kg = Milligrams per kilogram.
PCBs = Polychlorinated biphenyls
SVOC = Semi-volatile organic compound
ug/kg = Micrograms per kilogram
VOC = Volatile organic compound

Criteria Footnotes

- ID = Insufficient data to develop criterion.
NA = A criterion or value is not available
NLL = Hazardous substance is not likely to leach under most soil conditions.
NLV = Hazardous substance is not likely to volatilize under most conditions.
(B) = Background, as defined in R 299.1(b), may be substituted if higher than the calculated cleanup criterion. Background levels may be less than criteria for some inorganic compounds.
(BB) = The state drinking water standard for asbestos (fibers greater than 10 micrometers in length) is in units of a million fibers per liter of water (MFL). Soil concentrations of asbestos are determined by polarized light microscopy.
(C) = The criterion developed under R 299.20 to R 299.26 exceeds the chemical- specific soil saturation screening level (Csat). The person proposing or implementing response activity shall document whether additional response activity is required to control free-phase liquids or NAPL to protect against risks associated with free-phase liquids by using methods appropriate for the free-phase liquids present. Development of a site-specific Csat or methods presented in R 299.22, R 299.24(5), and R 299.26(8) may be conducted for the relevant exposure pathways.
(D) = Calculated criterion exceeds 100 percent, hence it is reduced to 100 percent or 1.0E+9 parts per billion (ppb).
(DD) = Hazardous substance causes developmental effects. Residential direct contact criteria are protective of both prenatal and postnatal exposure. Nonresidential direct contact criteria are protective for a pregnant adult receptor.
(G) = Groundwater surface water interface (GSI) criterion depends on the pH or water hardness, or both, of the receiving surface water. The final chronic value (FCV) for the protection of aquatic life shall be calculated based on the pH or hardness of the receiving surface water. Where water hardness exceeds 400 mg CaCO3/L, use 400 mg CaCO3/L for the FCV calculation. The FCV formula provides values in units of ug/L or ppb. The generic GSI criterion is the lesser of the calculated FCV, the wildlife value (WV), and the surface water human non-drinking water value (HNDV). The soil GSI protection criteria for these hazardous substances are the greater of the 20 times the GSI criterion or the GSI soil-water partition values using the GSI criteria developed with the procedure described in this footnote. A spreadsheet that may be used to calculate GSI and GSI protection criteria for (G)-footnoted hazardous substances is available on the Department of Environmental Quality (DEQ) internet web site.
(H) = Valence-specific chromium data (Cr III and Cr VI) shall be compared to the corresponding valence-specific cleanup criteria. If both Cr III and Cr VI are present in groundwater, the total concentration of both cannot exceed the drinking water criterion of 100 ug/L. If analytical data are provided for total chromium only, they shall be compared to the cleanup criteria for Cr VI. Cr III soil cleanup criterion for prote
(I) = Hazardous substance may exhibit the characteristic of ignitability as defined in 40 C.F.R. §261.21 (revised as of July 1, 2001), which is adopted by reference in these rules and is available for inspection at the DEQ, 525 West Allegan Street, Lansing, Michigan. Copies of the regulation may be purchased, at a cost as of the time of adoption of these rules of \$45, from the Superintendent of documents, Government Printing Office, Washington, DC 20401 (stock number 869-044-00155-1), or from the DEQ, Remediation and Redevelopment Division (RRD), 525 West Allegan Street, Lansing, Michigan 48933, at cost.
(J) = Hazardous substance may be present in several isomer forms. Isomer-specific concentrations shall be added together for comparison to criteria.
(M) = Calculated criterion is below the analytical target detection limit, therefore, the criterion defaults to the target detection limit.
(P) = Amenable cyanide methods or method OIA-1677 shall be used to quantify cyanide concentrations for compliance with all groundwater criteria. Total cyanide methods or method OIA-1677 shall be used to quantify cyanide concentrations for compliance with soil criteria. Nonresidential direct contact criteria may not be protective of the potential for release of hydrogen cyanide gas. Additional land or resource use restrictions may be necessary to protect for the acute inhalation concerns associated with hydrogen cyanide gas.
(Q) = Criteria for carcinogenic polycyclic aromatic hydrocarbons were developed using relative potential potencies to benzo(a)pyrene.
(R) = Hazardous substance may exhibit the characteristic of reactivity as defined in 40 C.F.R. §261.23 (revised as of July 1, 2001), which is adopted by reference in these rules and is available for inspection at the DEQ, 525 West Allegan Street, Lansing, Michigan. Copies of the regulation may be purchased, at a cost as of the time of adoption of these rules of \$45, from the Superintendent of Documents, Government Printing Office, Washington, DC 20401 (stock number 869-044-00155-1), or from the DEQ, RRD, 525 West Allegan Street, Lansing, Michigan 48933, at cost.
(T) = Refer to the federal Toxic Substances Control Act (TSCA), 40 C.F.R. §761, Subpart D and 40 C.F.R. §761, Subpart G, to determine the applicability of TSCA cleanup standards. Subpart D and Subpart G of 40 C.F.R. §761 (July 1, 2001) are adopted by reference in these rules and are available for inspection at the DEQ, 525 West Allegan Street, Lansing, Michigan. Copies of the regulations may be purchased, at a cost as of the time of adoption of these rules of \$55, from the Superintendent of Documents, Government Printing Office, Washington, DC 20401, or from the DEQ, RRD, 525 West Allegan Street, Lansing, Michigan 48933, at cost. Alternatives to compliance with the TSCA standards listed below are possible under 40 C.F.R. §761 Subpart D. New releases may be subject to the standards identified in 40 C.F.R. §761, Subpart G. Use Part 201 soil direct contact cleanup criteria in the published table if TSCA standards are not applicable.
(X) = The GSI criterion shown in the generic cleanup criteria tables is not protective for surface water that is used as a drinking water source. (See R 299.49 Footnotes for generic cleanup criteria tables for additional information.)
(Z) = Mercury is typically measured as total mercury. The generic cleanup criteria, however, are based on data for different species of mercury. Specifically, data for elemental mercury, chemical abstract service (CAS) number 7439976, serve as the basis for the soil volatilization to indoor air criteria, groundwater volatilization to indoor air, and soil inhalation criteria. Data for methyl mercury, CAS number 22967926, serve as the basis for the GSI criterion; and data for mercuric chloride, CAS number 7487947, serve as the basis for the drinking water, groundwater contact, soil direct contact, and the groundwater protection criteria. Comparison to criteria shall be based on species-specific analytical data only if sufficient facility characterization has been conducted to rule out the presence of other species of mercury.

Laboratory Footnotes

J = Estimated result
ND = Not detected
U = Analyte analyzed for but not detected above the reported sample reporting limit.

DETAILED FINDINGS REPORT
LAKE LINDEN SANDS AREA

TABLE 6-2
Sample Analytical Summary - Groundwater
Lake Linden Sands Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Station Name	CAS Number	Residential Drinking Water Criteria	Nonresidential Drinking Water Criteria	Groundwater Surface Water Interface Criteria	Residential Groundwater Volatilization to Indoor Air Inhalation Criteria	Nonresidential Groundwater Volatilization to Indoor Air Inhalation Criteria	Water Solubility	Flammability and Explosivity Screening Level	CHLL-GW02	CHLL-GW03	CHLL-GW05	CHLL-GW06	CHLL-GW07	
Field Sample ID									CHLL-GW 02 9-14'	CHLL-GW 03 9-14'	CHLL-GW 05 20-25'	CHLL-GW 06 16'-21'	CHLL-GW 07 14'-19'	CHLL-GW 07 14'-19' dup
Sample Date									6/16/2014	6/15/2014	6/16/2014	6/16/2014	6/16/2014	6/16/2014
Sample Interval (bgs)									9 - 14 ft	9 - 14 ft	20 - 25 ft	16 - 21 ft	14 - 19 ft	14 - 19 ft
Sample Description									--	--	--	--	--	Field Duplicate
Inorganics - Metals (ug/l)														
ALUMINUM	7429-90-5	50 (V)	50 (V)	NA	NLV	NLV	NA	ID	10000	74	82	84 J	110	--
ARSENIC	7440-38-2	10 (A)	10 (A)	10	NLV	NLV	NA	ID	6.4	2.9	2.2	<1.0 U	2.5	--
BARIUM	7440-39-3	2,000 (A)	2,000 (A)	200 (G)	NLV	NLV	NA	ID	590	200	630	190	360	--
CHROMIUM	7440-47-3	100 (A,H)	100 (A,H)	40 (G,H,X)	NLV	NLV	NA	ID	47	<1.0 U	<1.0 U	<1.0 U	<1.0 U	--
COBALT	7440-48-4	40	100	100	NLV	NLV	NA	ID	6.6	<5.0 U	<5.0 U	<5.0 U	<5.0 U	--
COPPER	7440-50-8	1,000 (E)	1,000 (E)	4.7 (G)	NLV	NLV	NA	ID	1700	250	600	62	530	--
IRON	7439-89-6	300 (E)	300 (E)	NA	NLV	NLV	NA	ID	8800	5500	830	760	360	--
LEAD	7439-92-1	4.0 (L)	4.0 (L)	11 (G,X)	NLV	NLV	NA	ID	7.6	<1.0 U	<1.0 U	<1.0 U	<1.0 U	--
MANGANESE	7439-96-5	50 (E)	50 (E)	1,000 (G,X)	NLV	NLV	NA	ID	300	2000	45	390	31	--
NICKEL	7440-02-0	100 (A)	100 (A)	28 (G)	NLV	NLV	NA	ID	24	7.1	9.6	11	7.6	--
SELENIUM	7782-49-2	50 (A)	50 (A)	5	NLV	NLV	NA	ID	<1.0 U	<1.0 U	1.3	<1.0 U	<1.0 U	--
SILVER	7440-22-4	34	98	0.2 (M)	NLV	NLV	NA	ID	6.1	0.7	0.2	0.6	0.3	--
ZINC	7440-66-6	2,400	5,000 (E)	63 (G)	NLV	NLV	NA	ID	60	5.0	5.2	<5.0 U	<5.0 U	--
Organics - PCBs (ug/l)														
									ND	ND	ND	ND	ND	ND
Organics - SVOCs (ug/l)														
ACENAPHTHENE	83-32-9	1,300	3,800	38	4,200 (S)	4,200 (S)	4,240	ID	<1.0 U	3.4 J	<1.0 U	<1.0 U	<1.0 U	--
ANTHRACENE	120-12-7	43 (S)	43 (S)	ID	43 (S)	43 (S)	43.4	ID	<1.0 U	1.2 J	<1.0 U	<1.0 U	<1.0 U	--
FLUORANTHENE	206-44-0	210 (S)	210 (S)	1.6	210 (S)	210 (S)	206	ID	<1.0 U	1.6 J	<1.0 U	<1.0 U	<1.0 U	--
FLUORENE	86-73-7	880	2,000 (S)	12	2,000 (S)	2,000 (S)	1,980	ID	<1.0 U	2.2 J	<1.0 U	<1.0 U	<1.0 U	--
PHENANTHRENE	85-01-8	52	150	2.0 (M)	1,000 (S)	1,000 (S)	1,000	ID	<1.0 U	7.1 J	<1.0 U	<1.0 U	<1.0 U	--
PYRENE	129-00-0	140 (S)	140 (S)	ID	140 (S)	140 (S)	135	ID	<1.0 U	1.1 J	<1.0 U	<1.0 U	<1.0 U	--
Organics - VOCs (ug/l)														
									ND	ND	ND	ND	ND	--
Field Measurements														
Conductivity (ms/cm)	NA	NA	NA	NA	NA	NA	NA	NA	0.231	0.5	0.63	0.66	0.423	--
DO (%)	NA	NA	NA	NA	NA	NA	NA	NA	2.6	1.6	59.3	1.8	46.8	--
pH	NA	NA	NA	NA	NA	NA	NA	NA	7.06	7.04	7.32	7.26	7.43	--
Temperature (°C)	NA	NA	NA	NA	NA	NA	NA	NA	9.6	9.5	16	11.4	10.7	--

Note: Analytical and Criteria Footnotes
are included on the last page of the table.

DETAILED FINDINGS REPORT
LAKE LINDEN SANDS AREA

TABLE 6-2
Sample Analytical Summary - Groundwater
Lake Linden Sands Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Groundwater Table Footnotes:

MDEQ Part 201 residential and non-residential generic cleanup criteria and screening levels criteria were originally promulgated December 21, 2002 within the Administrative Rules for Part 201, Environmental Remediation, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. This table reflects revisions to the criteria pursuant to the December 2010 Part 201 amendments and new criteria consistent with the provisions of R299.5706a.Remediation, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. Release Date: December 30, 2013.

Only detected analytes are listed - Gray rows indicate requested analyses. If no analytes are listed below a gray row then all analytes of that group were either not analyzed or not detected. ND indicates that one or more analyte of that group was tested and not detected and a – indicates not analyzed.

Bold values are concentrations detected above the reporting limit.

Shaded values indicate analyte concentration exceed applicable criteria. Color presented is the criteria below with the highest value that was exceeded:

Residential Drinking Water Criteria
Nonresidential Drinking Water Criteria
Groundwater Surface Water Interface Criteria
Residential Groundwater Volatilization to Indoor Air Inhalation Criteria
Nonresidential Groundwater Volatilization to Indoor Air Inhalation Criteria
Water Solubility
Flammability and Explosivity Screening Level

-- = Not analyzed/Not reported

bgs = Below ground surface

DO = Dissolved oxygen

ft = Feet

PCBs = Polychlorinated biphenyls

SVOC = Semi-volatile organic compound

ug/l = Micrograms per liter

VOC = Volatile organic compound

°C = Degrees Celsius

mS/cm = MilliSiemens per centimeter

% = Percent

Groundwater Table Footnotes:

ID = Insufficient data to develop criterion.

NA = A criterion or value is not available

NLL = Hazardous substance is not likely to leach under most soil conditions.

NLV = Hazardous substance is not likely to volatilize under most conditions.

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

(BB) = The state drinking water standard for asbestos (fibers greater than 10 micrometers in length) is in units of a million fibers per liter of water (MFL). Soil concentrations of asbestos are determined by polarized light microscopy.

(D) = Calculated criterion exceeds 100 percent, hence it is reduced to 100 percent or 1.0E+9 parts per billion (ppb).

(E) = Criterion is the aesthetic drinking water value, as required by Section 20120a(5) of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA). A notice of aesthetic impact may be employed as an institutional control mechanism if groundwater concentrations exceed the aesthetic drinking water criterion, but do not exceed the applicable health-based drinking water value provided in a table available on the Department of Environmental Quality (DEQ) internet web site. (See R 299.49 Footnotes for generic cleanup criteria tables for additional information)

(G) = Groundwater surface water interface (GSI) criterion depends on the pH or water hardness, or both, of the receiving surface water. The final chronic value (FCV) for the protection of aquatic life shall be calculated based on the pH or hardness of the receiving surface water. Where water hardness exceeds 400 mg CaCO3/L, use 400 mg CaCO3/L for the FCV calculation. The FCV formula provides values in units of ug/L or ppb. The generic GSI criterion is the lesser of the calculated FCV, the wildlife value (WV), and the surface water human non-drinking water value (HNDV). The soil GSI protection criteria for these hazardous substances are the greater of the 20 times the GSI criterion or the GSI soil-water partition values using the GSI criteria developed with the procedure described in this footnote. A spreadsheet that may be used to calculate GSI and GSI protection criteria for (G)-footnoted hazardous substances is available on the Department of Environmental Quality (DEQ) internet web site.

(H) = Valence-specific chromium data (Cr III and Cr VI) shall be compared to the corresponding valence-specific cleanup criteria. If both Cr III and Cr VI are present in groundwater, the total concentration of both cannot exceed the drinking water criterion of 100 ug/L. If analytical data are provided for total chromium only, they shall be compared to the cleanup criteria for Cr VI. Cr III soil clea

(HH) = The residential criterion for sodium is 230,000 ug/l in accordance with the Sodium Advisory Council recommendation and revised Groundwater Discharge Standards.

(I) = Hazardous substance may exhibit the characteristic of ignitability as defined in 40 C.F.R. §261.21 (revised as of July 1, 2001), which is adopted by reference in these rules and is available for inspection at the DEQ, 525 West Allegan Street, Lansing, Michigan. Copies of the regulation may be purchased, at a cost as of the time of adoption of these rules of \$45, from the Superintendent of documents, Government Printing Office, Washington, DC 20401 (stock number 869-044-00155-1), or from the DEQ, Remediation and Redevelopment Division (RRD), 525 West Allegan Street, Lansing, Michigan 48933, at cost.

(J) = Hazardous substance may be present in several isomer forms. Isomer-specific concentrations shall be added together for comparison to criteria.

(L) = Criteria for lead are derived using a biologically based model, as allowed for under Section 20120a(9) of the NREPA, and are not calculated using the algorithms and assumptions specified in pathway-specific rules. The generic residential drinking water criterion of 4 ug/L is linked to the generic residential soil direct contact criterion of 400 mg/kg. A higher concentration in the drinking water, up to the state action level of 15 ug/L, may be allowed as a site-specific remedy and still allow for drinking water use, under Section 20120a(2) and 20120b of the NREPA if soil concentrations are appropriately lower than 400 mg/kg. If a site-specific criterion is approved based on this subdivision, a notice shall be filed on the deed for all property where the groundwater concentrations will exceed 4 ug/L to provide notice of the potential for unacceptable risk if soil or groundwater concentrations increase. Acceptable combinations of site-specific soil and drinking water concentrations are presented in a table available on the Department of Environmental Quality (DEQ) internet web site (See R 299.49 Footnotes for generic cleanup criteria tables for additional information).

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

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

(P) = Amenable cyanide methods or method OIA-1677 shall be used to quantify cyanide concentrations for compliance with all groundwater criteria. Total cyanide methods or method OIA-1677 shall be used to quantify cyanide concentrations for compliance with soil criteria. Nonresidential direct contact criteria may not be protective of the potential for release of hydrogen cyanide gas. Additional land or resource use restrictions may be necessary to protect for the acute inhalation concerns associated with hydrogen cyanide gas.

(Q) = Criteria for carcinogenic polycyclic aromatic hydrocarbons were developed using relative potential potencies to benzo(a)pyrene.

(R) = Hazardous substance may exhibit the characteristic of reactivity as defined in 40 C.F.R. §261.23 (revised as of July 1, 2001), which is adopted by reference in these rules and is available for inspection at the DEQ, 525 West Allegan Street, Lansing, Michigan. Copies of the regulation may be purchased, at a cost as of the time of adoption of these rules of \$45, from the Superintendent of Documents, Government Printing Office, Washington, DC 20401 (stock number 869-044-00155-1), or from the DEQ, RRD, 525 West Allegan Street, Lansing, Michigan 48933, at cost.

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

(T) = Refer to the federal Toxic Substances Control Act (TSCA), 40 C.F.R. §761, Subpart D and 40 C.F.R. §761, Subpart G, to determine the applicability of TSCA cleanup standards. Subpart D and Subpart G of 40 C.F.R. §761 (July 1, 2001) are adopted by reference in these rules and are available for inspection at the DEQ, 525 West Allegan Street, Lansing, Michigan. Copies of the regulations may be purchased, at a cost as of the time of adoption of these rules of \$55, from the Superintendent of Documents, Government Printing Office, Washington, DC 20401, or from the DEQ, RRD, 525 West Allegan Street, Lansing, Michigan 48933, at cost. Alternatives to compliance with the TSCA standards listed below are possible under 40 C.F.R. §761 Subpart D. New releases may be subject to the standards identified in 40 C.F.R. §761, Subpart G. Use Part 201 soil direct contact cleanup criteria in the published table if TSCA standards are not applicable.

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

(X) = The GSI criterion shown in the generic cleanup criteria tables is not protective for surface water that is used as a drinking water source. (See R 299.49 Footnotes for generic cleanup criteria tables for additional information.)

(Z) = Mercury is typically measured as total mercury. The generic cleanup criteria, however, are based on data for different species of mercury. Specifically, data for elemental mercury, chemical abstract service (CAS) number 7439976, serve as the basis for the soil volatilization to indoor air criteria, groundwater volatilization to indoor air, and soil inhalation criteria. Data for methyl mercury, CAS number 22967926, serve as the basis for the GSI criterion; and data for mercuric chloride, CAS number 7487947, serve as the basis for the drinking water, groundwater contact, soil direct contact, and the groundwater protection criteria. Comparison to criteria shall be based on species-specific analytical data only if sufficient facility characterization has been conducted to rule out the presence of other species of mercury.

Laboratory Footnotes:

ND = Not detected

J = Estimated result

U = Analyte analyzed for but not detected above the reported sample reporting limit.

DETAILED FINDINGS REPORT
LAKE LINDEN SANDS AREA

TABLE 6-3
Sample Analytical Summary - Sediment
Lake Linden Sands Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Station Name	CAS Number	EPA Region 5 Ecological Screening Level	Threshold Effect Concentration (TEC)	Probable Effect Concentration (PEC)	CHLL-SD05				CHLL-SD07		CHLL-SD08		
Field Sample ID					CHLL-SD-05-0-6"	CHLL-SD-05-1-3'	CHLL-SD-05-1-3' dup	CHLL-SD-05-3'-5'	CHLL-SD07-0"-6"	CHLL-SD07-1'-3'	CHLL-SD 08-0"-6"	CHLL-SD 08-1'-3'	CHLL-SD 08-3'-4'
Sample Date					5/29/2015	5/29/2015	5/29/2015	5/29/2015		7/12/2014	7/11/2014	7/11/2014	7/11/2014
Sample Interval (bgs)					0 - 0.5 ft	1 - 3 ft	1 - 3 ft	3 - 5 ft	0 - 0.5 ft	1 - 3 ft	0 - 0.5 ft	1 - 3 ft	3 - 4 ft
Sample Description					SAND, Dark Brown to Black, fine grained, silty	SAND, Reddish-Brown, fine grained, silty	Field Duplicate	SAND, Reddish-Brown, fine grained, silty	SILT, Sandy, Dark brown to black	SILT, Clayey, Dark brown to black to reddish brown	SILT, Sandy, Dark brown	SILT, Sandy, Dark brown	SILT, Sandy, Dark brown
Inorganics - Metals (mg/kg)													
ALUMINUM	7429-90-5	NA	NA	NA	5600	--	--	--	--	--	--	--	--
ARSENIC	7440-38-2	9.79	9.79	33.0	1.4	--	--	--	--	--	--	--	--
BARIUM	7440-39-3	NA	NA	NA	24	--	--	--	--	--	--	--	--
BERYLLIUM	7440-41-7	NA	NA	NA	0.9	--	--	--	--	--	--	--	--
CADMIUM	7440-43-9	0.99	0.99	4.98	<0.2 U	--	--	--	--	--	--	--	--
CHROMIUM	7440-47-3	43.4	43.4	111	18	--	--	--	--	--	--	--	--
COBALT	7440-48-4	50	NA	NA	8.1	--	--	--	--	--	--	--	--
COPPER	7440-50-8	31.6	31.6	149	1800	--	--	--	--	--	--	--	--
IRON	7439-89-6	NA	NA	NA	15000	--	--	--	--	--	--	--	--
LEAD	7439-92-1	35.8	35.8	128	6.5	--	--	--	--	--	--	--	--
LITHIUM	7439-93-2	NA	NA	NA	4.3	--	--	--	--	--	--	--	--
MAGNESIUM	7439-95-4	NA	NA	NA	6400	--	--	--	--	--	--	--	--
MANGANESE	7439-96-5	NA	NA	NA	230	--	--	--	--	--	--	--	--
NICKEL	7440-02-0	22.7	22.7	48.6	19	--	--	--	--	--	--	--	--
SELENIUM	7782-49-2	NA	NA	NA	<0.4 U	--	--	--	--	--	--	--	--
SILVER	7440-22-4	0.5	NA	NA	1.6	--	--	--	--	--	--	--	--
ZINC	7440-66-6	121	121	459	79	--	--	--	--	--	--	--	--
Inorganics - Cyanide (mg/kg)													
					ND	--	--	--	--	--	--	--	--
Organics - PCBs (ug/kg)													
					ND	ND	ND	ND	ND	ND	ND	ND	ND
Organics - SVOCs (ug/kg)													
PHENANTHRENE	85-01-8	204	204	1,170	--	<260 U	<260 U	--	--	--	--	--	--

Note: Analytical and Criteria Footnotes
are included on the last page of the table.

DETAILED FINDINGS REPORT
LAKE LINDEN SANDS AREA

TABLE 6-3
Sample Analytical Summary - Sediment
Lake Linden Sands Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Station Name	CAS Number	EPA Region 5 Ecological Screening Level	Threshold Effect Concentration (TEC)	Probable Effect Concentration (PEC)	CHLL-SD09			CHLL-SD10		CHLL-SD72			TL08-080
Field Sample ID					CHLL-SD 09-0"-6"	CHLL-SD 09-1'-2.1'	CHLL-SD 09-1'-2.1' dup	CHLL-SD 10-0"-6"	CHLL-SD 10-1'-2'	CHLL-SD-72-0-6"	CHLL-SD-72-1-3'	CHLL-SD-72-3'-4.9'	TL08-080
Sample Date					6/15/2014	6/15/2014	6/15/2014	6/15/2014	6/15/2014	5/29/2015	5/29/2015	5/29/2015	8/28/2008
Sample Interval (bgs)					0 - 0.5 ft	1 - 2.1 ft	1 - 2.1 ft	0 - 0.5 ft	1 - 2 ft	0 - 0.5 ft	1 - 3 ft	3 - 4.9 ft	0 - 0 ft
Sample Description					SAND, Fine to medium grained, Reddish brown	SAND, Fine to medium grained, Reddish brown	Field Duplicate	SAND, Fine grained, Reddish brown	SAND, Fine grained, Reddish brown	SILT, Sandy, Dark brown to black	SAND, silty, fine grained, reddish-brown	SAND, silty, fine grained, reddish-brown	--
Inorganics - Metals (mg/kg)													
ALUMINUM	7429-90-5	NA	NA	NA	--	--	--	--	--	7000	--	--	--
ARSENIC	7440-38-2	9.79	9.79	33.0	--	--	--	--	--	3.2	--	--	--
BARIUM	7440-39-3	NA	NA	NA	--	--	--	--	--	48	--	--	--
BERYLLIUM	7440-41-7	NA	NA	NA	--	--	--	--	--	0.9	--	--	--
CADMIUM	7440-43-9	0.99	0.99	4.98	--	--	--	--	--	0.3	--	--	--
CHROMIUM	7440-47-3	43.4	43.4	111	--	--	--	--	--	20	--	--	--
COBALT	7440-48-4	50	NA	NA	--	--	--	--	--	9.4	--	--	--
COPPER	7440-50-8	31.6	31.6	149	--	--	--	--	--	1400	--	--	--
IRON	7439-89-6	NA	NA	NA	--	--	--	--	--	18000	--	--	--
LEAD	7439-92-1	35.8	35.8	128	--	--	--	--	--	17	--	--	--
LITHIUM	7439-93-2	NA	NA	NA	--	--	--	--	--	5.6	--	--	--
MAGNESIUM	7439-95-4	NA	NA	NA	--	--	--	--	--	7100	--	--	--
MANGANESE	7439-96-5	NA	NA	NA	--	--	--	--	--	280	--	--	--
NICKEL	7440-02-0	22.7	22.7	48.6	--	--	--	--	--	22	--	--	--
SELENIUM	7782-49-2	NA	NA	NA	--	--	--	--	--	0.4	--	--	--
SILVER	7440-22-4	0.5	NA	NA	--	--	--	--	--	1.8	--	--	--
ZINC	7440-66-6	121	121	459	--	--	--	--	--	110	--	--	--
Inorganics - Cyanide (mg/kg)													
					--	--	--	--	--	ND	--	--	--
Organics - PCBs (ug/kg)													
					ND	ND	ND	ND	ND	ND	ND	ND	ND
Organics - SVOCs (ug/kg)													
PHENANTHRENE	85-01-8	204	204	1,170	--	--	--	--	--	--	1400	--	--

Note: Analytical and Criteria Footnotes
are included on the last page of the table.

TABLE 6-3
Sample Analytical Summary - Sediment
Lake Linden Sands Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Sediment Table Footnotes:

- ESLs, TECs, and PECs are adapted from Appendix A and Appendix B of Michigan Department of Environmental Quality - Remediation and Redevelopment Division Operational Memorandum No. 4 Attachment 3, Interim Final August 2, 2006
- Only detected analytes are listed - Gray rows indicate requested analyses. If no analytes are listed below a gray row then all analytes of that group were either not analyzed or not detected. ND indicates that one or more analyte of that group was tested and not detected and a -- indicates not analyzed.
- **Bold** values are concentrations detected above the reporting limit.
- **Shaded values indicate analyte concentration exceed applicable criteria. Color presented is the criteria with the highest value that was exceeded:**

EPA Region 5 RCRA ESLs dated August 22, 2003
TECs from MacDonald <i>et al.</i> 2000
PECs from MacDonald <i>et al.</i> 2000

- = Not analyzed/Not Reported
- bgs = Below ground surface
- ESL = Ecological Screening Level
- ft = Feet
- in = Inches
- mg/kg = Milligrams per kilogram.
- PCBs = Polychlorinated biphenyls
- PEC = Probable Effect Concentration
- RCRA = Resource Conservation and Recovery Act
- SVOC = Semi-volatile organic compound
- TEC = Threshold Effect Concentration
- ug/kg = Micrograms per kilogram
- VOC = Volatile organic compound

Criteria Footnotes:

- NA = A criterion or value is not available

Laboratory Footnotes:

- J = Estimated result
- ND = Analyte analyzed for but not detected above the reported sample reporting limit.
- U = Analyte analyzed for but not detected above the reported sample reporting limit.

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TABLE 6-4
Sample Analytical Summary - Surface Water and SPMD
Lake Linden Sands Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Station Name	CAS Number	EPA Region 5 Ecological Screening Level	Rule 57 HCV Drink	Rule 57 HNV Drink	Rule 57 WV	SPMD Site #2
Field Sample ID						SPMD Site #2
Sample Date						11/18/2005
Sample Interval						3 - 3 ft
Organics - PCBs (ug/l)						
PCB 028	PCB 028	NA	NA	NA	NA	2.6
PCB 031	PCB 031	NA	NA	NA	NA	1.9
PCB 033	PCB 033	NA	NA	NA	NA	1.4
PCB 037-042	PCB 037-042	NA	NA	NA	NA	1.3
PCB 044	PCB 044	NA	NA	NA	NA	1.5
PCB 049	PCB 049	NA	NA	NA	NA	3.7
PCB 052	PCB 052	NA	NA	NA	NA	2
PCB 066-095	PCB 066-095	NA	NA	NA	NA	1.8
PCB 070	PCB 070	NA	NA	NA	NA	1.3
PCB 077a-110	PCB 077a-110	NA	NA	NA	NA	1.7
PCB 090-101	PCB 090-101	NA	NA	NA	NA	0.9
PCB 118a	PCB 118a	NA	NA	NA	NA	0.6
PCB 138a-163	PCB 138a-163	NA	NA	NA	NA	0.5
PCB 153	PCB 153	NA	NA	NA	NA	0.8
PCB 174	PCB 174	NA	NA	NA	NA	0.7
TOTAL PCBs	TPCB	0.00012	0.000026	NLS	0.00012	22

Surface Water Table Footnotes:

- MDEQ Rule 57 values derived from the Michigan Department of Environmental Quality, Water Bureau, Water Resources Protection, filed with the Secretary of State on January 13, 2006. Part 4 Water Quality Standards, Rule 323.1057 Toxic Substances, as amended. Updated on February 27, 2014.
- ESLs are adapted from Appendix A and Appendix B of Michigan Department of Environmental Quality - Remediation and Redevelopment Division Operational Memorandum No. 4 Attachment 3, Interim Final August 2, 2006
- Only detected analytes are listed - Gray rows indicate requested analyses. If no analytes are listed below a gray row then all analytes of that group were either not analyzed or not detected. ND indicates that one or more analyte of that group was tested and not detected and a -- indicates not analyzed.
- SPMD results are not compared to surface water criteria.
- **Bold** values are concentrations detected above the reporting limit.
- **Shaded values indicate analyte concentration exceed applicable criteria. Color presented is the criteria with the highest value that was exceeded:**

EPA Region 5 RCRA ESLs dated August 22, 2003

MDEQ Rule 57 Water Quality Value, HCV, drinking water source, dated February 27, 2014

MDEQ Rule 57 Water Quality Value, HNV, drinking water source, dated February 27, 2014

MDEQ Rule 57 Water Quality Value, WV, dated February 27, 2014

-- = Not analyzed/Not reported

bgs = below ground surface

EPA = United States Environmental Protection Agency

ESL = Ecological Screening Level

ft = feet

HCV = Human Non-Cancer Value

HNV = Human Cancer Value

MDEQ = Michigan Department of Environmental Quality

PCBs = Polychlorinated biphenyls

RCRA = Resource Conservation and Recovery Act

SPMD = Semi-permeable membrane device

ug/l = Micrograms per liter

WV = Wildlife Value

Criteria Footnotes:

NA = a criterion or value is not available

NLS = no literature search has been conducted

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LAKE LINDEN SANDS AREA**

SECTION 6

**DETAILED FINDINGS REPORT – LAKE LINDEN SANDS AREA
FIGURES**

Image Source: MIS - Public Imagery

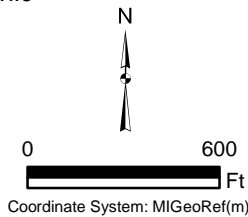
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Sampling Location Type

- Soil
- Groundwater
- Semi-Permeable Membrane Device
- Sediment

Conceptual Site and Geographic Area Boundaries



Prepared for:
**Michigan Department of
Environmental Quality**



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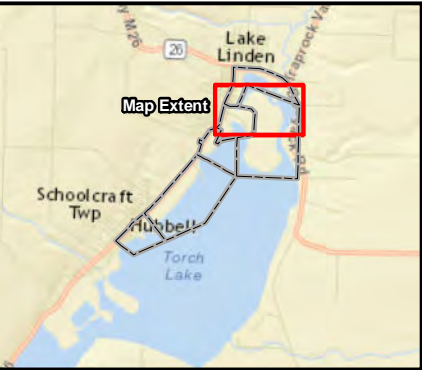
Figure 6-1
Sampling Location Map
Lake Linden Sands Area
Lake Linden, Houghton County, Michigan

Image Source: MIS-Public Imagery

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Image Source: MIS - Public Imagery

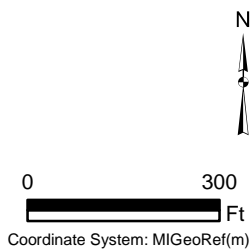


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- Sampling locations with at least one exceedance
- Sampling locations with no exceedances
- Locations are included within a different geographical area boundary

- Locations Analyzed for PCBs**
- No Detections
 - At Least One Detection
 - Conceptual Site and Geographic Area Boundaries



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 (VSIC)
6=Residential Infinite Source Volatile Soil Inhalation Criteria
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
18=Hazardous Waste Toxicity Screening Value
* Exceedances of criteria 2, 4, and 11 shown for organics and cyanide only

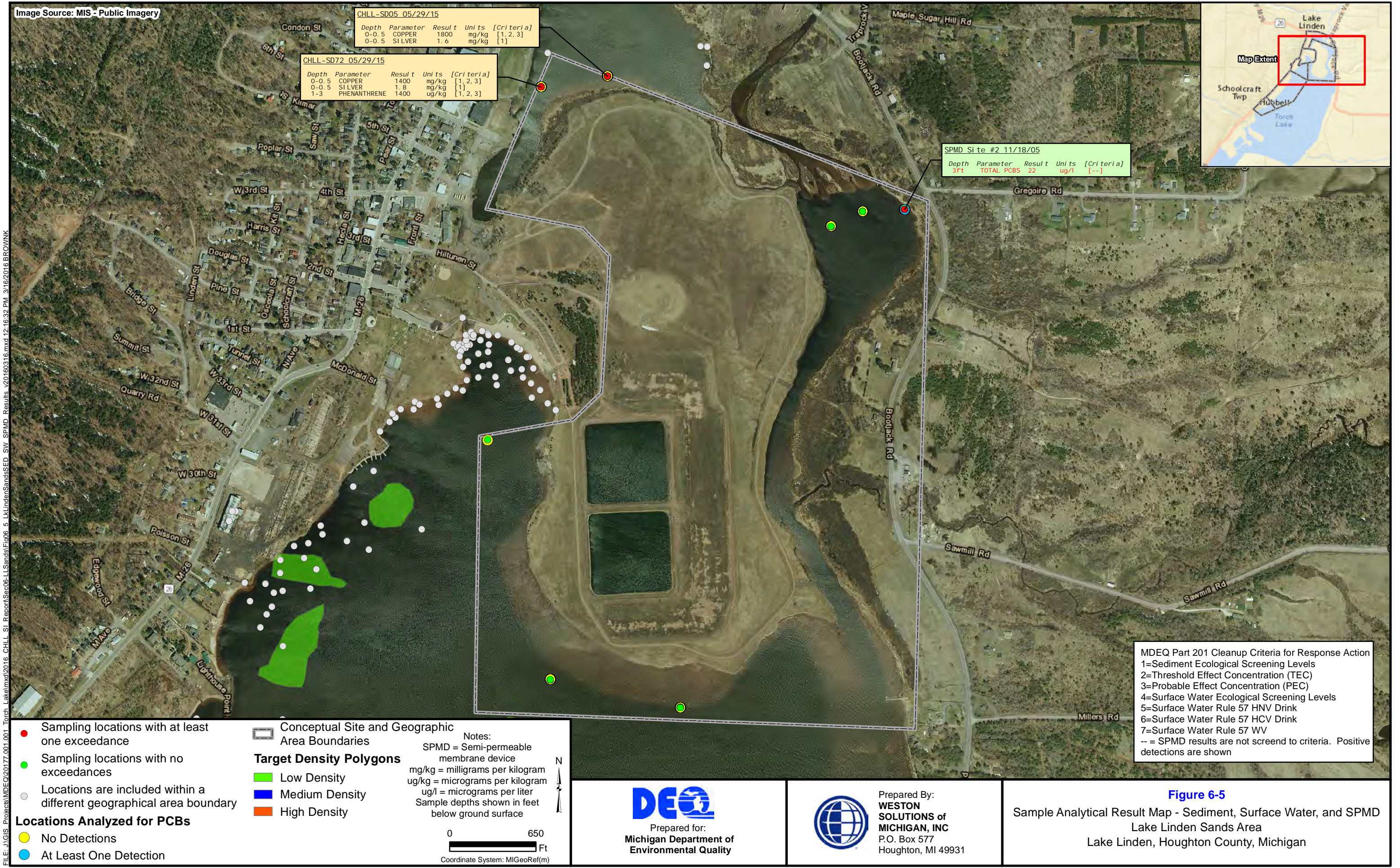
DEQ
Prepared for:
**Michigan Department of
Environmental Quality**



Prepared By:
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Figure 6-3
Sample Analytical Result Map - Soil
Lake Linden Sands Area
Lake Linden, Houghton County, Michigan





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**DETAILED FINDINGS REPORT
LAKE LINDEN RECREATION AREA**

7. DETAILED FINDINGS REPORT – LAKE LINDEN RECREATION AREA

This Section summarizes the findings derived from implementation of the sampling and analysis plan (SAP) in the Lake Linden Recreation Area. The narrative follows the investigative approach outlined in **Section 3**, while providing specific details about the study area and the potential human health and ecological risks associated with mining era operations in the study area.

7.1 SITE INSPECTION AND INVESTIGATION RESULTS

The implementation of the site inspection and investigation activities provided critical lines of evidence that link the findings of the archival research to the current environmental conditions in and around Torch Lake. The following subsections present the findings of the inspection and investigation activities and provide correlation of mining era operations and their potential impacts on the nearshore environment of Torch Lake.

7.1.1 Site Inspection

The site inspection at the Lake Linden Recreation Area included the locating and inventory of structures and similar surficial artifacts associated with the mining era industrial operations. The study area was also inspected for potential physical and health hazards which were documented, photographed, and located with a global positioning system (GPS) unit. The inventoried hazards, if identified, were then qualitatively assessed for potential human health and environmental risks to determine if analytical sampling was warranted during the targeted inspection phase of the work.

7.1.1.1 Reconnaissance

On 6 October 2014, a field team comprised of Weston Solutions of Michigan, Inc. (WESTON®) personnel performed reconnaissance activities in the Lake Linden Recreation Area. The inspected areas included the multiple parcels that are generally owned and maintained by the Village of Lake Linden. Specifically, these parcels included public access areas including the Lake Linden Village Park, the Lake Linden Marina, the Lake Linden Beach, and the Campground. Although also open to the public, the walking trail and frisbee golf course, located in the same vicinity, were evaluated as part of the Lake Linden Sands Area.

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The aforementioned properties were visually inspected and observations were recorded on field logs. The following provides a summary of the relevant findings associated with the reconnaissance activities.

Lake Linden Recreation Area – Reconnaissance Summary	
Potential Chemical or Physical Hazards	Recorded Observations
Suspect Asbestos Containing Material (SACM)	No SACM was observed during the inspection.
Residual Process Materials	The Lake Linden Recreation Area incorporates portions of the historical stamp mill and reclamation facilities associated with mining era operations. As such stamp sands and other wastes are suspected to be present beneath the vegetated covering on the majority of the properties.
Potentially Abandoned Containers	No mining era containers were observed during the inspection.
Soil Staining/Stressed Vegetation	A barren stamp sand covered area was observed north of the baseball field in an area of municipal operations. In addition, stamp sand is also used as access road surfacing at the Marina. In other areas of sparse vegetation, stamp sands were observed in the topsoil matrix. Wave action has resulted in erosion of portions of the vegetated shoreline north of the Marina property.
Potential Polychlorinated Biphenyl (PCB) or Mercury Containing Equipment	No potential PCB or mercury containing equipment was observed on the inspected properties.
Other:	Observations of other hazards, not summarized above, were not recorded during the inspection.

In general, no significant hazards were identified in the Lake Linden Recreation Area during the reconnaissance activities. The stamp sands are believed to be prevalent throughout the area in the near-surface soils; however, the composition and migration potential of these materials have been well characterized in historical reports. Field logs documenting reconnaissance observations are included in **Appendix D** of the Site Investigation (SI) Report.

7.1.1.2 Targeted Inspection

The qualitative assessment of the reconnaissance findings in the Lake Linden Recreation Area did not warrant the performance of targeted inspection activities at any of the properties.

7.1.2 Site Investigation

The SI at the Lake Linden Recreation Area was developed based on a variety of data and information as outlined in **Section 3**. In addition to the historical accounts and documentation,

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current land use and potential exposure pathways were also taken into consideration when selecting the sampling locations specific to the Lake Linden Recreation Area. The following subsections present the outcomes of investigative activities completed in the area by summarizing the laboratory analytical results and characterizing their impacts on the environmental media in which they were detected.

7.1.2.1 Terrestrial Investigation

Intrusive investigation activities in the Lake Linden Recreation Area were generally guided by the findings of historical research, the results of previous remedial actions, the results of previous intrusive and non-intrusive investigations, and field observations. As stated previously, the Lake Linden Recreation Area was part of the larger stamp mill and reclamation industrial complexes. In addition to these historical operations, previous remedial actions resulted in the removal of shallow heavy metal and PCB-laden sludge from near-surface soils along the shoreline, west of the Lake Linden Beach. As a result, there is generally significant historical analytical data available for the area, which ultimately prioritized the SI activities towards filling potential data gaps. The upland investigative work in the area was relatively widespread with the intent of either investigating areas where no data existed, or investigating areas where the vertical and horizontal distribution of contaminants of concern (COCs) in soil and groundwater was not well understood. The following subsections present a summary of the field observations and analytical results derived from the terrestrial sampling activities

7.1.2.1.1 Field Observations – Soil and Groundwater

Borings in the Lake Linden Recreation Area were generally advanced to depths between 12 and 17 feet (ft) below the ground surface (bgs) with two borings that were advanced to 24 ft and 33 ft. Boring locations are depicted on [Figure 7-1](#). Soil observations documented on field logs indicate that the subsurface is primarily comprised of coarse to fine grained sands that were reddish brown in color. Some locations featured clay or topsoil in the upper 6 in. of the boring. Two boring locations (CHLL-SB122 and CHLL-SB123) were reportedly comprised of sand and gravel fill material to a depth of 5 ft bgs.

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During groundwater sampling, temporary well points were generally established between 7 ft and 17 ft bgs. Saturated soil conditions were generally encountered between depths of 4 ft and 8 ft. In two soil boring locations CHLL-SB07 and CHLL-SB12, saturated soil conditions were not encountered until a depth of 24 ft bgs. A temporary sampling location (CHLL-GW04) was established in boring CHLL-SB07 between 28 ft and 33 ft bgs. Groundwater quality parameters, including temperature, conductivity, dissolved oxygen (DO) and pH, measured at the time of sample collection were generally considered normal. DO measurements were greater than 40% in six of the sample locations with a maximum concentration of 95%. Elevated DO concentrations are typically indicative of low bio-activity, indicating that oxygen is not being consumed by aerobic organisms in the subsurface. These conditions may persist in the study area due to the presence of stamp sands deposits along the shoreline of Torch Lake. Alternatively, the presence of other volatile chemicals in soil or groundwater and inconsistencies in sample collection could also cause interference within the instrument, causing inaccurate or false measurements. Additional evaluation would be required to determine if these results are indicators of variability in sample collection or the presence of chemical interference.

7.1.2.1.2 Soil Sampling Results

Terrestrial investigation activities were completed in the Lake Linden Recreation Area during three mobilizations. The first round of investigative work was completed between 14 and 16 June 2014, the second was completed between 20 and 21 August 2014, and the third was completed on 19 August 2015. Between the three mobilizations, a total of 55 soil samples and three duplicate soil samples were collected from 29 boring locations. Soil sampling locations are depicted on [Figure 7-1](#). Investigative methodologies and soil sampling techniques were conducted using the procedures outlined in **Section 3**.

The surficial and subsurface soil analytical results for the Lake Linden Recreation Area contained a variety of inorganic COCs at concentrations at or above applicable regulatory criteria. Semi-volatile organic compounds (SVOCs) were also detected in one subsurface soil sample above applicable regulatory criteria. Cyanide was also detected in five surface soil samples above applicable regulatory criteria. Total PCBs, although detected in one sample north of the Lake

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Linden Beach in a subsurface sample, did not exceed applicable regulatory criteria in any of the soil samples collected from the Lake Linden Recreation Area.

A detailed summary of soil analytical results collected from the Lake Linden Recreation Area are provided in **Table 7-1**. X-ray fluorescence (XRF) soil screening results from the Lake Linden Recreation Area are depicted on **Figure 7-2**. Soil analytical results from the Lake Linden Recreation Area are depicted on **Figure 7-3**.

7.1.2.1.3 Groundwater Sampling Results

During the installation of soil borings in the Lake Linden Recreation Area 25 temporary groundwater sampling locations were established to characterize groundwater in the area. The temporary sampling locations were installed and sampled using the methodologies presented in **Section 3**. A total of 25 groundwater samples and two duplicate samples were collected from the temporary sampling locations. The screened intervals in the groundwater sampling locations were generally between 7 ft and 17 ft bgs. Temporary groundwater sampling locations are depicted on **Figure 7-1**.

All groundwater samples were analyzed for PCBs. A subset of samples were also analyzed for other COCs including volatile organic compounds (VOCs), SVOCs, cyanide, and inorganic constituents. A detailed summary of groundwater analytical results collected from the Lake Linden Recreation Area are provided in **Table 7-2**. Groundwater analytical results from the Lake Linden Recreation Area are depicted on **Figure 7-4**. Soil boring logs are included in **Appendix G** of the SI Report.

7.1.2.2 Offshore Investigation

Similar to the terrestrial investigation, the proposed offshore investigation activities for the Lake Linden Recreation Area were also guided by several factors. First, historical analytical data was evaluated to determine if adequate characterization data was available in the study area to assess the overall sediment and surface water quality. In addition, underwater surveillance of the area, as described in **Section 3**, was used to locate and assess potential offshore waste deposits. Lastly, field observations, both terrestrial and offshore, were used to position sampling locations. Offshore

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sediment and surface water samples were collected from the Lake Linden Recreation Area during the SI. The following subsections present a summary of the analytical results derived from offshore sampling activities in the Lake Linden Recreation Area.

7.1.2.2.1 Sediment Sampling Results

Offshore investigation activities were completed in the Lake Linden Recreation Area during four mobilizations. The first round of investigative work was completed between 15 and 16 June 2014, the second followed over a period of several days between 9 and 12 July 2014, the third between 27 and 28 May 2015, and the fourth on 12 July 2014. Between the four mobilizations, a total of 62 sediment samples and six duplicate sediment samples were collected from 24 sampling locations. Sediment sampling locations are depicted on [Figure 7-1](#). Investigative methodologies and sediment sampling techniques were conducted using the procedures outlined in [Section 3](#).

Sediment sampling locations included 24 surficial sediment samples, ranging from 0 to 6 inches (in.) in depth. The investigation also included the collection of 38 deeper sediment samples ranging from 1 ft to 5 ft in depth. All samples were analyzed for PCBs. A subset of sediment samples were also selected for inorganic constituents, SVOCs, and cyanide analysis.

The sediment analytical results for each of the samples contained multiple inorganic COCs at or above concentrations that exceeded applicable regulatory criteria. Total PCBs were detected in nine surficial sediment samples and six deep sediment samples collected from the Lake Linden Recreation Area that exceeded applicable regulatory criteria. Cyanide was not detected in any of the samples collected from the Lake Linden Recreation Area.

A detailed summary of sediment analytical results collected from the Lake Linden Recreation Area are provided in [Table 7-3](#). Sediment analytical results from the Lake Linden Recreation Area are depicted on [Figure 7-5a](#), [Figure 7-5b](#), and [Figure 7-5c](#). Sediment core logs are included in [Appendix H](#) of the SI Report.

7.1.2.2.2 Surface Water Sampling Results

Surface water sampling activities were also completed between 27 and 28 May 2015. A total of four surface water samples, ranging from 7.7 to 12.5 ft in depth, were collected from four sampling

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locations. Investigative methodologies and surface water sampling techniques were conducted using the procedures outlined in **Section 3**. All samples were analyzed for PCBs.

Total PCBs and were not detected in any of the surface water samples collected from the Lake Linden Recreation Area during the SI.

In addition, three grab surface water samples and one Semi-permeable Membrane Device (SPMD) sampling location were located in the Lake Linden Recreation Area during previous sampling activities. The grab surface water samples were analyzed for inorganic COCs, cyanide, VOCs, and SVOCs. Grab surface water sample analytical results exceeded applicable regulatory criteria for inorganic contaminants, cyanide, and SVOCs. The general purpose of the SPMD collection method is to provide a time-weighted exposure that is representative of chemical uptake through fish respiration. SPMD sample results do not provide for a direct comparison to surface water criteria, but are an indicator of contaminants in the water column. PCB congeners were detected in the SPMD sample.

Grab, SPMD, and surface water sampling locations are depicted on **Figure 7-1**. Analytical results for the grab, SPMD, and surface water sampling locations in the Lake Linden Recreation Area are presented in **Table 7-4**. SPMD and surface water analytical results for the Lake Linden Recreation Area are depicted on **Figure 7-5a**, **Figure 7-5b**, and **Figure 7-5c**. Surface water information is included on the corresponding sediment core logs in **Appendix H** of the SI Report.

7.2 NATURE AND EXTENT OF CONTAMINATION

Utilizing the established regulatory criteria presented in **Section 4** for various land use categories and exposure pathways, the laboratory analytical results summarized in the preceding section for the Lake Linden Recreation Area were reviewed and compared to the following regulatory criteria as applicable for the sampled environmental media:

- Michigan Department of Environmental Quality (MDEQ) Cleanup Criteria Requirements for Response Activity;
- MDEQ – Rule 57 Water Quality Values;
- U.S. Environmental Protection Agency (EPA) Ecological Screening Levels (ESLs); and,

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- Sediment Quality Guidelines, Threshold Effect Concentrations (TECs) and Probable Effect Concentrations (PECs), MacDonald, et al, 2000.

7.2.1 Comprehensive Exposure Assessment

The comparison was completed to determine which ecological and human exposure pathways, risks, and conditions are relevant in the Lake Linden Recreation Area. Although not inclusive of relevant pathways where regulatory criteria were not exceeded, the following exposure pathways were determined to be relevant in the Lake Linden Recreation Area:

- Risks posed by hazardous substances in soil and the potential for the substances to leach to groundwater that could vent to surface water.
- Risks posed by hazardous substances in soil and the potential for direct contact with these soils in both residential and nonresidential settings.
- Risks posed by hazardous substances in groundwater and the potential for that groundwater to be used as a drinking water source in both residential and nonresidential settings.
- Risks posed by hazardous substances in groundwater and the potential for that groundwater to vent to surface water.
- Risks posed by hazardous substances in surface water and sediments that have the potential to have toxic effects on aquatic biota and/or enter the food chain.

As discussed in **Section 4.2.5**, the MDEQ drinking water/surface water pathway criteria exceedances for metals were excluded from the soil and groundwater evaluation. The rationale for this exclusion is twofold:

- The Project investigation and anticipated response actions are being undertaken pursuant to Part 201 of Michigan's Natural Resources and Environmental Protection Act (NREPA), being Public Act (PA) 451 of 1994, as amended. The concentrations of metals in excess of the MDEQ drinking water/surface water pathway 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 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,

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- The study area is part of OU2 for which the EPA Record of Decision (ROD) remedy called for No Action. The EPA's ROD Operable Unit (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 as a result of the remedial action taken at OU 1 and OU 3.
 - Ongoing natural sedimentation and detoxification.
 - Institutional programs and practices controlling potential future exposure to site-affected drinking water which were intended to be administered at the county and state level.
 - 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.

Note that metals criteria for other relevant pathways, and cyanide and organic contaminants for all pathways were included in the evaluation.

7.2.1.1 Soil Exposure Pathway Assessment

Soil analytical results from the Lake Linden Recreation Area included COC concentrations in soil that were at or above concentrations that trigger a "Facility" designation as defined in Section 20101(1) (s) of the NREPA.

The following tables provide an aggregate summary of the soil sample locations with respect to the total number of samples and how they compare to the applicable MDEQ's Cleanup Criteria for Response Activity under both Residential and Nonresidential exposure scenarios. The tables are based solely on the total number of samples, inclusive of historical samples, collected from the Lake Linden Recreation Area. They list only the number of samples for a specific analytical suite that contained one or more exceedance of a given criterion.

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Soil Analytical Result Summary Table	Cleanup Criteria Requirements for Response Activity – Residential											
	Analytical Summary			Groundwater Protection		Indoor Air	Ambient Air (Y) (C)				Contact	Csat
	Total Number of Samples	Detected Analytes	Total Exceedances	Residential Drinking Water Protection Criteria	Groundwater Surface Water Interface Protection Criteria	Soil Volatilization to Indoor Air Inhalation Criteria	Infinite Source Volatile Soil Inhalation Criteria (VSIC)	Finite VSIC for 5 Meter Source Thickness	Finite VSIC for 2 Meter Source Thickness	Particulate Soil Inhalation Criteria	Direct Contact Criteria	Soil Saturation Concentration Screening Levels
Inorganics	54	613	12	0	0	0	0	0	0	0	8	0
Cyanide	34	5	5	0	5	0	0	0	0	0	0	0
VOCs	5	0	0	0	0	0	0	0	0	0	0	0
SVOCs	28	100	3	0	1	0	0	0	0	0	1	0
Asbestos	6	0	0	0	0	0	0	0	0	0	0	0
Total PCBs	86	1	0	0	0	0	0	0	0	0	0	0
COCs exceeding applicable regulatory criteria in one or more samples				Arsenic, Barium, Copper, Cyanide, Lead, Benzo(a)Pyrene, Fluoranthene, Phenanthrene								

Soil Analytical Result Summary Table	Cleanup Criteria Requirements for Response Activity – Nonresidential											
	Analytical Summary			Groundwater Protection		Indoor Air	Ambient Air (Y) (C)				Contact	Csat
	Total Number of Samples	Detected Analytes	Total Exceedances	Nonresidential Drinking Water Protection Criteria	Groundwater Surface Water Interface Protection Criteria	Soil Volatilization to Indoor Air Inhalation Criteria	Infinite Source Volatile Soil Inhalation Criteria (VSIC)	Finite VSIC for 5 Meter Source Thickness	Finite VSIC for 2 Meter Source Thickness	Particulate Soil Inhalation Criteria	Direct Contact Criteria	Soil Saturation Concentration Screening Levels
Inorganics	54	613	3	0	0	0	0	0	0	0	3	0
Cyanide	34	5	5	0	5	0	0	0	0	0	0	0
VOCs	5	0	0	0	0	0	0	0	0	0	0	0
SVOCs	28	100	2	0	1	0	0	0	0	0	0	0
Asbestos	6	0	0	0	0	0	0	0	0	0	0	0
Total PCBs	86	1	0	0	0	0	0	0	0	0	0	0
COCs exceeding applicable regulatory criteria in one or more sample				Arsenic, Cyanide, Lead, Fluoranthene, Phenanthrene								

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LAKE LINDEN RECREATION AREA****7.2.1.2 Groundwater Exposure Pathway Assessment**

Groundwater analytical results from the Lake Linden Recreation Area included COC concentrations in groundwater that were at or above concentrations that trigger a facility designation as defined in Section 20101(1) (s) of the NREPA.

Shallow groundwater analytical results from the Lake Linden Recreation Area included COC concentrations that were at or above concentrations that pose potential risks to human health and the environment. Similar to the preceding soil tables, the following table provides summary of the aforementioned sample locations with respect to the total number of samples and how they compare to the applicable MDEQ's Cleanup Criteria for Response Activity under both Residential and Nonresidential exposure scenarios.

Groundwater Analytical Result Summary Table	Analytical Summary			Cleanup Criteria Requirements for Response Activity – Residential and Nonresidential						
	Total Number of Samples	Total Number of Detected Analytes	Total Exceedances	Residential Drinking Water Criteria	Nonresidential Drinking Water Criteria	Groundwater Surface Water Interface Criteria	Residential Groundwater Volatilization to Indoor Air Inhalation Criteria	Nonresidential Groundwater Volatilization to Indoor Air Inhalation Criteria	Water Solubility	Flammability and Explosivity Screening Levels
Inorganics	16	202	0	0	0	0	0	0	0	0
Cyanide	23	0	0	0	0	0	0	0	0	0
VOCs	17	26	3	3	3	2	0	0	0	0
SVOCs	20	4	0	0	0	0	0	0	0	0
Total PCBs	34	0	0	0	0	0	0	0	0	0
Other – General Chemistry	5	27	3	3	3	0	0	0	0	0
COCs exceeding applicable regulatory criteria in one or more sample				Benzene, Ammonia						

**DETAILED FINDINGS REPORT
LAKE LINDEN RECREATION AREA****7.2.1.3 Sediment Exposure Pathway Assessment**

Sediment analytical results from the Lake Linden Recreation Area included COC concentrations that were at or above concentrations that pose potential risks to sediment dwelling species, and consequently the food chain. The following table provides a summary of the sample locations located in the Lake Linden Recreation Area. The table lists only the number of samples for a specific analytical suite that contained one or more exceedance of a given criterion.

Sediment Analytical Result Summary	Analytical Summary			EPA, Region 5, Resource Conservation and Recovery Act	Consensus Based Sediment Quality Guidelines	
	Total Number of Samples	Detected Analytes	Total Exceedances	Ecological Screening Levels	Threshold Effect Concentration (TEC)	Probable Effect Concentration (PEC)
Inorganics	96	679	228	96	96	86
Cyanide	16	0	0	0	0	0
VOCs	0	0	0	0	0	0
SVOCs	20	5	4	2	2	0
Total PCBs	147	23	22	22	22	9
DRO/ORO	2	4	0	0	0	0
Corrosivity-pH	0	0	0	0	0	0
COCs exceeding applicable regulatory criteria in one or more sample				Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Silver, Zinc, Pyrene, Total PCBs		

**DETAILED FINDINGS REPORT
LAKE LINDEN RECREATION AREA****7.2.1.4 Surface Water Exposure Pathway Assessment**

The surface water analytical results from the Lake Linden Recreation Area contained COC concentrations that were at or above concentrations that pose potential risks to sediment and water column dwelling species, the food chain, and consequently human health through fish consumption. The following table provides a summary of the sample locations located in the Lake Linden Recreation Area. The table lists only the number of samples for a specific analytical suite that contained one or more exceedance of a given criterion.

Surface Water Analytical Result Summary	Analytical Summary			EPA, Region 5, Resource Conservation and Recovery Act	Surface Water - Rule 57		
	Total Number of Samples	Detected Analytes	Total Exceedances	Ecological Screening Levels	Human Non-Cancer Value	Human Cancer Value	Wildlife Value
Inorganics	4	49	16	4	2	1	0
Cyanide	4	1	1	1	0	0	0
VOCs	4	1	0	0	0	0	0
SVOCs	4	1	1	1	0	0	0
Total PCBs	8	0	0	0	0	0	0
COCs exceeding applicable regulatory criteria in one or more sample				Antimony, Arsenic, Barium, Cadmium, Copper, Cyanide, Lead, Silver, Vanadium, Zinc, Bis(2-EthylHexyl)Phthalate			

7.2.2 Extent of Contamination

The comparison of analytical results to applicable regulatory criteria indicates that potential human health and ecological risks are present in soil, groundwater, sediment, and surface water in the Lake Linden Recreation Area. Recalling that the goals and objectives of the SI, the following subsections describe the extent of contamination in environmental media in the study area.

7.2.2.1 Soil Extent of Contamination

Soil analytical results exceeded Groundwater Surface Water Interface Protection Criteria (GSIPC) and Direct Contact Criteria (DCC) in one or both of the residential and nonresidential exposure scenarios for inorganic contaminants. Similarly, historical surface soil screening results also included measured inorganic contaminant concentrations that exceeded DCC and Particulate Soil

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Inhalation Criteria (PSIC) in both residential and non-residential exposure scenarios. In addition, a limited number of samples analyzed for cyanide and SVOCs exceeded GSIPC.

All samples were collected from surface and subsurface soil intervals from areas of public access including the Lake Linden Village Park, the Lake Linden Beach, the Campground, and the Marina. The soil sampling and screening locations were generally located within 50 ft to 700 ft of the shoreline of Torch Lake and the Torch Lake Backwater. Although physical hazards were not identified during the inspection of the Lake Linden Recreation Area, eroded areas of vegetative cap, specifically along the shoreline, were documented.

Soils with elevated levels of inorganic COCs are ubiquitous in the area, which becomes a limiting factor when evaluating potential exposure pathways. In the case of the Lake Linden Recreation Area, elevated concentrations of inorganic contaminants include exposure risks related to inhalation and dermal contact pathways, which must be taken under consideration when evaluating land use, public access, and the extent of contamination in surface and near surface soils that could be encountered through normal use of the property.

The remaining exposure risks are generally related to the leaching of contaminants to groundwater and their potential impacts on surface water. These risks pose a long-term threat to the overall environmental health of the watershed, the widespread distribution of inorganic COCs throughout the region limit determinations related to the extent of contamination in the Lake Linden Recreation Area. Nevertheless, risks posed to groundwater and surface water are significant and are a factor when considering the public use of these resources in the Lake Linden Recreation Area.

7.2.2.2 Groundwater Extent of Contamination

Groundwater analytical results exceeded Drinking Water Criteria (DWC) for both residential and nonresidential exposure scenarios, and Groundwater/Surface Water Criteria (GSIC) for organic contaminants. In several samples, ammonia exceeded DWC for both residential and nonresidential exposure scenarios. Lastly, benzene exceeded DWC and GSIC at three sampling locations at the Marina.

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The temporary groundwater sampling locations were located within the previously discussed soil boring locations in the Lake Linden Recreation Area. The groundwater samples were collected from a zone within 50 ft to 700 ft of the shoreline of Torch Lake and the Torch Lake Backwater in areas of public access including the Lake Linden Village Park, the Lake Linden Beach, the Campground, and the Marina. Based on the horizontal and vertical placement of these sampling locations it may be presumed that groundwater is venting to the adjacent shorelines of Torch Lake and the Torch Lake Backwater.

The detection of benzene in samples is anomalous and requires additional consideration as it relates to a potential undocumented release upgradient of the sampling location. The potential risks associated with using groundwater as a drinking water source as well as its connectivity to nearby surface water bodies should be a consideration in determinations related to the extent of contamination in the Lake Linden Recreation Area.

7.2.2.3 Sediment Extent of Contamination

Sediment analytical results exceeded ESLs, TECs, and PECs for inorganic contaminants. In addition, analytical results for Total PCBs also exceeded TECs and PECs in both surficial and deep sampling locations. Sediment samples were generally collected from a zone within 10 ft to 200 ft of the shoreline of Torch Lake.

As stated in the preceding subsection, inorganic COCs are prevalent in the area and the related exceedances, although potentially detrimental to aquatic biota, remain a consistent finding in sediment samples collected from Torch Lake. The detection of PCBs above applicable regulatory criteria in up to 15 samples, however, present a more significant exposure risk particularly as it relates to ecological receptors.

The potential risks associated with inorganic constituents, though prevalent in the region, should be considered when evaluating the extent of sediment contamination in the Lake Linden Recreation Area. The presence of Total PCBs in sediment present additional risks both to benthic organisms and potentially human health due to their proximity to the shoreline and their potential effect on the food chain. In addition, the detection of Total PCBs in both deep and surficial sediment indicates that a significant source of PCBs may be present in the nearshore sediments.

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LAKE LINDEN RECREATION AREA****7.2.3 Surface Water Extent of Contamination**

Total PCBs and were not detected in any of the surface water samples collected from the Lake Linden Recreation Area during the SI. Analytical results for three grab surface water samples located in the Lake Linden Recreation Area during previous sampling activities exceeded applicable regulatory criteria for inorganic contaminants.

The presence of inorganic COCs is supported by the ubiquitous presence of inorganics in study area groundwater. Similar to the measured COC concentrations in the area sediment samples, COC concentrations in surface water are potentially detrimental to aquatic biota and potentially human health due to its close proximity to the shoreline. The potential risks associated with inorganic constituents, though prevalent in the region, should also be considered when evaluating the extent of surface water contamination in the Lake Linden Recreation Area.

7.3 CONCLUSIONS AND RECOMMENDATIONS

The analytical results and interpretation summarized in the preceding subsections document potential human health and ecological risks that are present in the Lake Linden Recreation Area. The following subsections provide a synopsis of these findings and a recommended path forward for mitigating these risks in the Lake Linden Recreation Area.

7.3.1 Conclusions

Environmental impacts in the Lake Linden Recreation Area are generally characterized by detections of organic and inorganic contaminants in soil, groundwater, sediment, and surface water; repercussions of mining era operations in the region. Although, specific sources of these contaminants may not be fully understood, historical research related to the operations, closing, and eventual abandonment/scrapping of mining company operations provided substantive evidence for assessing specific operational areas and selecting target analytes anticipated to be present within the study area.

The findings of these investigative activities are summarized as follows:

- Soil analytical results exceeded GSIPC and DCC in one or both of the residential and nonresidential exposure scenarios for inorganic and SVOCs contaminants. In addition, a limited number of samples analyzed for cyanide and SVOCs exceeded GSIPC and SVOCs exceeded DCC for the residential exposure scenario.

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- Surface soil screening results also included measured inorganic contaminant concentrations that exceeded DCC and PSIC in both residential and non-residential exposure scenarios.
- Groundwater analytical results exceeded DWC for both residential and nonresidential exposure scenarios and GSIC for ammonia and organic contaminants. In several samples, ammonia exceeded DWC for both residential and nonresidential exposure scenarios. Lastly, benzene exceeded DWC and GSIC in three sampling locations at the Marina.
- Sediment analytical results exceeded ESLs, TECs, and PECs for inorganic contaminants. In addition, analytical results for Total PCBs also exceeded TECs and PECs in both surficial and deep sampling locations.
- Surface water sample analytical results exceeded applicable regulatory criteria for inorganic contaminants.

The analytical results summarized above provide sufficient analytical data and lines of evidence to conclude that the study area is a facility as defined in Section 20101(1) (s) of the NREPA. The following table provides a summary of the affected environmental media, applicable regulatory criteria, and potential receptors within the Lake Linden Recreation Area.

Lake Linden Recreation Area – Media, Criteria, Potential Receptor Summary													
Media	Soil			Groundwater			Air		Sediment	Surface Water		Building Materials, Asbestos, and Abandoned Containers	
Criteria	Drinking Water Protection	Groundwater Surface Water Interface	Direct Contact	Drinking Water Protection	Groundwater Surface Water Interface	Flammability and Explosivity	Volatilization	Particulate Inhalation	Ecological	Ecological	Human Health	Particulate Inhalation	Flammability and Explosivity
Potential Receptor													
Residential Human		✓	✓	✓	✓			✓			✓		
Nonresidential Human		✓	✓	✓	✓			✓			✓		
Water Column Organism									✓	✓			
Benthic Organism									✓	✓			
COCs exceeding applicable regulatory criteria in one or more sample				Arsenic, Barium, Cadmium, Chromium, Copper, Cyanide, Lead, Mercury, Nickel, Silver, Zinc, Total PCBs, Benzo(a)pyrene, Fluoranthene, Phenanthrene, Benzene, Ammonia, Bis(2-EthylHexyl)Phthalate, Pyrene, Antimony, Vanadium									

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In addition to the evaluation of analytical results collected from the study area, the following provides a summary of findings derived from the assessment of the Lake Linden Recreation Area with respect to the goals and objectives for the Project:

- Significant in-lake and terrestrial sources of contamination are present in the form of inorganic, cyanide, and organic COCs in the study area. Concentrations of Total PCBs exceeding regulatory criteria were identified in 15 sediment samples indicating a significant in-lake source of PCB contamination in the study area;
- PCBs were identified in an SPMD sample;
- A suspected in-lake PCB-containing waste deposit was identified in sediment in the vicinity of the Lake Linden Village Park and the Lake Linden Beach. Terrestrial investigation in the vicinity of the suspected waste deposit did not indicate that PCBs were present landward of the shoreline;
- Bulk disposal areas, including capped stamp sand deposits, are present in the study area and their proximal distance to areas of unrestricted public access are significant; and,
- Industrial ruins, including foundations and building floors are present at the ground surface have been incorporated into facilities at the Lake Linden Village Park. The ruins were investigated as part of the SI and SACM and similar mining area containers, building materials, or wastes were not identified in the area.

7.3.2 Recommendations

The conclusions outlined in the preceding subsection establish that the Lake Linden Recreation Area is a Part 201 Facility. Section 20107a of Part 201 of NREPA describes the duties of owners or operators of a Facility, regardless of their liability, including: prevent unacceptable exposures, prevent exacerbation, and take reasonable precautions against the foreseeable actions of third parties. Some exceptions may apply; in any case, owners and operators of contaminated properties should become familiar with Section 20107a and the associated Rules. To that end, actions have been taken through the implementation of remedial measures, such as the placement of a soil and vegetative cap on the stamp sands, to address these environmental issues.

Based on the results of the SI and to ensure compliance with regulatory statutes, potential human health and ecological risks should minimally be qualitatively evaluated with property-specific data to determine if risks to the public health, safety, or welfare or to the environment are likely within the study area. The performance of a risk assessment on select properties or groups of properties,

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based on current and anticipated future land-use will help identify remedial goals for properties where potential human health and ecological hazards have been identified. Assessment based on current and future land-use contributes to the beneficial and safe re-use and potential redevelopment of any given property by clarifying applicability of regulatory statutes, as traditional property zoning (residential versus nonresidential) is generally undefined in the study area.

Benzene detected in groundwater above applicable regulatory criteria should be further delineated to assess the potential for an unknown hydrocarbon source in the vicinity of the temporary groundwater sampling locations. Additional SI activities, including soil and groundwater sampling should be conducted peripheral to the current sampling locations.

MDEQ should continue to provide new study data to the Remediation and Redevelopment Division Superfund Section (RRD SFS), which is responsible for monitoring EPA's remedy for the terrestrial and lake portion of the Torch Lake Superfund Site. RRD SFS should evaluate whether any remedy modifications are necessary. The EPA and RRD SFS should verify that administrative controls for areas that have been previously remediated by the EPA have been employed to ensure that the selected remedy is performing as designed and those institutional controls, where required, have been recorded and are being enforced.

Additionally, MDEQ should continue to provide pertinent data to the Michigan Department of Health and Human Services (MDHHS) where evaluation of specific potential public health risks is warranted.

Analytical results derived from the Lake Linden Recreation Area have been provided to the MDHHS for further evaluation to supplement the *Public Health Assessment, Evaluation of Recreational Uses at Beach Areas at Lake Linden and Along Torch Lake, Houghton County, Michigan* (Michigan Department of Community Health [MDCH], September 2014).

**DETAILED FINDINGS REPORT
LAKE LINDEN RECREATION AREA**

SECTION 7

**DETAILED FINDINGS REPORT – LAKE LINDEN RECREATION AREA
TABLES**

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LAKE LINDEN RECREATION AREA

TABLE 7-1
Sample Analytical Summary - Soil
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Station Name	CAS Number	Residential Drinking Water Protection Criteria	Groundwater Surface Water Interface Protection Criteria	Residential Particulate Soil Inhalation Criteria	Residential Direct Contact Criteria	Nonresidential Drinking Water Protection Criteria	Nonresidential Particulate Soil Inhalation Criteria	Nonresidential Direct Contact Criteria	CHLL-SB07			CHLL-SB12			CHLL-SB14	
Field Sample ID									CHLL-SB 07 0'-6"	CHLL-SB 07 6"-12'	CHLL-SB 07 12'-23'	CHLL-SB 12 0'-6"	CHLL-SB 12 6"-12'	CHLL-SB 12 12'-24'	CHLL-SB 14 0"-6"	CHLL-SB 14 6"-36"
Sample Date:									6/16/2014	6/16/2014	6/16/2014	6/16/2014	6/16/2014	6/16/2014	6/15/2014	6/15/2014
Sample Interval (bgs):									0 - 0.5 ft	0.5 - 12 ft	12 - 23 ft	0 - 0.5 ft	0.5 - 12 ft	12 - 24 ft	0 - 0.5 ft	0.5 - 3 ft
Sample Description:									SAND, Fine to medium grained, Reddish brown	SAND, Fine to medium grained, Reddish brown	SAND, Fine to medium grained, Reddish brown, Some SILTY SAND	SAND, Fine to medium grained, Reddish brown	SAND, Fine to medium grained, Reddish brown	SAND, Fine to medium grained, Reddish brown, Some SILTY SAND	SAND, Fine to medium grained, Gray	FILL, Sand, gravel, and concrete
Inorganics - Metals (mg/kg)																
ALUMINUM	7429-90-5	6,900 (B)	NA	ID	50,000 (DD)	6,900 (B)	ID	370,000 (DD)	5600	11000	6400	7500	8000	8400	14000	9200
ANTIMONY	7440-36-0	4.3	1.2 (X)	13,000	180	4.3	5,900	670	<0.3 U	<0.3 U	<0.3 U	<0.3 U	<0.3 U	<0.3 U	<0.3 U	<0.3 U
ARSENIC	7440-38-2	4.6	4.6	720	7.6	4.6	910	37	1.0	1.2	3.2	1.2	1.5	1.1	2.3	14
BARIUM	7440-39-3	1,300 (G)	130	330,000	37,000	1,300	150,000	130,000	27	14	16	23	25	16	13	39
BERYLLIUM	7440-41-7	51	4.6 (G)	1,300	410	51	590	1,600	0.4	0.8	0.8	0.9	0.9	0.8	0.4	0.5
CADMIUM	7440-43-9	6.0	1.6 (G,X)	1,700	550	6.0	2,200	2,100	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	0.2
CALCIUM	7440-70-2	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
CHROMIUM	7440-47-3	1,000,000 (D,H)	1,200,000 (G,H,X)	330,000 (H)	790,000 (H)	1,000,000 (D,H)	150,000 (H)	1,000,000 (D,H)	8.0	29	21	20	22	24	29	21
COBALT	7440-48-4	0.8	2.0	13,000	2,600	2.0	5,900	9,000	2.9	13	9.3	10	10	11	18	9.1
COPPER	7440-50-8	5,800	32 (G)	130,000	20,000	5,800	59,000	73,000	18	700	890	870	570	750	1500	7600
IRON	7439-89-6	12,000 (B)	NA	ID	160,000	12,000 (B)	ID	580,000	8900	15000	13000	12000	14000	14000	21000	16000
LEAD	7439-92-1	700	1,900 (G,X)	100,000	400	700	44,000	900 (DD)	2.5	2.0	2.2	13	7.5	2.0	7.6	110
MAGNESIUM	7439-95-4	8,000	NA	6,700,000	1,000,000 (D)	22,000	2,900,000	1,000,000 (D)	--	--	--	--	--	--	--	--
MANGANESE	7439-96-5	440 (B)	440 (B,G,X)	3,300	25,000	440 (B)	1,500	90,000	220	320	230 J	250	250	270	360	260
MERCURY	7439-97-6	1.7 (Z)	0.13 (B, Z)	20000 (Z)	160 (Z)	1.7 (Z)	8800 (Z)	580 (Z)	<0.06 U	<0.06 U	<0.06 U	<0.05 U	<0.05 U	0.2	<0.05 U	0.08
NICKEL	7440-02-0	100	29 (G)	13,000	40,000	100	16,000	150,000	6.2	39	25	27	28	32	29	22
POTASSIUM	7440-09-7	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
SELENIUM	7782-49-2	4.0	0.41 (B)	130,000	2,600	4.0	59,000	9,600	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	0.3
SILVER	7440-22-4	4.5	1.0 (M)	6,700	2,500	13	2,900	9,000	<0.1 U	1.2	1.6	2.4	1.5	2.8	0.7	3.6
SODIUM	7440-23-5	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
VANADIUM	7440-62-2	72	430	ID	750 (DD)	990	ID	5,500 (DD)	--	--	--	--	--	--	--	--
ZINC	7440-66-6	2,400	62 (G)	ID	170,000	5,000	ID	630,000	15	58	57	67	57	58	58	83
Inorganics - Chromium, Hexavalent																
									--	ND	--	--	--	--	--	--
Inorganics - Cyanide (mg/kg)																
CYANIDE	57-12-5	4.0 (P,R)	0.1 (P,R)	250 (P,R)	12 (P,R)	4.0 (P,R)	250 (P,R)	250 (P,R)	<0.11 U	<0.12 U	<0.11 U	<0.11 U	<0.11 U	<0.11 U	0.25	<0.11 U
Organics - PCBs (ug/kg)																
AROCLO-1262	37324-23-5	NA	NA	NA	NA	NA	NA	NA	--	<250 U	<110 U	--	<110 U	<110 U	<110 U	<350 U
TOTAL PCBs (J,T)	TPCB	NLL	NLL	5,200,000	1,000 (T)	NLL	6,500,000	1,000 (T)	--	ND	ND	--	ND	ND	ND	ND
Organics - SVOCs																
ACETOPHENONE	98-86-2	30,000	ID	3.3E+10	4.7E+07 (C)	88,000	1.4E+10	1.5E+08 (C)	--	--	--	--	--	--	--	--
ANTHRACENE	120-12-7	41,000	ID	6.7E+10	2.3E+08	41,000	2.9E+10	7.3E+08	--	<250 U	<220 U	--	<220 UJ	<230 U	<220 U	460 J
BENZO(A)ANTHRACENE	56-55-3	NLL	NLL	ID	20,000	NLL	ID	80,000	--	<250 U	<220 U	--	<220 UJ	<230 U	<220 U	2300 J
BENZO(A)PYRENE	50-32-8	NLL	NLL	1,500,000 (Q)	2,000 (Q)	NLL	1,900,000 (Q)	8,000 (Q)	--	<500 U	<450 U	--	<430 UJ	<450 U	<440 U	2400 J
BENZO(B)FLUORANTHENE	205-99-2	NLL	NLL	ID	20,000 (Q)	NLL	ID	80,000 (Q)	--	<500 U	<450 U	--	<430 UJ	<450 U	<440 U	3100 J
BENZO(G,H,I)PERYLENE	191-24-2	NLL	NLL	8E+08 (Q)	2,500,000 (Q)	NLL	3.5E+08	7,000,000 (Q)	--	<500 U	<450 U	--	<430 UJ	<450 U	<440 U	1300 J
BENZO(K)FLUORANTHENE	207-08-9	NLL	NLL	ID	200,000 (Q)	NLL	ID	800,000 (Q)	--	<500 U	<450 U	--	<430 UJ	<450 U	<440 U	1100 J
CARBAZOLE	86-74-8	9,400	1,100	6.2E+07	530,000	39,000	7.8E+07	2,400,000	--	--	--	--	--	--	--	--
CHRYSENE	218-01-9	NLL	NLL	ID	2,000,000 (Q)	NLL	ID	8,000,000 (Q)	--	<250 U	<220 U	--	<220 UJ	<230 U	<220 U	2600 J
DIBENZO(A,H)ANTHRACENE	53-70-3	NLL	NLL	ID	2,000 (Q)	NLL	ID	8,000 (Q)	--	<500 U	<450 U	--	<430 UJ	<450 U	<440 U	<440 UJ
FLUORANTHENE	206-44-0	730,000	5,500	9.3E+09	4.6E+07	730,000	4.1E+09	1.3E+08	--	<250 U	<220 U	--	<220 UJ	<230 U	<220 U	6800 J
INDENO(1,2,3-CD)PYRENE	193-39-5	NLL	NLL	ID	20,000	NLL	ID	80,000	--	<500 U	<450 U	--	<430 UJ	<450 U	<440 U	1200 J
NAPHTHALENE (SVOC)	91-20-3S	35,000	730	2E+08	1.6E+07	100,000	8.8E+07	5.2E+07	--	<250 U	<220 U	--	<220 UJ	<230 U	<220 U	200 J
PHENANTHRENE	85-01-8	56,000	2,100	6,700,000	1,600,000	160,000	2,900,000	5,200,000	--	<250 U	<220 U	--	<220 UJ	<230 U	<220 U	3400 J
PYRENE	129-00-0	480,000	ID	6.7E+09	2.9E+07	480,000	2.9E+09	8.4E+07	--	<250 U	<220 U	--	<220 UJ	<230 U	<220 U	5600 J
Organics - VOCs																
									--	ND	ND	--	ND	ND	--	ND
Asbestos																
									--	--	--	--	--	--	--	--

Note: Analytical and Criteria Footnotes are included on the last page of the table.

DETAILED FINDINGS REPORT
LAKE LINDEN RECREATION AREA

TABLE 7-1
Sample Analytical Summary - Soil
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Station Name	CAS Number	Residential Drinking Water Protection Criteria	Groundwater Surface Water Interface Protection Criteria	Residential Particulate Soil Inhalation Criteria	Residential Direct Contact Criteria	Nonresidential Drinking Water Protection Criteria	Nonresidential Particulate Soil Inhalation Criteria	Nonresidential Direct Contact Criteria	CHLL-SB17		CHLL-SB18		CHLL-SB19			CHLL-SB20	
Field Sample ID									CHLL-SB 17 0"-6"	CHLL-SB 17 3'-5'	CHLL-SB 18 4"-12"	CHLL-SB 18 1'-4'	CHLL-SB 19 0"-6"	CHLL-SB 19 1'-5'	CHLL-SB 19 1'-5' Dup	CHLL-SB 20 6"-12"	CHLL-SB 20 3'-6'
Sample Date:									6/14/2014	6/14/2014	6/14/2014	6/14/2014	6/14/2014	6/14/2014	6/14/2014	6/14/2014	6/14/2014
Sample Interval (bgs):									0 - 0.5 ft	3 - 5 ft	0.33 - 1 ft	1 - 4 ft	0 - 0.5 ft	1 - 5 ft	1 - 5 ft	0.5 - 1 ft	3 - 6 ft
Sample Description:									SAND, Fine to medium grained, Brown	SAND, Coarse to medium grained, Reddish brown	SAND, Coarse to medium grained, Reddish brown	SAND, Coarse to medium grained, Reddish brown	CLAY, Brown	SAND, Medium to fine grained, brown; GRAVEL, Gray from 4-5'	Field Duplicate	SAND, Medium grained, Dark brown	SAND, Coarse to medium grained, Reddish brown
Inorganics - Metals (mg/kg)																	
ALUMINIUM	7429-90-5	6,900 (B)	NA	ID	50,000 (DD)	6,900 (B)	ID	370,000 (DD)	8000	6300	5200	5000	--	--	--	--	--
ANTIMONY	7440-36-0	4.3	1.2 (X)	13,000	180	4.3	5,900	670	<0.3 U	<0.3 U	<0.3 U	<0.3 U	--	--	--	--	--
ARSENIC	7440-38-2	4.6	4.6	720	7.6	4.6	910	37	2.4	1.3	1.2	1.1	--	--	--	--	--
BARIUM	7440-39-3	1,300 (G)	130	330,000	37,000	1,300	150,000	130,000	21	45	14	9.4	--	--	--	--	--
BERYLLIUM	7440-41-7	51	4.6 (G)	1,300	410	51	590	1,600	0.6	0.8	0.8	0.8	--	--	--	--	--
CADMIUM	7440-43-9	6.0	1.6 (G,X)	1,700	550	6.0	2,200	2,100	<0.2 U	<0.2 U	<0.2 U	<0.2 U	--	--	--	--	--
CALCIUM	7440-70-2	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	NA	--
CHROMIUM	7440-47-3	1,000,000 (D,H)	1,200,000 (G,H,X)	330,000 (H)	790,000 (H)	1,000,000 (D,H)	150,000 (H)	1,000,000 (D,H)	17	19	13	13	--	--	--	--	--
COBALT	7440-48-4	0.8	2.0	13,000	2,600	2.0	5,900	9,000	8.3	8.7	7.3	6.7	--	--	--	--	--
COPPER	7440-50-8	5,800	32 (G)	130,000	20,000	5,800	59,000	73,000	330	4100	6300	4300	--	--	--	--	--
IRON	7439-89-6	12,000 (B)	NA	ID	160,000	12,000 (B)	ID	580,000	16000	11000	9400	9900	--	--	--	--	--
LEAD	7439-92-1	700	1,900 (G,X)	100,000	400	700	44,000	900 (DD)	5.6	4.9	3.5	2.9	--	--	--	--	--
MAGNESIUM	7439-95-4	8,000	NA	6,700,000	1,000,000 (D)	22,000	2,900,000	1,000,000 (D)	--	--	--	--	--	--	--	--	--
MANGANESE	7439-96-5	440 (B)	440 (B,G,X)	3,300	25,000	440 (B)	1,500	90,000	250 J	260	190	180	--	--	--	--	--
MERCURY	7439-97-6	1.7 (Z)	0.13 (B, Z)	20000 (Z)	160 (Z)	1.7 (Z)	8800 (Z)	580 (Z)	<0.06 U	<0.06 U	<0.05 U	<0.05 U	--	--	--	--	--
NICKEL	7440-02-0	100	29 (G)	13,000	40,000	100	16,000	150,000	20	23	17	16	--	--	--	--	--
POTASSIUM	7440-09-7	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--	--
SELENIUM	7782-49-2	4.0	0.41 (B)	130,000	2,600	4.0	59,000	9,600	<0.2 U	0.2	<0.2 U	<0.2 U	--	--	--	--	--
SILVER	7440-22-4	4.5	1.0 (M)	6,700	2,500	13	2,900	9,000	0.7	1.8	3.1	3.4	--	--	--	--	--
SODIUM	7440-23-5	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--	--
VANADIUM	7440-62-2	72	430	ID	750 (DD)	990	ID	5,500 (DD)	--	--	--	--	--	--	--	--	--
ZINC	7440-66-6	2,400	62 (G)	ID	170,000	5,000	ID	630,000	46	55	53	52	--	--	--	--	--
Inorganics - Chromium, Hexavalent																	
									--	--	--	--	--	--	--	--	--
Inorganics - Cyanide (mg/kg)																	
CYANIDE	57-12-5	4.0 (P,R)	0.1 (P,R)	250 (P,R)	12 (P,R)	4.0 (P,R)	250 (P,R)	250 (P,R)	<0.12 U	<0.11 U	<0.11 U	<0.11 U	--	--	--	--	--
Organics - PCBs (ug/kg)																	
AROCLOR-1262	37324-23-5	NA	NA	NA	NA	NA	NA	NA	<120 U	<110 U	<110 U	<110 U	<230 U	<340 U	<230 U	<470 U	<110 U
TOTAL PCBs (J,T)	TPCB	NLL	NLL	5,200,000	1,000 (T)	NLL	6,500,000	1,000 (T)	ND	ND	ND	ND	ND	ND	ND	ND	ND
Organics - SVOCs																	
ACETOPHENONE	98-86-2	30,000	ID	3.3E+10	4.7E+07 (C)	88,000	1.4E+10	1.5E+08 (C)	--	--	--	--	--	--	--	--	--
ANTHRACENE	120-12-7	41,000	ID	6.7E+10	2.3E+08	41,000	2.9E+10	7.3E+08	--	--	--	--	--	--	--	--	--
BENZO(A)ANTHRACENE	56-55-3	NLL	NLL	ID	20,000	NLL	ID	80,000	--	--	--	--	--	--	--	--	--
BENZO(A)PYRENE	50-32-8	NLL	NLL	1,500,000 (Q)	2,000 (Q)	NLL	1,900,000 (Q)	8,000 (Q)	--	--	--	--	--	--	--	--	--
BENZO(B)FLUORANTHENE	205-99-2	NLL	NLL	ID	20,000 (Q)	NLL	ID	80,000 (Q)	--	--	--	--	--	--	--	--	--
BENZO(G,H,I)PERYLENE	191-24-2	NLL	NLL	8E+08 (Q)	2,500,000 (Q)	NLL	3.5E+08	7,000,000 (Q)	--	--	--	--	--	--	--	--	--
BENZO(K)FLUORANTHENE	207-08-9	NLL	NLL	ID	200,000 (Q)	NLL	ID	800,000 (Q)	--	--	--	--	--	--	--	--	--
CARBAZOLE	86-74-8	9,400	1,100	6.2E+07	530,000	39,000	7.8E+07	2,400,000	--	--	--	--	--	--	--	--	--
CHRYSENE	218-01-9	NLL	NLL	ID	2,000,000 (Q)	NLL	ID	8,000,000 (Q)	--	--	--	--	--	--	--	--	--
DIBENZO(A,H)ANTHRACENE	53-70-3	NLL	NLL	ID	2,000 (Q)	NLL	ID	8,000 (Q)	--	--	--	--	--	--	--	--	--
FLUORANTHENE	206-44-0	730,000	5,500	9.3E+09	4.6E+07	730,000	4.1E+09	1.3E+08	--	--	--	--	--	--	--	--	--
INDENO(1,2,3-CD)PYRENE	193-39-5	NLL	NLL	ID	20,000	NLL	ID	80,000	--	--	--	--	--	--	--	--	--
NAPHTHALENE (SVOC)	91-20-3S	35,000	730	2E+08	1.6E+07	100,000	8.8E+07	5.2E+07	--	--	--	--	--	--	--	--	--
PHENANTHRENE	85-01-8	56,000	2,100	6,700,000	1,600,000	160,000	2,900,000	5,200,000	--	--	--	--	--	--	--	--	--
PYRENE	129-00-0	480,000	ID	6.7E+09	2.9E+07	480,000	2.9E+09	8.4E+07	--	--	--	--	--	--	--	--	--
Organics - VOCs																	
									--	--	--	--	--	--	--	--	--
Asbestos																	
									ND	--	--	--	ND	--	--	--	--

Note: Analytical and Criteria Footnotes are included on the last page of the table.

DETAILED FINDINGS REPORT
LAKE LINDEN RECREATION AREA

TABLE 7-1
Sample Analytical Summary - Soil
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Station Name	CAS Number	Residential Drinking Water Protection Criteria	Groundwater Surface Water Interface Protection Criteria	Residential Particulate Soil Inhalation Criteria	Residential Direct Contact Criteria	Nonresidential Drinking Water Protection Criteria	Nonresidential Particulate Soil Inhalation Criteria	Nonresidential Direct Contact Criteria	CHLL-SB21		CHLL-SB22		CHLL-SB50	CHLL-SB55		CHLL-SB56	CHLL-SB109
Field Sample ID									CHLL-SB 21 3"-9"	CHLL-SB 21 9"-4'	CHLL-SB 22 3"-9"	CHLL-SB 22 1'-4'	CHLL-SB 50 0"-12"	CHLL-SB 55 0-6"	CHLL-SB 55 6"-4'	CHLL-SB56-0-6	CHLL-SB109-0-6"
Sample Date:									6/14/2014	6/14/2014	6/14/2014	6/14/2014	6/14/2014	6/14/2014	6/14/2014	6/14/2014	8/20/2014
Sample Interval (bgs):									0.25 - 0.75 ft	0.75 - 4 ft	0.25 - 0.75 ft	1 - 4 ft	0 - 1 ft	0.5 - 0.5 ft	0.5 - 4 ft	0 - 0.5 ft	0 - 0.5 ft
Sample Description:									SAND, Fine to medium grained, Reddish brown	SAND, Coarse to fine grained, Brown to reddish brown	SAND, Fine to medium grained, Reddish brown	SAND, Fine to medium grained, Reddish brown	SAND, Coarse to medium grained, With gravel, Reddish Brown	SAND, Medium to fine grained, Dark gray	SAND, Coarse to fine grained, Brown to reddish brown	No cuttings	TOPSOIL, Sandy Loam, Brown
Inorganics - Metals (mg/kg)																	
ALUMINIUM	7429-90-5	6,900 (B)	NA	ID	50,000 (DD)	6,900 (B)	ID	370,000 (DD)	--	--	17000	6900	9900	5700	8100	--	--
ANTIMONY	7440-36-0	4.3	1.2 (X)	13,000	180	4.3	5,900	670	--	--	0.3	0.5	<0.3 U	<0.3 U	<0.3 U	--	--
ARSENIC	7440-38-2	4.6	4.6	720	7.6	4.6	910	37	--	--	6.6	5.9	2.3	1.3	5.7	--	9.2
BARIUM	7440-39-3	1,300 (G)	130	330,000	37,000	1,300	150,000	130,000	--	--	34	110	19	15	25	--	43
BERYLLIUM	7440-41-7	51	4.6 (G)	1,300	410	51	590	1,600	--	--	0.6	0.9	0.4	<0.2 U	0.8	--	--
CADMIUM	7440-43-9	6.0	1.6 (G,X)	1,700	550	6.0	2,200	2,100	--	--	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	--	--
CALCIUM	7440-70-2	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--	--
CHROMIUM	7440-47-3	1,000,000 (D,H)	1,200,000 (G,H,X)	330,000 (H)	790,000 (H)	1,000,000 (D,H)	150,000 (H)	1,000,000 (D,H)	--	--	36	20	22	13	19	--	--
COBALT	7440-48-4	0.8	2.0	13,000	2,600	2.0	5,900	9,000	--	--	18	9.2	13	5.5	9.8	--	--
COPPER	7440-50-8	5,800	32 (G)	130,000	20,000	5,800	59,000	73,000	--	--	4900	9600	730	270	9100	--	3600
IRON	7439-89-6	12,000 (B)	NA	ID	160,000	12,000 (B)	ID	580,000	--	--	22000	20000	17000	9200	14000	--	--
LEAD	7439-92-1	700	1,900 (G,X)	100,000	400	700	44,000	900 (DD)	--	--	620	640	26	7.7	23	--	170
MAGNESIUM	7439-95-4	8,000	NA	6,700,000	1,000,000 (D)	22,000	2,900,000	1,000,000 (D)	--	--	--	--	--	--	--	--	--
MANGANESE	7439-96-5	440 (B)	440 (B,G,X)	3,300	25,000	440 (B)	1,500	90,000	--	--	410	260	350	130	290	--	380
MERCURY	7439-97-6	1.7 (Z)	0.13 (B, Z)	20000 (Z)	160 (Z)	1.7 (Z)	8800 (Z)	580 (Z)	--	--	0.08	0.1	0.1	<0.05 U	0.07	--	--
NICKEL	7440-02-0	100	29 (G)	13,000	40,000	100	16,000	150,000	--	--	57	22	31	11	27	--	--
POTASSIUM	7440-09-7	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--	--
SELENIUM	7782-49-2	4.0	0.41 (B)	130,000	2,600	4.0	59,000	9,600	--	--	<0.2 U	<0.2 U	0.2	<0.2 U	<0.2 U	--	--
SILVER	7440-22-4	4.5	1.0 (M)	6,700	2,500	13	2,900	9,000	--	--	2.6	4.8	0.5	0.1	16	--	--
SODIUM	7440-23-5	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--	--
VANADIUM	7440-62-2	72	430	ID	750 (DD)	990	ID	5,500 (DD)	--	--	--	--	--	--	--	--	--
ZINC	7440-66-6	2,400	62 (G)	ID	170,000	5,000	ID	630,000	--	--	79	86	55	28	81	--	--
Inorganics - Chromium, Hexavalent																	
									ND	--	--	--	--	--	--	--	--
Inorganics - Cyanide (mg/kg)																	
CYANIDE	57-12-5	4.0 (P,R)	0.1 (P,R)	250 (P,R)	12 (P,R)	4.0 (P,R)	250 (P,R)	250 (P,R)	--	--	<0.11 U	<0.12 U	0.12	<0.11 U	<0.11 U	--	<0.11 U
Organics - PCBs (ug/kg)																	
AROCLOR-1262	37324-23-5	NA	NA	NA	NA	NA	NA	NA	<110 U	<110 U	<110 U	<590 U	<230 U	<110 U	<2300 U	--	--
TOTAL PCBs (J,T)	TPCB	NLL	NLL	5,200,000	1,000 (T)	NLL	6,500,000	1,000 (T)	ND	ND	ND	ND	ND	ND	ND	--	--
Organics - SVOCs																	
ACETOPHENONE	98-86-2	30,000	ID	3.3E+10	4.7E+07 (C)	88,000	1.4E+10	1.5E+08 (C)	--	--	--	--	--	--	--	--	--
ANTHRACENE	120-12-7	41,000	ID	6.7E+10	2.3E+08	41,000	2.9E+10	7.3E+08	--	--	--	--	--	--	--	--	--
BENZO(A)ANTHRACENE	56-55-3	NLL	NLL	ID	20,000	NLL	ID	80,000	--	--	--	--	--	--	--	--	--
BENZO(A)PYRENE	50-32-8	NLL	NLL	1,500,000 (Q)	2,000 (Q)	NLL	1,900,000 (Q)	8,000 (Q)	--	--	--	--	--	--	--	--	--
BENZO(B)FLUORANTHENE	205-99-2	NLL	NLL	ID	20,000 (Q)	NLL	ID	80,000 (Q)	--	--	--	--	--	--	--	--	--
BENZO(G,H,I)PERYLENE	191-24-2	NLL	NLL	8E+08 (Q)	2,500,000 (Q)	NLL	3.5E+08	7,000,000 (Q)	--	--	--	--	--	--	--	--	--
BENZO(K)FLUORANTHENE	207-08-9	NLL	NLL	ID	200,000 (Q)	NLL	ID	800,000 (Q)	--	--	--	--	--	--	--	--	--
CARBAZOLE	86-74-8	9,400	1,100	6.2E+07	530,000	39,000	7.8E+07	2,400,000	--	--	--	--	--	--	--	--	--
CHRYSENE	218-01-9	NLL	NLL	ID	2,000,000 (Q)	NLL	ID	8,000,000 (Q)	--	--	--	--	--	--	--	--	--
DIBENZO(A,H)ANTHRACENE	53-70-3	NLL	NLL	ID	2,000 (Q)	NLL	ID	8,000 (Q)	--	--	--	--	--	--	--	--	--
FLUORANTHENE	206-44-0	730,000	5,500	9.3E+09	4.6E+07	730,000	4.1E+09	1.3E+08	--	--	--	--	--	--	--	--	--
INDENO(1,2,3-CD)PYRENE	193-39-5	NLL	NLL	ID	20,000	NLL	ID	80,000	--	--	--	--	--	--	--	--	--
NAPHTHALENE (SVOC)	91-20-3S	35,000	730	2E+08	1.6E+07	100,000	8.8E+07	5.2E+07	--	--	--	--	--	--	--	--	--
PHENANTHRENE	85-01-8	56,000	2,100	6,700,000	1,600,000	160,000	2,900,000	5,200,000	--	--	--	--	--	--	--	--	--
PYRENE	129-00-0	480,000	ID	6.7E+09	2.9E+07	480,000	2.9E+09	8.4E+07	--	--	--	--	--	--	--	--	--
Organics - VOCs																	
									--	--	--	--	--	--	--	--	--
Asbestos																	
									--	--	ND	--	ND	ND	--	ND	--

Note: Analytical and Criteria Footnotes are included on the last page of the table.

DETAILED FINDINGS REPORT
LAKE LINDEN RECREATION AREA

TABLE 7-1
Sample Analytical Summary - Soil
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Station Name	CAS Number	Residential Drinking Water Protection Criteria	Groundwater Surface Water Interface Protection Criteria	Residential Particulate Soil Inhalation Criteria	Residential Direct Contact Criteria	Nonresidential Drinking Water Protection Criteria	Nonresidential Particulate Soil Inhalation Criteria	Nonresidential Direct Contact Criteria	CHLL-SB110	CHLL-SB111		CHLL-SB112		CHLL-SB113		CHLL-SB114	
Field Sample ID									CHLL-SB110-0-6"	CHLL-SB 111 6"-12"	CHLL-SB 111 12"-3'	CHLL-SB 112 6"-12"	CHLL-SB 112 12"-3'	CHLL-SB113 6-12"	CHLL-SB113 12"-3'	CHLL-SB114 6"-12"	CHLL-SB114 12"-3'
Sample Date:									8/20/2014	8/20/2014	8/20/2014	8/20/2014	8/20/2014	8/20/2014	8/20/2014	8/20/2014	8/20/2014
Sample Interval (bgs):									0 - 0.5 ft	0.5 - 1 ft	1 - 3 ft	0.5 - 1 ft	1 - 3 ft	0.5 - 1 ft	1 - 3 ft	0.5 - 1 ft	1 - 3 ft
Sample Description:									TOPSOIL, Sandy Loam, Brown	CLAY, Gray	SAND, Medium grained, Reddish brown	CLAY, Gray	SAND, Medium grained, Reddish brown	CLAY, Gray	SAND, Medium grained, Reddish brown	CLAY, Gray	SAND, Medium grained, Reddish brown
Inorganics - Metals (mg/kg)																	
ALUMINUM	7429-90-5	6,900 (B)	NA	ID	50,000 (DD)	6,900 (B)	ID	370,000 (DD)	--	--	--	--	--	--	--	--	--
ANTIMONY	7440-36-0	4.3	1.2 (X)	13,000	180	4.3	5,900	670	--	--	--	--	--	--	--	--	--
ARSENIC	7440-38-2	4.6	4.6	720	7.6	4.6	910	37	0.8	--	--	--	--	--	--	--	--
BARIUM	7440-39-3	1,300 (G)	130	330,000	37,000	1,300	150,000	130,000	17	--	--	--	--	--	--	--	--
BERYLLIUM	7440-41-7	51	4.6 (G)	1,300	410	51	590	1,600	--	--	--	--	--	--	--	--	--
CADMIUM	7440-43-9	6.0	1.6 (G,X)	1,700	550	6.0	2,200	2,100	--	--	--	--	--	--	--	--	--
CALCIUM	7440-70-2	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	NA	--
CHROMIUM	7440-47-3	1,000,000 (D,H)	1,200,000 (G,H,X)	330,000 (H)	790,000 (H)	1,000,000 (D,H)	150,000 (H)	1,000,000 (D,H)	--	--	--	--	--	--	--	--	--
COBALT	7440-48-4	0.8	2.0	13,000	2,600	2.0	5,900	9,000	--	--	--	--	--	--	--	--	--
COPPER	7440-50-8	5,800	32 (G)	130,000	20,000	5,800	59,000	73,000	65	--	--	--	--	--	--	--	--
IRON	7439-89-6	12,000 (B)	NA	ID	160,000	12,000 (B)	ID	580,000	--	--	--	--	--	--	--	--	--
LEAD	7439-92-1	700	1,900 (G,X)	100,000	400	700	44,000	900 (DD)	3.3	--	--	--	--	--	--	--	--
MAGNESIUM	7439-95-4	8,000	NA	6,700,000	1,000,000 (D)	22,000	2,900,000	1,000,000 (D)	--	--	--	--	--	--	--	--	--
MANGANESE	7439-96-5	440 (B)	440 (B,G,X)	3,300	25,000	440 (B)	1,500	90,000	98	--	--	--	--	--	--	--	--
MERCURY	7439-97-6	1.7 (Z)	0.13 (B, Z)	20000 (Z)	160 (Z)	1.7 (Z)	8800 (Z)	580 (Z)	--	--	--	--	--	--	--	--	--
NICKEL	7440-02-0	100	29 (G)	13,000	40,000	100	16,000	150,000	--	--	--	--	--	--	--	--	--
POTASSIUM	7440-09-7	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--	--
SELENIUM	7782-49-2	4.0	0.41 (B)	130,000	2,600	4.0	59,000	9,600	--	--	--	--	--	--	--	--	--
SILVER	7440-22-4	4.5	1.0 (M)	6,700	2,500	13	2,900	9,000	--	--	--	--	--	--	--	--	--
SODIUM	7440-23-5	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--	--
VANADIUM	7440-62-2	72	430	ID	750 (DD)	990	ID	5,500 (DD)	--	--	--	--	--	--	--	--	--
ZINC	7440-66-6	2,400	62 (G)	ID	170,000	5,000	ID	630,000	--	--	--	--	--	--	--	--	--
Inorganics - Chromium, Hexavalent																	
									--	--	--	--	--	--	--	--	--
Inorganics - Cyanide (mg/kg)																	
CYANIDE	57-12-5	4.0 (P,R)	0.1 (P,R)	250 (P,R)	12 (P,R)	4.0 (P,R)	250 (P,R)	250 (P,R)	<0.11 U	--	--	--	--	--	--	--	--
Organics - PCBs (ug/kg)																	
AROCLOR-1262	37324-23-5	NA	NA	NA	NA	NA	NA	NA	--	<120 U	<110 U	<110 U	<110 U	<110 U	<110 U	<110 U	<120 U
TOTAL PCBs (J,T)	TPCB	NLL	NLL	5,200,000	1,000 (T)	NLL	6,500,000	1,000 (T)	--	ND	ND	ND	ND	ND	ND	ND	ND
Organics - SVOCs																	
ACETOPHENONE	98-86-2	30,000	ID	3.3E+10	4.7E+07 (C)	88,000	1.4E+10	1.5E+08 (C)	--	--	--	--	--	--	--	--	--
ANTHRACENE	120-12-7	41,000	ID	6.7E+10	2.3E+08	41,000	2.9E+10	7.3E+08	--	--	--	--	--	--	--	--	--
BENZO(A)ANTHRACENE	56-55-3	NLL	NLL	ID	20,000	NLL	ID	80,000	--	--	--	--	--	--	--	--	--
BENZO(A)PYRENE	50-32-8	NLL	NLL	1,500,000 (Q)	2,000 (Q)	NLL	1,900,000 (Q)	8,000 (Q)	--	--	--	--	--	--	--	--	--
BENZO(B)FLUORANTHENE	205-99-2	NLL	NLL	ID	20,000 (Q)	NLL	ID	80,000 (Q)	--	--	--	--	--	--	--	--	--
BENZO(G,H,I)PERYLENE	191-24-2	NLL	NLL	8E+08 (Q)	2,500,000 (Q)	NLL	3.5E+08	7,000,000 (Q)	--	--	--	--	--	--	--	--	--
BENZO(K)FLUORANTHENE	207-08-9	NLL	NLL	ID	200,000 (Q)	NLL	ID	800,000 (Q)	--	--	--	--	--	--	--	--	--
CARBAZOLE	86-74-8	9,400	1,100	6.2E+07	530,000	39,000	7.8E+07	2,400,000	--	--	--	--	--	--	--	--	--
CHRYSENE	218-01-9	NLL	NLL	ID	2,000,000 (Q)	NLL	ID	8,000,000 (Q)	--	--	--	--	--	--	--	--	--
DIBENZO(A,H)ANTHRACENE	53-70-3	NLL	NLL	ID	2,000 (Q)	NLL	ID	8,000 (Q)	--	--	--	--	--	--	--	--	--
FLUORANTHENE	206-44-0	730,000	5,500	9.3E+09	4.6E+07	730,000	4.1E+09	1.3E+08	--	--	--	--	--	--	--	--	--
INDENO(1,2,3-CD)PYRENE	193-39-5	NLL	NLL	ID	20,000	NLL	ID	80,000	--	--	--	--	--	--	--	--	--
NAPHTHALENE (SVOC)	91-20-3S	35,000	730	2E+08	1.6E+07	100,000	8.8E+07	5.2E+07	--	--	--	--	--	--	--	--	--
PHENANTHRENE	85-01-8	56,000	2,100	6,700,000	1,600,000	160,000	2,900,000	5,200,000	--	--	--	--	--	--	--	--	--
PYRENE	129-00-0	480,000	ID	6.7E+09	2.9E+07	480,000	2.9E+09	8.4E+07	--	--	--	--	--	--	--	--	--
Organics - VOCs																	
									--	--	--	--	--	--	--	--	--
Asbestos																	
									--	--	--	--	--	--	--	--	--

Note: Analytical and Criteria Footnotes are included on the last page of the table.

DETAILED FINDINGS REPORT
LAKE LINDEN RECREATION AREA

TABLE 7-1
Sample Analytical Summary - Soil
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Station Name	CAS Number	Residential Drinking Water Protection Criteria	Groundwater Surface Water Interface Protection Criteria	Residential Particulate Soil Inhalation Criteria	Residential Direct Contact Criteria	Nonresidential Drinking Water Protection Criteria	Nonresidential Particulate Soil Inhalation Criteria	Nonresidential Direct Contact Criteria	CHLL-SB115			CHLL-SB116	CHLL-SB117		CHLL-SB118	
Field Sample ID									CHLL-SB115 6"-12"	CHLL-SB115 12"-5'	CHLL-SB115 12"-5' DUP	CHLL-SB 116 6"-12"	CHLL-SB117 6"-12"	CHLL-SB117 12"-3'	CHLL-SB 118 6"-12"	CHLL-SB 118 12"-3'
Sample Date:									8/20/2014	8/20/2014	8/20/2014	8/20/2014	8/20/2014	8/20/2014	8/21/2014	8/21/2014
Sample Interval (bgs):									0.5 - 1 ft	1 - 5 ft	1 - 5 ft	0.5 - 1 ft	0.5 - 1 ft	1 - 3 ft	0.5 - 1 ft	1 - 3 ft
Sample Description:									CLAY, Gray	SAND, Medium grained, Reddish brown	Field Duplicate	SAND, Medium grained, Reddish brown	SAND, Medium grained, Reddish brown	SAND, Medium grained, Reddish brown	SAND, Medium grained, Reddish brown	SAND, Medium grained, Reddish brown
Inorganics - Metals (mg/kg)																
ALUMINUM	7429-90-5	6,900 (B)	NA	ID	50,000 (DD)	6,900 (B)	ID	370,000 (DD)	--	--	--	--	--	--	--	--
ANTIMONY	7440-36-0	4.3	1.2 (X)	13,000	180	4.3	5,900	670	--	--	--	--	--	--	--	--
ARSENIC	7440-38-2	4.6	4.6	720	7.6	4.6	910	37	--	--	--	--	--	--	--	--
BARIUM	7440-39-3	1,300 (G)	130	330,000	37,000	1,300	150,000	130,000	--	--	--	--	--	--	--	--
BERYLLIUM	7440-41-7	51	4.6 (G)	1,300	410	51	590	1,600	--	--	--	--	--	--	--	--
CADMIUM	7440-43-9	6.0	1.6 (G,X)	1,700	550	6.0	2,200	2,100	--	--	--	--	--	--	--	--
CALCIUM	7440-70-2	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
CHROMIUM	7440-47-3	1,000,000 (D,H)	1,200,000 (G,H,X)	330,000 (H)	790,000 (H)	1,000,000 (D,H)	150,000 (H)	1,000,000 (D,H)	--	--	--	--	--	--	--	--
COBALT	7440-48-4	0.8	2.0	13,000	2,600	2.0	5,900	9,000	--	--	--	--	--	--	--	--
COPPER	7440-50-8	5,800	32 (G)	130,000	20,000	5,800	59,000	73,000	--	--	--	--	--	--	--	--
IRON	7439-89-6	12,000 (B)	NA	ID	160,000	12,000 (B)	ID	580,000	--	--	--	--	--	--	--	--
LEAD	7439-92-1	700	1,900 (G,X)	100,000	400	700	44,000	900 (DD)	--	--	--	--	--	--	--	--
MAGNESIUM	7439-95-4	8,000	NA	6,700,000	1,000,000 (D)	22,000	2,900,000	1,000,000 (D)	--	--	--	--	--	--	--	--
MANGANESE	7439-96-5	440 (B)	440 (B,G,X)	3,300	25,000	440 (B)	1,500	90,000	--	--	--	--	--	--	--	--
MERCURY	7439-97-6	1.7 (Z)	0.13 (B, Z)	20000 (Z)	160 (Z)	1.7 (Z)	8800 (Z)	580 (Z)	--	--	--	--	--	--	--	--
NICKEL	7440-02-0	100	29 (G)	13,000	40,000	100	16,000	150,000	--	--	--	--	--	--	--	--
POTASSIUM	7440-09-7	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
SELENIUM	7782-49-2	4.0	0.41 (B)	130,000	2,600	4.0	59,000	9,600	--	--	--	--	--	--	--	--
SILVER	7440-22-4	4.5	1.0 (M)	6,700	2,500	13	2,900	9,000	--	--	--	--	--	--	--	--
SODIUM	7440-23-5	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
VANADIUM	7440-62-2	72	430	ID	750 (DD)	990	ID	5,500 (DD)	--	--	--	--	--	--	--	--
ZINC	7440-66-6	2,400	62 (G)	ID	170,000	5,000	ID	630,000	--	--	--	--	--	--	--	--
Inorganics - Chromium, Hexavalent																
									--	--	--	--	--	--	--	--
Inorganics - Cyanide (mg/kg)																
CYANIDE	57-12-5	4.0 (P,R)	0.1 (P,R)	250 (P,R)	12 (P,R)	4.0 (P,R)	250 (P,R)	250 (P,R)	--	--	--	--	--	--	--	--
Organics - PCBs (ug/kg)																
AROCLOR-1262	37324-23-5	NA	NA	NA	NA	NA	NA	NA	<110 U	<110 U	<120 U	<120 U	<110 U	<110 U	<110 U	<130 U
TOTAL PCBs (I,T)	TPCB	NLL	NLL	5,200,000	1,000 (T)	NLL	6,500,000	1,000 (T)	ND	ND	ND	ND	ND	ND	ND	ND
Organics - SVOCs																
ACETOPHENONE	98-86-2	30,000	ID	3.3E+10	4.7E+07 (C)	88,000	1.4E+10	1.5E+08 (C)	--	--	--	--	--	--	--	--
ANTHRACENE	120-12-7	41,000	ID	6.7E+10	2.3E+08	41,000	2.9E+10	7.3E+08	--	--	--	--	--	--	--	--
BENZO(A)ANTHRACENE	56-55-3	NLL	NLL	ID	20,000	NLL	ID	80,000	--	--	--	--	--	--	--	--
BENZO(A)PYRENE	50-32-8	NLL	NLL	1,500,000 (Q)	2,000 (Q)	NLL	1,900,000 (Q)	8,000 (Q)	--	--	--	--	--	--	--	--
BENZO(B)FLUORANTHENE	205-99-2	NLL	NLL	ID	20,000 (Q)	NLL	ID	80,000 (Q)	--	--	--	--	--	--	--	--
BENZO(G,H,I)PERYLENE	191-24-2	NLL	NLL	8E+08 (Q)	2,500,000 (Q)	NLL	3.5E+08	7,000,000 (Q)	--	--	--	--	--	--	--	--
BENZO(K)FLUORANTHENE	207-08-9	NLL	NLL	ID	200,000 (Q)	NLL	ID	800,000 (Q)	--	--	--	--	--	--	--	--
CARBAZOLE	86-74-8	9,400	1,100	6.2E+07	530,000	39,000	7.8E+07	2,400,000	--	--	--	--	--	--	--	--
CHRYSENE	218-01-9	NLL	NLL	ID	2,000,000 (Q)	NLL	ID	8,000,000 (Q)	--	--	--	--	--	--	--	--
DIBENZO(A,H)ANTHRACENE	53-70-3	NLL	NLL	ID	2,000 (Q)	NLL	ID	8,000 (Q)	--	--	--	--	--	--	--	--
FLUORANTHENE	206-44-0	730,000	5,500	9.3E+09	4.6E+07	730,000	4.1E+09	1.3E+08	--	--	--	--	--	--	--	--
INDENO(1,2,3-CD)PYRENE	193-39-5	NLL	NLL	ID	20,000	NLL	ID	80,000	--	--	--	--	--	--	--	--
NAPHTHALENE (SVOC)	91-20-3S	35,000	730	2E+08	1.6E+07	100,000	8.8E+07	5.2E+07	--	--	--	--	--	--	--	--
PHENANTHRENE	85-01-8	56,000	2,100	6,700,000	1,600,000	160,000	2,900,000	5,200,000	--	--	--	--	--	--	--	--
PYRENE	129-00-0	480,000	ID	6.7E+09	2.9E+07	480,000	2.9E+09	8.4E+07	--	--	--	--	--	--	--	--
Organics - VOCs																
									--	--	--	--	--	--	--	--
Asbestos																
									--	--	--	--	--	--	--	--

Note: Analytical and Criteria Footnotes are included on the last page of the table.

TABLE 7-1
Sample Analytical Summary - Soil
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

DETAILED FINDINGS REPORT
LAKE LINDEN RECREATION AREA

Station Name	CAS Number	Residential Drinking Water Protection Criteria	Groundwater Surface Water Interface Protection Criteria	Residential Particulate Soil Inhalation Criteria	Residential Direct Contact Criteria	Nonresidential Drinking Water Protection Criteria	Nonresidential Particulate Soil Inhalation Criteria	Nonresidential Direct Contact Criteria	CHLL-SB119		CHLL-SB120		CHLL-SB121		CHLL-SB122	
Field Sample ID									CHLL-SB 119 6"-12"	CHLL-SB 119 12"-3'	CHLL-SB-120 0-6"	CHLL-SB120 6"-3'	CHLL-SB-121 0-6"	CHLL-SB-121 6"-4'	CHLL-SB-122 0-6"	CHLL-SB-122 6"-3'
Sample Date:									8/21/2014	8/21/2014	8/20/2014	8/20/2014	8/20/2014	8/20/2014	8/20/2014	8/20/2014
Sample Interval (bgs):									0.5 - 1 ft	1 - 3 ft	0 - 0.5 ft	0.5 - 3 ft	0 - 0.5 ft	0.5 - 4 ft	0 - 0.5 ft	0.5 - 3 ft
Sample Description:									SAND, Medium grained, Reddish brown	SAND, Medium grained, Reddish brown	SILTY SAND, brown, fine grained	SILTY SAND, brown, fine grained to 1 ft; SAND, Medium grained, Reddish brown	SILTY SAND, Fine grained, Brown to 1.5 ft	SILTY SAND, Fine grained, Medium grained, Reddish brown	FILL, Sand and gravel, Reddish brown	FILL, Sand and gravel, Reddish brown
Inorganics - Metals (mg/kg)																
ALUMINIUM	7429-90-5	6,900 (B)	NA	ID	50,000 (DD)	6,900 (B)	ID	370,000 (DD)	--	--	--	--	--	--	--	--
ANTIMONY	7440-36-0	4.3	1.2 (X)	13,000	180	4.3	5,900	670	--	--	--	--	--	--	--	--
ARSENIC	7440-38-2	4.6	4.6	720	7.6	4.6	910	37	--	--	--	--	--	--	--	--
BARIUM	7440-39-3	1,300 (G)	130	330,000	37,000	1,300	150,000	130,000	--	--	--	--	--	--	--	--
BERYLLIUM	7440-41-7	51	4.6 (G)	1,300	410	51	590	1,600	--	--	--	--	--	--	--	--
CADMIUM	7440-43-9	6.0	1.6 (G,X)	1,700	550	6.0	2,200	2,100	--	--	--	--	--	--	--	--
CALCIUM	7440-70-2	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
CHROMIUM	7440-47-3	1,000,000 (D,H)	1,200,000 (G,H,X)	330,000 (H)	790,000 (H)	1,000,000 (D,H)	150,000 (H)	1,000,000 (D,H)	--	--	--	--	--	--	--	--
COBALT	7440-48-4	0.8	2.0	13,000	2,600	2.0	5,900	9,000	--	--	--	--	--	--	--	--
COPPER	7440-50-8	5,800	32 (G)	130,000	20,000	5,800	59,000	73,000	--	--	--	--	--	--	--	--
IRON	7439-89-6	12,000 (B)	NA	ID	160,000	12,000 (B)	ID	580,000	--	--	--	--	--	--	--	--
LEAD	7439-92-1	700	1,900 (G,X)	100,000	400	700	44,000	900 (DD)	--	--	--	--	--	--	--	--
MAGNESIUM	7439-95-4	8,000	NA	6,700,000	1,000,000 (D)	22,000	2,900,000	1,000,000 (D)	--	--	--	--	--	--	--	--
MANGANESE	7439-96-5	440 (B)	440 (B,G,X)	3,300	25,000	440 (B)	1,500	90,000	--	--	--	--	--	--	--	--
MERCURY	7439-97-6	1.7 (Z)	0.13 (B, Z)	20000 (Z)	160 (Z)	1.7 (Z)	8800 (Z)	580 (Z)	--	--	--	--	--	--	--	--
NICKEL	7440-02-0	100	29 (G)	13,000	40,000	100	16,000	150,000	--	--	--	--	--	--	--	--
POTASSIUM	7440-09-7	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
SELENIUM	7782-49-2	4.0	0.41 (B)	130,000	2,600	4.0	59,000	9,600	--	--	--	--	--	--	--	--
SILVER	7440-22-4	4.5	1.0 (M)	6,700	2,500	13	2,900	9,000	--	--	--	--	--	--	--	--
SODIUM	7440-23-5	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
VANADIUM	7440-62-2	72	430	ID	750 (DD)	990	ID	5,500 (DD)	--	--	--	--	--	--	--	--
ZINC	7440-66-6	2,400	62 (G)	ID	170,000	5,000	ID	630,000	--	--	--	--	--	--	--	--
Inorganics - Chromium, Hexavalent																
									--	--	--	--	--	--	--	--
Inorganics - Cyanide (mg/kg)																
CYANIDE	57-12-5	4.0 (P,R)	0.1 (P,R)	250 (P,R)	12 (P,R)	4.0 (P,R)	250 (P,R)	250 (P,R)	--	--	--	--	--	--	--	--
Organics - PCBs (ug/kg)																
AROCLOR-1262	37324-23-5	NA	NA	NA	NA	NA	NA	NA	<110 U	57 J	<120 U	<140 U	<120 U	<120 U	<120 U	<120 U
TOTAL PCBs (I,T)	TPCB	NLL	NLL	5,200,000	1,000 (T)	NLL	6,500,000	1,000 (T)	ND	57 J	ND	ND	ND	ND	ND	ND
Organics - SVOCs																
ACETOPHENONE	98-86-2	30,000	ID	3.3E+10	4.7E+07 (C)	88,000	1.4E+10	1.5E+08 (C)	--	--	--	--	--	--	--	--
ANTHRACENE	120-12-7	41,000	ID	6.7E+10	2.3E+08	41,000	2.9E+10	7.3E+08	--	--	--	--	--	--	--	--
BENZO(A)ANTHRACENE	56-55-3	NLL	NLL	ID	20,000	NLL	ID	80,000	--	--	--	--	--	--	--	--
BENZO(A)PYRENE	50-32-8	NLL	NLL	1,500,000 (Q)	2,000 (Q)	NLL	1,900,000 (Q)	8,000 (Q)	--	--	--	--	--	--	--	--
BENZO(B)FLUORANTHENE	205-99-2	NLL	NLL	ID	20,000 (Q)	NLL	ID	80,000 (Q)	--	--	--	--	--	--	--	--
BENZO(G,H,I)PERYLENE	191-24-2	NLL	NLL	8E+08 (Q)	2,500,000 (Q)	NLL	3.5E+08	7,000,000 (Q)	--	--	--	--	--	--	--	--
BENZO(K)FLUORANTHENE	207-08-9	NLL	NLL	ID	200,000 (Q)	NLL	ID	800,000 (Q)	--	--	--	--	--	--	--	--
CARBAZOLE	86-74-8	9,400	1,100	6.2E+07	530,000	39,000	7.8E+07	2,400,000	--	--	--	--	--	--	--	--
CHRYSENE	218-01-9	NLL	NLL	ID	2,000,000 (Q)	NLL	ID	8,000,000 (Q)	--	--	--	--	--	--	--	--
DIBENZO(A,H)ANTHRACENE	53-70-3	NLL	NLL	ID	2,000 (Q)	NLL	ID	8,000 (Q)	--	--	--	--	--	--	--	--
FLUORANTHENE	206-44-0	730,000	5,500	9.3E+09	4.6E+07	730,000	4.1E+09	1.3E+08	--	--	--	--	--	--	--	--
INDENO(1,2,3-CD)PYRENE	193-39-5	NLL	NLL	ID	20,000	NLL	ID	80,000	--	--	--	--	--	--	--	--
NAPHTHALENE (SVOC)	91-20-3S	35,000	730	2E+08	1.6E+07	100,000	8.8E+07	5.2E+07	--	--	--	--	--	--	--	--
PHENANTHRENE	85-01-8	56,000	2,100	6,700,000	1,600,000	160,000	2,900,000	5,200,000	--	--	--	--	--	--	--	--
PYRENE	129-00-0	480,000	ID	6.7E+09	2.9E+07	480,000	2.9E+09	8.4E+07	--	--	--	--	--	--	--	--
Organics - VOCs																
									--	--	--	--	--	--	--	--
Asbestos																
									--	--	--	--	--	--	--	--

Note: Analytical and Criteria Footnotes are included on the last page of the table.

TABLE 7-1
Sample Analytical Summary - Soil
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Station Name	CAS Number	Residential Drinking Water Protection Criteria	Groundwater Surface Water Interface Protection Criteria	Residential Particulate Soil Inhalation Criteria	Residential Direct Contact Criteria	Nonresidential Drinking Water Protection Criteria	Nonresidential Particulate Soil Inhalation Criteria	Nonresidential Direct Contact Criteria	CHLL-SB123		CHLL-SB124			CHLL-SB125		LLV-25	
Field Sample ID									CHLL-SB 123 0-6"	CHLL-SB 123 6"-4'	CHLL-SB-124 0-6"	CHLL-SB-124 6"-4'	CHLL-SB-124 6"-4' DUP	CHLL-SB-125 0-6"	CHLL-SB-125 6"-4'	LLV-25A	LLV-25B
Sample Date:									8/20/2014	8/20/2014	8/20/2014	8/20/2014	8/20/2014	8/20/2014	8/20/2014	7/30/2007	7/30/2007
Sample Interval (bgs):									0 - 0.5 ft	0.5 - 4 ft	0 - 0.5 ft	0.5 - 4 ft	0.5 - 4 ft	0 - 0.5 ft	0.5 - 4 ft	0 - 0.25 ft	1 - 1.5 ft
Sample Description:									FILL, Sand and gravel, Reddish brown	FILL, Sand and gravel, Reddish brown	SAND, Medium grained, Brown to 1.5 ft	SAND, Medium grained, Brown to 1.5 ft; CLAY, Reddish brown to 2 ft; SAND, Medium grained, Reddish brown	Field Duplicate	SAND, Medium grained, Gray to 1 ft	SAND, Medium grained, Gray to 1 ft; SAND, Medium grained, Reddish brown	--	--
Inorganics - Metals (mg/kg)																	
ALUMINUM	7429-90-5	6,900 (B)	NA	ID	50,000 (DD)	6,900 (B)	ID	370,000 (DD)	--	--	--	--	--	--	--	--	--
ANTIMONY	7440-36-0	4.3	1.2 (X)	13,000	180	4.3	5,900	670	--	--	--	--	--	--	--	2.0	2.0
ARSENIC	7440-38-2	4.6	4.6	720	7.6	4.6	910	37	--	--	--	--	--	--	--	5.9	1.3
BARIUM	7440-39-3	1,300 (G)	130	330,000	37,000	1,300	150,000	130,000	--	--	--	--	--	--	--	33	11
BERYLLIUM	7440-41-7	51	4.6 (G)	1,300	410	51	590	1,600	--	--	--	--	--	--	--	--	--
CADMIUM	7440-43-9	6.0	1.6 (G,X)	1,700	550	6.0	2,200	2,100	--	--	--	--	--	--	--	--	--
CALCIUM	7440-70-2	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--	--
CHROMIUM	7440-47-3	1,000,000 (D,H)	1,200,000 (G,H,X)	330,000 (H)	790,000 (H)	1,000,000 (D,H)	150,000 (H)	1,000,000 (D,H)	--	--	--	--	--	--	--	--	--
COBALT	7440-48-4	0.8	2.0	13,000	2,600	2.0	5,900	9,000	--	--	--	--	--	--	--	--	--
COPPER	7440-50-8	5,800	32 (G)	130,000	20,000	5,800	59,000	73,000	--	--	--	--	--	--	--	100	1200
IRON	7439-89-6	12,000 (B)	NA	ID	160,000	12,000 (B)	ID	580,000	--	--	--	--	--	--	--	--	--
LEAD	7439-92-1	700	1,900 (G,X)	100,000	400	700	44,000	900 (DD)	--	--	--	--	--	--	--	9.3	2.2
MAGNESIUM	7439-95-4	8,000	NA	6,700,000	1,000,000 (D)	22,000	2,900,000	1,000,000 (D)	--	--	--	--	--	--	--	--	--
MANGANESE	7439-96-5	440 (B)	440 (B,G,X)	3,300	25,000	440 (B)	1,500	90,000	--	--	--	--	--	--	--	--	--
MERCURY	7439-97-6	1.7 (Z)	0.13 (B, Z)	20000 (Z)	160 (Z)	1.7 (Z)	8800 (Z)	580 (Z)	--	--	--	--	--	--	--	--	--
NICKEL	7440-02-0	100	29 (G)	13,000	40,000	100	16,000	150,000	--	--	--	--	--	--	--	--	--
POTASSIUM	7440-09-7	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--	--
SELENIUM	7782-49-2	4.0	0.41 (B)	130,000	2,600	4.0	59,000	9,600	--	--	--	--	--	--	--	--	--
SILVER	7440-22-4	4.5	1.0 (M)	6,700	2,500	13	2,900	9,000	--	--	--	--	--	--	--	--	--
SODIUM	7440-23-5	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--	--
VANADIUM	7440-62-2	72	430	ID	750 (DD)	990	ID	5,500 (DD)	--	--	--	--	--	--	--	--	--
ZINC	7440-66-6	2,400	62 (G)	ID	170,000	5,000	ID	630,000	--	--	--	--	--	--	--	--	--
Inorganics - Chromium, Hexavalent																	
									--	--	--	--	--	--	--	--	--
Inorganics - Cyanide (mg/kg)																	
CYANIDE	57-12-5	4.0 (P,R)	0.1 (P,R)	250 (P,R)	12 (P,R)	4.0 (P,R)	250 (P,R)	250 (P,R)	--	--	--	--	--	--	--	--	--
Organics - PCBs (ug/kg)																	
AROCLOR-1262	37324-23-5	NA	NA	NA	NA	NA	NA	NA	<110 U	<110 U	<110 U	<120 U	<130 U	<120 U	<120 U	--	--
TOTAL PCBs (J,T)	TPCB	NLL	NLL	5,200,000	1,000 (T)	NLL	6,500,000	1,000 (T)	ND	ND	ND	ND	ND	ND	ND	ND	ND
Organics - SVOCs																	
ACETOPHENONE	98-86-2	30,000	ID	3.3E+10	4.7E+07 (C)	88,000	1.4E+10	1.5E+08 (C)	--	--	--	--	--	--	--	--	--
ANTHRACENE	120-12-7	41,000	ID	6.7E+10	2.3E+08	41,000	2.9E+10	7.3E+08	<220 U	<220 U	<220 U	<240 U	<260 U	<1200 U	<240 U	--	--
BENZO(A)ANTHRACENE	56-55-3	NLL	NLL	ID	20,000	NLL	ID	80,000	320	840	<220 U	<240 U	<260 U	<1200 U	<240 U	--	--
BENZO(A)PYRENE	50-32-8	NLL	NLL	1,500,000 (Q)	2,000 (Q)	NLL	1,900,000 (Q)	8,000 (Q)	<440 U	920	<430 U	<480 U	<520 U	<2300 U	<470 U	--	--
BENZO(B)FLUORANTHENE	205-99-2	NLL	NLL	ID	20,000 (Q)	NLL	ID	80,000 (Q)	490	1200	<430 U	<480 U	<520 U	<2300 U	<470 U	--	--
BENZO(G,H,I)PERYLENE	191-24-2	NLL	NLL	8E+08 (Q)	2,500,000 (Q)	NLL	3.5E+08	7,000,000 (Q)	<440 U	640	<430 U	<480 U	<520 U	<2300 U	<470 U	--	--
BENZO(K)FLUORANTHENE	207-08-9	NLL	NLL	ID	200,000 (Q)	NLL	ID	800,000 (Q)	<440 U	450	<430 U	<480 U	<520 U	<2300 U	<470 U	--	--
CARBAZOLE	86-74-8	9,400	1,100	6.2E+07	530,000	39,000	7.8E+07	2,400,000	--	--	--	--	--	--	--	--	--
CHRYSENE	218-01-9	NLL	NLL	ID	2,000,000 (Q)	NLL	ID	8,000,000 (Q)	360	910	<220 U	<240 U	<260 U	<1200 U	<240 U	--	--
DIBENZO(A,H)ANTHRACENE	53-70-3	NLL	NLL	ID	2,000 (Q)	NLL	ID	8,000 (Q)	<440 U	<440 U	<430 U	<480 U	<520 U	<2300 U	<470 U	--	--
FLUORANTHENE	206-44-0	730,000	5,500	9.3E+09	4.6E+07	730,000	4.1E+09	1.3E+08	650	1900	<220 U	<240 U	<260 U	<1200 U	<240 U	--	--
INDENO(1,2,3-CD)PYRENE	193-39-5	NLL	NLL	ID	20,000	NLL	ID	80,000	<440 U	740	<430 U	<480 U	<520 U	<2300 U	<470 U	--	--
NAPHTHALENE (SVOC)	91-20-3S	35,000	730	2E+08	1.6E+07	100,000	8.8E+07	5.2E+07	<220 U	<220 U	<220 U	<240 U	<260 U	<1200 U	<240 U	--	--
PHENANTHRENE	85-01-8	56,000	2,100	6,700,000	1,600,000	160,000	2,900,000	5,200,000	<220 U	890	<220 U	<240 U	<260 U	<1200 U	<240 U	--	--
PYRENE	129-00-0	480,000	ID	6.7E+09	2.9E+07	480,000	2.9E+09	8.4E+07	690	2000	<220 U	<240 U	<260 U	<1200 U	<240 U	--	--
Organics - VOCs																	
									--	--	--	--	--	--	--	--	--
Asbestos																	
									--	--	--	--	--	--	--	--	--

Note: Analytical and Criteria Footnotes are included on the last page of the table.

DETAILED FINDINGS REPORT
LAKE LINDEN RECREATION AREA

TABLE 7-1
Sample Analytical Summary - Soil
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Station Name	CAS Number	Residential Drinking Water Protection Criteria	Groundwater Surface Water Interface Protection Criteria	Residential Particulate Soil Inhalation Criteria	Residential Direct Contact Criteria	Nonresidential Drinking Water Protection Criteria	Nonresidential Particulate Soil Inhalation Criteria	Nonresidential Direct Contact Criteria	LLV-26		LLV-27		LLV-28			
Field Sample ID									LLV-26A	LLV-26B	LLV-27A	LLV-27B	LLV-28A	LLV-28A DUP	LLV-28B	LLV-28B DUP
Sample Date:									7/31/2007	7/31/2007	7/31/2007	7/31/2007	7/31/2007	7/31/2007	7/31/2007	7/31/2007
Sample Interval (bgs):									0 - 0.25 ft	1 - 1.5 ft	0 - 0.25 ft	1 - 1.5 ft	0 - 0.25 ft	0 - 0.25 ft	1 - 1.5 ft	1 - 1.5 ft
Sample Description:									--	--	--	--	--	Field Duplicate	--	Field Duplicate
Inorganics - Metals (mg/kg)																
ALUMINUM	7429-90-5	6,900 (B)	NA	ID	50,000 (DD)	6,900 (B)	ID	370,000 (DD)	--	--	--	--	--	--	--	--
ANTIMONY	7440-36-0	4.3	1.2 (X)	13,000	180	4.3	5,900	670	1.9	2.0	2.0	2.0	1.9	2.1	2.2	2.2
ARSENIC	7440-38-2	4.6	4.6	720	7.6	4.6	910	37	3.0	1.4	14	1.5	1.6	2.0	1.5	1.5
BARIUM	7440-39-3	1,300 (G)	130	330,000	37,000	1,300	150,000	130,000	28	18	110	25	16	18	19	19
BERYLLIUM	7440-41-7	51	4.6 (G)	1,300	410	51	590	1,600	--	--	--	--	--	--	--	--
CADMIUM	7440-43-9	6.0	1.6 (G,X)	1,700	550	6.0	2,200	2,100	--	--	--	--	--	--	--	--
CALCIUM	7440-70-2	NA	NA	NA	NA	NA	NA	NA	--	NA	--	--	--	--	--	--
CHROMIUM	7440-47-3	1,000,000 (D,H)	1,200,000 (G,H,X)	330,000 (H)	790,000 (H)	1,000,000 (D,H)	150,000 (H)	1,000,000 (D,H)	--	--	--	--	--	--	--	--
COBALT	7440-48-4	0.8	2.0	13,000	2,600	2.0	5,900	9,000	--	--	--	--	--	--	--	--
COPPER	7440-50-8	5,800	32 (G)	130,000	20,000	5,800	59,000	73,000	60	1100	2000	730	33	39	170	250
IRON	7439-89-6	12,000 (B)	NA	ID	160,000	12,000 (B)	ID	580,000	--	--	--	--	--	--	--	--
LEAD	7439-92-1	700	1,900 (G,X)	100,000	400	700	44,000	900 (DD)	6.5	29	110	43	1.6	1.9	3.0	4.7
MAGNESIUM	7439-95-4	8,000	NA	6,700,000	1,000,000 (D)	22,000	2,900,000	1,000,000 (D)	--	22,000	--	--	--	--	--	--
MANGANESE	7439-96-5	440 (B)	440 (B,G,X)	3,300	25,000	440 (B)	1,500	90,000	--	--	--	--	--	--	--	--
MERCURY	7439-97-6	1.7 (Z)	0.13 (B, Z)	20000 (Z)	160 (Z)	1.7 (Z)	8800 (Z)	580 (Z)	--	--	--	--	--	--	--	--
NICKEL	7440-02-0	100	29 (G)	13,000	40,000	100	16,000	150,000	--	--	--	--	--	--	--	--
POTASSIUM	7440-09-7	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
SELENIUM	7782-49-2	4.0	0.41 (B)	130,000	2,600	4.0	59,000	9,600	--	--	--	--	--	--	--	--
SILVER	7440-22-4	4.5	1.0 (M)	6,700	2,500	13	2,900	9,000	--	--	--	--	--	--	--	--
SODIUM	7440-23-5	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
VANADIUM	7440-62-2	72	430	ID	750 (DD)	990	ID	5,500 (DD)	--	--	--	--	--	--	--	--
ZINC	7440-66-6	2,400	62 (G)	ID	170,000	5,000	ID	630,000	--	--	--	--	--	--	--	--
Inorganics - Chromium, Hexavalent																
									--	--	--	--	--	--	--	--
Inorganics - Cyanide (mg/kg)																
CYANIDE	57-12-5	4.0 (P,R)	0.1 (P,R)	250 (P,R)	12 (P,R)	4.0 (P,R)	250 (P,R)	250 (P,R)	--	--	--	--	--	--	--	--
Organics - PCBs (ug/kg)																
AROCOR-1262	37324-23-5	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
TOTAL PCBs (J,T)	TPCB	NLL	NLL	5,200,000	1,000 (T)	NLL	6,500,000	1,000 (T)	ND	ND	ND	ND	ND	ND	ND	ND
Organics - SVOCs																
ACETOPHENONE	98-86-2	30,000	ID	3.3E+10	4.7E+07 (C)	88,000	1.4E+10	1.5E+08 (C)	--	--	--	--	--	--	--	--
ANTHRACENE	120-12-7	41,000	ID	6.7E+10	2.3E+08	41,000	2.9E+10	7.3E+08	--	--	--	--	--	--	--	--
BENZO(A)ANTHRACENE	56-55-3	NLL	NLL	ID	20,000	NLL	ID	80,000	--	--	--	--	--	--	--	--
BENZO(A)PYRENE	50-32-8	NLL	NLL	1,500,000 (Q)	2,000 (Q)	NLL	1,900,000 (Q)	8,000 (Q)	--	--	--	--	--	--	--	--
BENZO(B)FLUORANTHENE	205-99-2	NLL	NLL	ID	20,000 (Q)	NLL	ID	80,000 (Q)	--	--	--	--	--	--	--	--
BENZO(G,H,I)PERYLENE	191-24-2	NLL	NLL	8E+08 (Q)	2,500,000 (Q)	NLL	3.5E+08	7,000,000 (Q)	--	--	--	--	--	--	--	--
BENZO(K)FLUORANTHENE	207-08-9	NLL	NLL	ID	200,000 (Q)	NLL	ID	800,000 (Q)	--	--	--	--	--	--	--	--
CARBAZOLE	86-74-8	9,400	1,100	6.2E+07	530,000	39,000	7.8E+07	2,400,000	--	--	--	--	--	--	--	--
CHRYSENE	218-01-9	NLL	NLL	ID	2,000,000 (Q)	NLL	ID	8,000,000 (Q)	--	--	--	--	--	--	--	--
DIBENZO(A,H)ANTHRACENE	53-70-3	NLL	NLL	ID	2,000 (Q)	NLL	ID	8,000 (Q)	--	--	--	--	--	--	--	--
FLUORANTHENE	206-44-0	730,000	5,500	9.3E+09	4.6E+07	730,000	4.1E+09	1.3E+08	--	--	--	--	--	--	--	--
INDENO(1,2,3-CD)PYRENE	193-39-5	NLL	NLL	ID	20,000	NLL	ID	80,000	--	--	--	--	--	--	--	--
NAPHTHALENE (SVOC)	91-20-3S	35,000	730	2E+08	1.6E+07	100,000	8.8E+07	5.2E+07	--	--	--	--	--	--	--	--
PHENANTHRENE	85-01-8	56,000	2,100	6,700,000	1,600,000	160,000	2,900,000	5,200,000	--	--	--	--	--	--	--	--
PYRENE	129-00-0	480,000	ID	6.7E+09	2.9E+07	480,000	2.9E+09	8.4E+07	--	--	--	--	--	--	--	--
Organics - VOCs																
									--	--	--	--	--	--	--	--
Asbestos																
									--	--	--	--	--	--	--	--

Note: Analytical and Criteria Footnotes are included on the last page of the table.

DETAILED FINDINGS REPORT
LAKE LINDEN RECREATION AREA

TABLE 7-1
Sample Analytical Summary - Soil
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Station Name	CAS Number	Residential Drinking Water Protection Criteria	Groundwater Surface Water Interface Protection Criteria	Residential Particulate Soil Inhalation Criteria	Residential Direct Contact Criteria	Nonresidential Drinking Water Protection Criteria	Nonresidential Particulate Soil Inhalation Criteria	Nonresidential Direct Contact Criteria	LLV-29		LLV-30		LLV-31		LLV-32	
Field Sample ID									LLV-29A	LLV-29B	LLV-30A	LLV-30B	LLV-31A	LLV-31B	LLV-32A	LLV-32B
Sample Date:									7/31/2007	7/31/2007	7/31/2007	7/31/2007	7/31/2007	7/31/2007	7/30/2007	7/30/2007
Sample Interval (bgs):									0 - 0.25 ft	1 - 1.5 ft	0 - 0.25 ft	1 - 1.5 ft	0 - 0.25 ft	1 - 1.5 ft	0 - 0.25 ft	1 - 1.5 ft
Sample Description:									--	--	--	--	--	--	--	--
Inorganics - Metals (mg/kg)																
ALUMINUM	7429-90-5	6,900 (B)	NA	ID	50,000 (DD)	6,900 (B)	ID	370,000 (DD)	--	--	--	--	--	--	--	--
ANTIMONY	7440-36-0	4.3	1.2 (X)	13,000	180	4.3	5,900	670	2.0	2.1	2.0	2.2	2.0	2.1	2.0	2.3
ARSENIC	7440-38-2	4.6	4.6	720	7.6	4.6	910	37	2.6	1.1	1.5	1.4	1.1	1.3	0.99	2.4
BARIUM	7440-39-3	1,300 (G)	130	330,000	37,000	1,300	150,000	130,000	34	23	16	12	18	16	17	120
BERYLLIUM	7440-41-7	51	4.6 (G)	1,300	410	51	590	1,600	--	--	--	--	--	--	--	--
CADMIUM	7440-43-9	6.0	1.6 (G,X)	1,700	550	6.0	2,200	2,100	--	--	--	--	--	--	--	--
CALCIUM	7440-70-2	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
CHROMIUM	7440-47-3	1,000,000 (D,H)	1,200,000 (G,H,X)	330,000 (H)	790,000 (H)	1,000,000 (D,H)	150,000 (H)	1,000,000 (D,H)	--	--	--	--	--	--	--	--
COBALT	7440-48-4	0.8	2.0	13,000	2,600	2.0	5,900	9,000	--	--	--	--	--	--	--	--
COPPER	7440-50-8	5,800	32 (G)	130,000	20,000	5,800	59,000	73,000	92	820	570	580	200	490	140	1100
IRON	7439-89-6	12,000 (B)	NA	ID	160,000	12,000 (B)	ID	580,000	--	--	--	--	--	--	--	--
LEAD	7439-92-1	700	1,900 (G,X)	100,000	400	700	44,000	900 (DD)	7.6	2.6	10	2.6	3.8	2.3	0.94	4.2
MAGNESIUM	7439-95-4	8,000	NA	6,700,000	1,000,000 (D)	22,000	2,900,000	1,000,000 (D)	--	--	--	--	--	--	--	--
MANGANESE	7439-96-5	440 (B)	440 (B,G,X)	3,300	25,000	440 (B)	1,500	90,000	--	--	--	--	--	--	--	--
MERCURY	7439-97-6	1.7 (Z)	0.13 (B, Z)	20000 (Z)	160 (Z)	1.7 (Z)	8800 (Z)	580 (Z)	--	--	--	--	--	--	--	--
NICKEL	7440-02-0	100	29 (G)	13,000	40,000	100	16,000	150,000	--	--	--	--	--	--	--	--
POTASSIUM	7440-09-7	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
SELENIUM	7782-49-2	4.0	0.41 (B)	130,000	2,600	4.0	59,000	9,600	--	--	--	--	--	--	--	--
SILVER	7440-22-4	4.5	1.0 (M)	6,700	2,500	13	2,900	9,000	--	--	--	--	--	--	--	--
SODIUM	7440-23-5	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
VANADIUM	7440-62-2	72	430	ID	750 (DD)	990	ID	5,500 (DD)	--	--	--	--	--	--	--	--
ZINC	7440-66-6	2,400	62 (G)	ID	170,000	5,000	ID	630,000	--	--	--	--	--	--	--	--
Inorganics - Chromium, Hexavalent																
									--	--	--	--	--	--	--	--
Inorganics - Cyanide (mg/kg)																
CYANIDE	57-12-5	4.0 (P,R)	0.1 (P,R)	250 (P,R)	12 (P,R)	4.0 (P,R)	250 (P,R)	250 (P,R)	--	--	--	--	--	--	--	--
Organics - PCBs (ug/kg)																
AROCOR-1262	37324-23-5	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
TOTAL PCBs (J,T)	TPCB	NLL	NLL	5,200,000	1,000 (T)	NLL	6,500,000	1,000 (T)	ND	ND	ND	ND	ND	ND	ND	ND
Organics - SVOCs																
ACETOPHENONE	98-86-2	30,000	ID	3.3E+10	4.7E+07 (C)	88,000	1.4E+10	1.5E+08 (C)	--	--	--	--	--	--	--	--
ANTHRACENE	120-12-7	41,000	ID	6.7E+10	2.3E+08	41,000	2.9E+10	7.3E+08	--	--	--	--	--	--	--	--
BENZO(A)ANTHRACENE	56-55-3	NLL	NLL	ID	20,000	NLL	ID	80,000	--	--	--	--	--	--	--	--
BENZO(A)PYRENE	50-32-8	NLL	NLL	1,500,000 (Q)	2,000 (Q)	NLL	1,900,000 (Q)	8,000 (Q)	--	--	--	--	--	--	--	--
BENZO(B)FLUORANTHENE	205-99-2	NLL	NLL	ID	20,000 (Q)	NLL	ID	80,000 (Q)	--	--	--	--	--	--	--	--
BENZO(G,H,I)PERYLENE	191-24-2	NLL	NLL	8E+08 (Q)	2,500,000 (Q)	NLL	3.5E+08	7,000,000 (Q)	--	--	--	--	--	--	--	--
BENZO(K)FLUORANTHENE	207-08-9	NLL	NLL	ID	200,000 (Q)	NLL	ID	800,000 (Q)	--	--	--	--	--	--	--	--
CARBAZOLE	86-74-8	9,400	1,100	6.2E+07	530,000	39,000	7.8E+07	2,400,000	--	--	--	--	--	--	--	--
CHRYSENE	218-01-9	NLL	NLL	ID	2,000,000 (Q)	NLL	ID	8,000,000 (Q)	--	--	--	--	--	--	--	--
DIBENZO(A,H)ANTHRACENE	53-70-3	NLL	NLL	ID	2,000 (Q)	NLL	ID	8,000 (Q)	--	--	--	--	--	--	--	--
FLUORANTHENE	206-44-0	730,000	5,500	9.3E+09	4.6E+07	730,000	4.1E+09	1.3E+08	--	--	--	--	--	--	--	--
INDENO(1,2,3-CD)PYRENE	193-39-5	NLL	NLL	ID	20,000	NLL	ID	80,000	--	--	--	--	--	--	--	--
NAPHTHALENE (SVOC)	91-20-3S	35,000	730	2E+08	1.6E+07	100,000	8.8E+07	5.2E+07	--	--	--	--	--	--	--	--
PHENANTHRENE	85-01-8	56,000	2,100	6,700,000	1,600,000	160,000	2,900,000	5,200,000	--	--	--	--	--	--	--	--
PYRENE	129-00-0	480,000	ID	6.7E+09	2.9E+07	480,000	2.9E+09	8.4E+07	--	--	--	--	--	--	--	--
Organics - VOCs																
									--	--	--	--	--	--	--	--
Asbestos																
									--	--	--	--	--	--	--	--

Note: Analytical and Criteria Footnotes are included on the last page of the table.

TABLE 7-1
Sample Analytical Summary - Soil
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

DETAILED FINDINGS REPORT
LAKE LINDEN RECREATION AREA

Station Name	CAS Number	Residential Drinking Water Protection Criteria	Groundwater Surface Water Interface Protection Criteria	Residential Particulate Soil Inhalation Criteria	Residential Direct Contact Criteria	Nonresidential Drinking Water Protection Criteria	Nonresidential Particulate Soil Inhalation Criteria	Nonresidential Direct Contact Criteria	SB-04		SB-05	SB-06	SB-07	SB-08	SB-09	SB-10
Field Sample ID									SB-04	SB-04D	SB-05	SB-06	SB-07	SB-08	SB-09	SB-10
Sample Date:									10/10/2011	10/10/2011	10/10/2011	10/11/2011	10/11/2011	10/11/2011	10/11/2011	10/11/2011
Sample Interval (bgs):									96 - 144 in	96 - 144 in	33 - 48 in	18 - 33 in	30 - 42 in	22 - 36 in	33 - 48 in	10 - 24 in
Sample Description:									--	Field Duplicate	--	--	--	--	--	--
Inorganics - Metals (mg/kg)																
ALUMINUM	7429-90-5	6,900 (B)	NA	ID	50,000 (DD)	6,900 (B)	ID	370,000 (DD)	6940	7050	3200	4750	5140	5580	6730	3490
ANTIMONY	7440-36-0	4.3	1.2 (X)	13,000	180	4.3	5,900	670	0.46 J	0.49 J	0.79 J	0.23 J	0.44 J	0.37 J	0.3 J	0.38 J
ARSENIC	7440-38-2	4.6	4.6	720	7.6	4.6	910	37	2.4 J-	3.2 J-	3.0 J-	2.0 J-	2.9 J-	2.4 J-	1.7 J-	3.1 J-
BARIUM	7440-39-3	1,300 (G)	130	330,000	37,000	1,300	150,000	130,000	39.2	51.4	43.4	16.3 J	57.3	39.9	11.6 J	54.8
BERYLLIUM	7440-41-7	51	4.6 (G)	1,300	410	51	590	1,600	0.74	0.77	0.7	0.62	0.74	0.81	0.59	0.66
CADMIUM	7440-43-9	6.0	1.6 (G,X)	1,700	550	6.0	2,200	2,100	1.2	1.2	0.78	0.88	1.0	1.0	1.0	0.59
CALCIUM	7440-70-2	NA	NA	NA	NA	NA	NA	NA	18900	19600	12400	9940	10800	13300	13800	4190
CHROMIUM	7440-47-3	1,000,000 (D,H)	1,200,000 (G,H,X)	330,000 (H)	790,000 (H)	1,000,000 (D,H)	150,000 (H)	1,000,000 (D,H)	29.1	28.7	16.2	19	21.2	24.1	23.4	12.9
COBALT	7440-48-4	0.8	2.0	13,000	2,600	2.0	5,900	9,000	10.3	9.8	5.7	6.9	8.5	9.3	10.4	4 J
COPPER	7440-50-8	5,800	32 (G)	130,000	20,000	5,800	59,000	73,000	1190	1220	5130	411	1170	1460	877	1030
IRON	7439-89-6	12,000 (B)	NA	ID	160,000	12,000 (B)	ID	580,000	18500	18700	11500	14400	14500	14900	14400	10000
LEAD	7439-92-1	700	1,900 (G,X)	100,000	400	700	44,000	900 (DD)	10.6	14.9	83.4	13.3	43	111	15.8	41.2
MAGNESIUM	7439-95-4	8,000	NA	6,700,000	1,000,000 (D)	22,000	2,900,000	1,000,000 (D)	7370	7600	5210	5190	6530	7940	7340	2770
MANGANESE	7439-96-5	440 (B)	440 (B,G,X)	3,300	25,000	440 (B)	1,500	90,000	269	280	170	196	226	248	267	121
MERCURY	7439-97-6	1.7 (Z)	0.13 (B, Z)	20000 (Z)	160 (Z)	1.7 (Z)	8800 (Z)	580 (Z)	0.021 J	0.041 J	0.041 J	0.035 J	0.58	0.041 J	0.02 J	0.054 J
NICKEL	7440-02-0	100	29 (G)	13,000	40,000	100	16,000	150,000	31.7	31.4	15.5	21.3	26.7	27.5	30.3	12.6
POTASSIUM	7440-09-7	NA	NA	NA	NA	NA	NA	NA	<500 U	<500 U	<500 U	<500 U	<500 U	<500 U	<500 U	<500 U
SELENIUM	7782-49-2	4.0	0.41 (B)	130,000	2,600	4.0	59,000	9,600	<3.5 U	<3.5 U	<3.5 U	<3.5 U	<3.5 U	<3.5 U	<3.5 U	0.27 J
SILVER	7440-22-4	4.5	1.0 (M)	6,700	2,500	13	2,900	9,000	2.3	2.4	7.0	1.0 J	3.2	4.3	2.2	1.1
SODIUM	7440-23-5	NA	NA	NA	NA	NA	NA	NA	257 J	219 J	203 J	249 J	205 J	158 J	180 J	229 J
VANADIUM	7440-62-2	72	430	ID	750 (DD)	990	ID	5,500 (DD)	46.5	48.4	32	32.9	36.2	39.3	34.8	21.9
ZINC	7440-66-6	2,400	62 (G)	ID	170,000	5,000	ID	630,000	61.6	65.6	79.3	50.6	68.1	147	61.5	37.4
Inorganics - Chromium, Hexavalent																
									--	--	--	--	--	--	--	--
Inorganics - Cyanide (mg/kg)																
CYANIDE	57-12-5	4.0 (P,R)	0.1 (P,R)	250 (P,R)	12 (P,R)	4.0 (P,R)	250 (P,R)	250 (P,R)	<0.5 UJ	<0.5 U	<0.5 UJ	<0.5 UJ	<0.5 UJ	<0.5 UJ	<0.5 UJ	<0.5 UJ
Organics - PCBs (ug/kg)																
AROCLOP-1262	37324-23-5	NA	NA	NA	NA	NA	NA	NA	<40 U	<43 U	<41 U	<36 U	<35 U	<34 U	<35 U	<39 U
TOTAL PCBs (J,T)	TPCB	NLL	NLL	5,200,000	1,000 (T)	NLL	6,500,000	1,000 (T)	ND	ND	ND	ND	ND	ND	ND	ND
Organics - SVOCs																
ACETOPHENONE	98-86-2	30,000	ID	3.3E+10	4.7E+07 (C)	88,000	1.4E+10	1.5E+08 (C)	410	460	<170 U	<170 U	<170 U	<170 U	<170 U	<170 U
ANTHRACENE	120-12-7	41,000	ID	6.7E+10	2.3E+08	41,000	2.9E+10	7.3E+08	130 J	<170 U	240	<170 U	<170 U	<170 U	<170 U	<170 U
BENZO(A)ANTHRACENE	56-55-3	NLL	NLL	ID	20,000	NLL	ID	80,000	340	<170 U	760 J	<170 U	<170 U	<170 U	<170 U	<170 U
BENZO(A)PYRENE	50-32-8	NLL	NLL	1,500,000 (Q)	2,000 (Q)	NLL	1,900,000 (Q)	8,000 (Q)	240	<170 U	610 J	<170 U	<170 U	<170 U	<170 U	<170 U
BENZO(B)FLUORANTHENE	205-99-2	NLL	NLL	ID	20,000 (Q)	NLL	ID	80,000 (Q)	250	<170 U	580 J	<170 U	<170 U	<170 U	<170 U	<170 U
BENZO(G,H,I)PERYLENE	191-24-2	NLL	NLL	8E+08 (Q)	2,500,000 (Q)	NLL	3.5E+08	7,000,000 (Q)	120 J	<170 U	360 J	<170 U	<170 U	<170 U	<170 U	110 J
BENZO(K)FLUORANTHENE	207-08-9	NLL	NLL	ID	200,000 (Q)	NLL	ID	800,000 (Q)	230	<170 U	490 J	<170 U	<170 U	<170 U	<170 U	<170 U
CARBAZOLE	86-74-8	9,400	1,100	6.2E+07	530,000	39,000	7.8E+07	2,400,000	<170 U	<170 U	110 J	<170 U	<170 U	<170 U	<170 U	<170 U
CHRYSENE	218-01-9	NLL	NLL	ID	2,000,000 (Q)	NLL	ID	8,000,000 (Q)	350	<170 U	930 J	<170 U	<170 U	<170 U	<170 U	180 J
DIBENZO(A,H)ANTHRACENE	53-70-3	NLL	NLL	ID	2,000 (Q)	NLL	ID	8,000 (Q)	<170 U	<170 U	130 J	<170 U	<170 U	<170 U	<170 U	<170 U
FLUORANTHENE	206-44-0	730,000	5,500	9.3E+09	4.6E+07	730,000	4.1E+09	1.3E+08	800 J	<170 UJ	1800 J	<170 UJ	<170 UJ	<170 UJ	<170 UJ	<170 UJ
INDENO(1,2,3-CD)PYRENE	193-39-5	NLL	NLL	ID	20,000	NLL	ID	80,000	120 J	<170 U	310 J	<170 U	<170 U	<170 U	<170 U	<170 U
NAPHTHALENE (SVOC)	91-20-35	35,000	730	2E+08	1.6E+07	100,000	8.8E+07	5.2E+07	<170 U	<170 U	<170 U	<170 U	<170 U	<170 U	<170 U	<170 U
PHENANTHRENE	85-01-8	56,000	2,100	6,700,000	1,600,000	160,000	2,900,000	5,200,000	730	<170 U	1400	<170 U	<170 U	<170 U	<170 U	<170 U
PYRENE	129-00-0	480,000	ID	6.7E+09	2.9E+07	480,000	2.9E+09	8.4E+07	610	<170 U	1900 J	<170 U	<170 U	<170 U	<170 U	340
Organics - VOCs																
									--	--	--	--	--	--	--	--
Asbestos																
									--	--	--	--	--	--	--	--

Note: Analytical and Criteria Footnotes are included on the last page of the table.

TABLE 7-1
Sample Analytical Summary - Soil
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Station Name	CAS Number	Residential Drinking Water Protection Criteria	Groundwater Surface Water Interface Protection Criteria	Residential Particulate Soil Inhalation Criteria	Residential Direct Contact Criteria	Nonresidential Drinking Water Protection Criteria	Nonresidential Particulate Soil Inhalation Criteria	Nonresidential Direct Contact Criteria	SB-13	SS-04	SS-05	SS-06	SS-07	SS-08	SS-09
Field Sample ID									SB-13	SS-04	SS-05	SS-06	SS-07	SS-08	SS-09
Sample Date:									10/11/2011	10/11/2011	10/11/2011	10/11/2011	10/10/2011	10/10/2011	10/10/2011
Sample Interval (bgs):									21 - 30 in	0 - 5 in	2 - 10 in	0 - 1 in	9 - 12 in	0 - 6 in	0 - 2 in
Sample Description:									--	--	--	--	--	--	--
Inorganics - Metals (mg/kg)															
ALUMINUM	7429-90-5	6,900 (B)	NA	ID	50,000 (DD)	6,900 (B)	ID	370,000 (DD)	3720	7540 J	2940 J	3070 J	4430 J	10800 J	7190 J
ANTIMONY	7440-36-0	4.3	1.2 (X)	13,000	180	4.3	5,900	670	8.5 J	0.4 J	1.1 J	4.5 J	0.49 J	45.4	0.49 J
ARSENIC	7440-38-2	4.6	4.6	720	7.6	4.6	910	37	17.5 J-	2.6	5	46.8	7.6	11	5.2
BARIUM	7440-39-3	1,300 (G)	130	330,000	37,000	1,300	150,000	130,000	108000	33 J	57.1 J	76.2 J	29.2 J	219 J	27.3 J
BERYLLIUM	7440-41-7	51	4.6 (G)	1,300	410	51	590	1,600	0.78	0.52 J	1.0	2.0	0.96	1.2	0.69
CADMIUM	7440-43-9	6.0	1.6 (G,X)	1,700	550	6.0	2,200	2,100	8.4	1.1	1.2	8.9	0.88	1.5	1.7
CALCIUM	7440-70-2	NA	NA	NA	NA	NA	NA	NA	7270	6460 J	4640 J	6800 J	9110 J	20600 J	6680 J
CHROMIUM	7440-47-3	1,000,000 (D,H)	1,200,000 (G,H,X)	330,000 (H)	790,000 (H)	1,000,000 (D,H)	150,000 (H)	1,000,000 (D,H)	14.6	24.2	13.6	17.4	19.8	21.6	23.9
COBALT	7440-48-4	0.8	2.0	13,000	2,600	2.0	5,900	9,000	<5.0 UJ	11.1	5.4	15	9.4	9.2	10.9
COPPER	7440-50-8	5,800	32 (G)	130,000	20,000	5,800	59,000	73,000	9940	788 J	989 J	53700 J	16500 J	3710 J	2480 J
IRON	7439-89-6	12,000 (B)	NA	ID	160,000	12,000 (B)	ID	580,000	23800	16000 J	15400 J	153000 J	13400 J	18000 J	17200 J
LEAD	7439-92-1	700	1,900 (G,X)	100,000	400	700	44,000	900 (DD)	16100	31.5	134	18.5	15.7	6940	39.1
MAGNESIUM	7439-95-4	8,000	NA	6,700,000	1,000,000 (D)	22,000	2,900,000	1,000,000 (D)	4250	7520	4720	3900	8370	4950	6970
MANGANESE	7439-96-5	440 (B)	440 (B,G,X)	3,300	25,000	440 (B)	1,500	90,000	229	334 J	124 J	189 J	250 J	356 J	302 J
MERCURY	7439-97-6	1.7 (Z)	0.13 (B, Z)	20000 (Z)	160 (Z)	1.7 (Z)	8800 (Z)	580 (Z)	0.1	0.018 J-	0.024 J-	1.4 J-	0.036 J-	0.22 J-	0.02 J-
NICKEL	7440-02-0	100	29 (G)	13,000	40,000	100	16,000	150,000	24.3	29.2	9.8	35.7	23.3	29.8	31.5
POTASSIUM	7440-09-7	NA	NA	NA	NA	NA	NA	NA	<500 U	<500 U	<500 U	<500 U	<500 U	<500 U	435
SELENIUM	7782-49-2	4.0	0.41 (B)	130,000	2,600	4.0	59,000	9,600	<3.5 U	<3.5 U	<3.5 U	<3.5 U	<3.5 U	<3.5 U	<3.5 U
SILVER	7440-22-4	4.5	1.0 (M)	6,700	2,500	13	2,900	9,000	3.2	0.53 J	2.5	40.9	8.1	1.7	1.4
SODIUM	7440-23-5	NA	NA	NA	NA	NA	NA	NA	472	205 J	106 J	339 J	217 J	278 J	175 J
VANADIUM	7440-62-2	72	430	ID	750 (DD)	990	ID	5,500 (DD)	21.6	34.6 J	33.2 J	32.2 J	40.2 J	25.4 J	38.6 J
ZINC	7440-66-6	2,400	62 (G)	ID	170,000	5,000	ID	630,000	607	69.7 J	60.5 J	81.7 J	144 J	175 J	139 J
Inorganics - Chromium, Hexavalent															
									--	--	--	--	--	--	--
Inorganics - Cyanide (mg/kg)															
CYANIDE	57-12-5	4.0 (P,R)	0.1 (P,R)	250 (P,R)	12 (P,R)	4.0 (P,R)	250 (P,R)	250 (P,R)	<0.5 UJ	0.12 J	<0.5 U	0.17 J	<0.5 U	0.23 J	<0.5 U
Organics - PCBs (ug/kg)															
AROCLOR-1262	37324-23-5	NA	NA	NA	NA	NA	NA	NA	<37 U	<37 U	<38 U	<40 U	<35 U	<39 U	<36 U
TOTAL PCBs (J,T)	TPCB	NLL	NLL	5,200,000	1,000 (T)	NLL	6,500,000	1,000 (T)	ND	ND	ND	ND	ND	ND	ND
Organics - SVOCs															
ACETOPHENONE	98-86-2	30,000	ID	3.3E+10	4.7E+07 (C)	88,000	1.4E+10	1.5E+08 (C)	<170 U	<170 U	<170 U	<170 U	<170 U	<170 U	<170 U
ANTHRACENE	120-12-7	41,000	ID	6.7E+10	2.3E+08	41,000	2.9E+10	7.3E+08	<170 U	<170 U	<170 U	<170 U	<170 U	<170 U	94 J
BENZO(A)ANTHRACENE	56-55-3	NLL	NLL	ID	20,000	NLL	ID	80,000	<170 U	<170 U	<170 U	400	<170 U	300	610 J
BENZO(A)PYRENE	50-32-8	NLL	NLL	1,500,000 (Q)	2,000 (Q)	NLL	1,900,000 (Q)	8,000 (Q)	<170 U	93 J	<170 UJ	390	<170 U	290	620 J
BENZO(B)FLUORANTHENE	205-99-2	NLL	NLL	ID	20,000 (Q)	NLL	ID	80,000 (Q)	<170 U	120 J	<170 UJ	490	110 J	310	570 J
BENZO(G,H,I)PERYLENE	191-24-2	NLL	NLL	8E+08 (Q)	2,500,000 (Q)	NLL	3.5E+08	7,000,000 (Q)	<170 U	99 J	<170 UJ	310	<170 U	230	430 J
BENZO(K)FLUORANTHENE	207-08-9	NLL	NLL	ID	200,000 (Q)	NLL	ID	800,000 (Q)	<170 U	<170 U	<170 UJ	470	<170 U	300	650 J
CARBAZOLE	86-74-8	9,400	1,100	6.2E+07	530,000	39,000	7.8E+07	2,400,000	<170 U	<170 U	<170 U	<170 U	<170 U	<170 U	110 J
CHRYSENE	218-01-9	NLL	NLL	ID	2,000,000 (Q)	NLL	ID	8,000,000 (Q)	<170 U	<170 U	<170 U	500	180	340	800 J
DIBENZO(A,H)ANTHRACENE	53-70-3	NLL	NLL	ID	2,000 (Q)	NLL	ID	8,000 (Q)	<170 U	<170 U	<170 UJ	110 J	<170 U	<170 U	160 J
FLUORANTHENE	206-44-0	730,000	5,500	9.3E+09	4.6E+07	730,000	4.1E+09	1.3E+08	<170 U	100 J	<170 UJ	730	280	590 J	2000 J
INDENO(1,2,3-CD)PYRENE	193-39-5	NLL	NLL	ID	20,000	NLL	ID	80,000	<170 U	<170 U	<170 UJ	300	<170 U	220	390 J
NAPHTHALENE (SVOC)	91-20-3S	35,000	730	2E+08	1.6E+07	100,000	8.8E+07	5.2E+07	<170 U	<170 U	<170 U	<170 U	<170 U	<170 U	<170 U
PHENANTHRENE	85-01-8	56,000	2,100	6,700,000	1,600,000	160,000	2,900,000	5,200,000	<170 U	<170 U	<170 U	160 J	360	220	1200
PYRENE	129-00-0	480,000	ID	6.7E+09	2.9E+07	480,000	2.9E+09	8.4E+07	<170 UJ	130 J	<170 U	680	160 J	560	1700 J
Organics - VOCs															
									--	--	--	--	--	--	--
Asbestos															
									--	--	--	--	--	--	--

Note: Analytical and Criteria Footnotes are included on the last page of the table.

DETAILED FINDINGS REPORT
LAKE LINDEN RECREATION AREA

TABLE 7-1
Sample Analytical Summary - Soil
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Soil Table Footnotes:

- MDEQ Part 201 residential and non-residential generic cleanup criteria and screening levels criteria were originally promulgated December 21, 2002 within the Administrative Rules for Part 201, Environmental Remediation, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. This table reflects revisions to the criteria pursuant to the December 2010 Part 201 amendments and new criteria consistent with the provisions of R299.5706a.Remediation, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. Release Date: December 30, 2013.
- Only detected analytes are listed - Gray rows indicate requested analyses. If no analytes are listed below a gray row then all analytes of that group were either not analyzed or not detected. ND indicates that one or more analyte of that goup was tested and not detected and a -- indicates not analyzed.
- **Bold** values are concentrations detected above the laboratory reporting limit.
- **Shaded values indicate analyte concentration exceed applicable criteria. Color presented is the criteria with the highest value that was exceeded:**

Residential Drinking Water Protection Criteria
Groundwater Surface Water Interface Protection Criteria
Residential Particulate Soil Inhalation Criteria
Residential Direct Contact Criteria
Nonresidential Drinking Water Protection Criteria
Nonresidential Particulate Soil Inhalation Criteria
Nonresidential Direct Contact Criteria

-- = Not analyzed/Not Reported
bgs = Below ground surface
ft = Feet
in = Inches
mg/kg = Milligrams per kilogram.
PCBs = Polychlorinated biphenyls
SVOC = Semi-volatile organic compound
ug/kg = Micrograms per kilogram
VOC = Volatile organic compound

Criteria Footnotes

- ID = Insufficient data to develop criterion.
- NA = A criterion or value is not available
- NLL = Hazardous substance is not likely to leach under most soil conditions.
- NLV = Hazardous substance is not likely to volatilize under most conditions.
- (B) = Background, as defined in R 299.1(b), may be substituted if higher than the calculated cleanup criterion. Background levels may be less than criteria for some inorganic compounds.
- (BB) = The state drinking water standard for asbestos (fibers greater than 10 micrometers in length) is in units of a million fibers per liter of water (MFL). Soil concentrations of asbestos are determined by polarized light microscopy.
- (C) = The criterion developed under R 299.20 to R 299.26 exceeds the chemical- specific soil saturation screening level (Csat). The person proposing or implementing response activity shall document whether additional response activity is required to control free-phase liquids or NAPL to protect against risks associated with free-phase liquids by using methods appropriate for the free-phase liquids present. Development of a site-specific Csat or methods presented in R 299.22, R 299.24(5), and R 299.26(8) may be conducted for the relevant exposure pathways.
- (D) = Calculated criterion exceeds 100 percent, hence it is reduced to 100 percent or 1.0E+9 parts per billion (ppb).
- (DD) = Hazardous substance causes developmental effects. Residential direct contact criteria are protective of both prenatal and postnatal exposure. Nonresidential direct contact criteria are protective for a pregnant adult receptor.
- (G) = Groundwater surface water interface (GSI) criterion depends on the pH or water hardness, or both, of the receiving surface water. The final chronic value (FCV) for the protection of aquatic life shall be calculated based on the pH or hardness of the receiving surface water. Where water hardness exceeds 400 mg CaCO3/L, use 400 mg CaCO3/L for the FCV calculation. The FCV formula provides values in units of ug/L or ppb. The generic GSI criterion is the lesser of the calculated FCV, the wildlife value (WV), and the surface water human non-drinking water value (HNDV). The soil GSI protection criteria for these hazardous substances are the greater of the 20 times the GSI criterion or the GSI soil-water partition values using the GSI criteria developed with the procedure described in this footnote. A spreadsheet that may be used to calculate GSI and GSI protection criteria for (G)-footnoted hazardous substances is available on the Department of Environmental Quality (DEQ) internet web site.
- (H) = Valence-specific chromium data (Cr III and Cr VI) shall be compared to the corresponding valence-specific cleanup criteria. If both Cr III and Cr VI are present in groundwater, the total concentration of both cannot exceed the drinking water criterion of 100 ug/L. If analytical data are provided for total chromium only, they shall be compared to the cleanup criteria for Cr VI. Cr III soil cleanup criterion for protection
- (I) = Hazardous substance may exhibit the characteristic of ignitability as defined in 40 C.F.R. §261.21 (revised as of July 1, 2001), which is adopted by reference in these rules and is available for inspection at the DEQ, 525 West Allegan Street, Lansing, Michigan. Copies of the regulation may be purchased, at a cost as of the time of adoption of these rules of \$45, from the Superintendent of documents, Government Printing Office, Washington, DC 20401 (stock number 869-044-00155-1), or from the DEQ, Remediation and Redevelopment Division (RRD), 525 West Allegan Street, Lansing, Michigan 48933, at cost.
- (J) = Hazardous substance may be present in several isomer forms. Isomer-specific concentrations shall be added together for comparison to criteria.
- (M) = Calculated criterion is below the analytical target detection limit, therefore, the criterion defaults to the target detection limit.
- (P) = Amenable cyanide methods or method OIA-1677 shall be used to quantify cyanide concentrations for compliance with all groundwater criteria. Total cyanide methods or method OIA-1677 shall be used to quantify cyanide concentrations for compliance with soil criteria. Nonresidential direct contact criteria may not be protective of the potential for release of hydrogen cyanide gas. Additional land or resource use restrictions may be necessary to protect for the acute inhalation concerns associated with hydrogen cyanide gas.
- (Q) = Criteria for carcinogenic polycyclic aromatic hydrocarbons were developed using relative potential potencies to benzo(a)pyrene.
- (R) = Hazardous substance may exhibit the characteristic of reactivity as defined in 40 C.F.R. §261.23 (revised as of July 1, 2001), which is adopted by reference in these rules and is available for inspection at the DEQ, 525 West Allegan Street, Lansing, Michigan. Copies of the regulation may be purchased, at a cost as of the time of adoption of these rules of \$45, from the Superintendent of Documents, Government Printing Office, Washington, DC 20401 (stock number 869-044-00155-1), or from the DEQ, RRD, 525 West Allegan Street, Lansing, Michigan 48933, at cost.
- (T) = Refer to the federal Toxic Substances Control Act (TSCA), 40 C.F.R. §761, Subpart D and 40 C.F.R. §761, Subpart G, to determine the applicability of TSCA cleanup standards. Subpart D and Subpart G of 40 C.F.R. §761 (July 1, 2001) are adopted by reference in these rules and are available for inspection at the DEQ, 525 West Allegan Street, Lansing, Michigan. Copies of the regulations may be purchased, at a cost as of the time of adoption of these rules of \$55, from the Superintendent of Documents, Government Printing Office, Washington, DC 20401, or from the DEQ, RRD, 525 West Allegan Street, Lansing, Michigan 48933, at cost. Alternatives to compliance with the TSCA standards listed below are possible under 40 C.F.R. §761 Subpart D. New releases may be subject to the standards identified in 40 C.F.R. §761, Subpart G. Use Part 201 soil direct contact cleanup criteria in the published table if TSCA standards are not applicable.
- (X) = The GSI criterion shown in the generic cleanup criteria tables is not protective for surface water that is used as a drinking water source. (See R 299.49 Footnotes for generic cleanup criteria tables for additional information.)
- (Z) = Mercury is typically measured as total mercury. The generic cleanup criteria, however, are based on data for different species of mercury. Specifically, data for elemental mercury, chemical abstract service (CAS) number 7439976, serve as the basis for the soil volatilization to indoor air criteria, groundwater volatilization to indoor air, and soil inhalation criteria. Data for methyl mercury, CAS number 22967926, serve as the basis for the GSI criterion; and data for mercuric chloride, CAS number 7487947, serve as the basis for the drinking water, groundwater contact, soil direct contact, and the groundwater protection criteria. Comparison to criteria shall be based on species-specific analytical data only if sufficient facility characterization has been conducted to rule out the presence of other species of mercury.

Laboratory Footnotes

J = Estimated result
ND = Not detected
U = Analyte analyzed for but not detected above the reported sample reporting limit.

TABLE 7-2
Sample Analytical Summary - Groundwater
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

DETAILED FINDINGS REPORT
LAKE LINDEN RECREATION AREA

Station Name	CAS Number	Residential Drinking Water Criteria	Nonresidential Drinking Water Criteria	Groundwater Surface Water Interface Criteria	Residential Groundwater Volatilization to Indoor Air Inhalation Criteria	Nonresidential Groundwater Volatilization to Indoor Air Inhalation Criteria	Water Solubility	Flammability and Explosivity Screening Level	CHLL-GW04	CHLL-GW08	CHLL-GW09	CHLL-GW10	CHLL-GW11	CHLL-GW35	CHLL-GW38	CHLL-GW42
Field Sample ID									CHLL-GW 04 28-33'	CHLL-GW 08 12'-17'	CHLL-GW 09 12'-17'	CHLL-GW 10 12'-17'	CHLL-GW 11 10'-15'	CHLL-GW 35 6'-11'	CHLL-GW 38 10'-15'	CHLL-GW-42 7-12'
Sample Date									6/16/2014	6/14/2014	6/14/2014	6/14/2014	6/14/2014	6/14/2014	6/14/2014	8/20/2014
Sample Interval (bgs)									28 - 33 ft	12 - 17 ft	12 - 17 ft	12 - 17 ft	10 - 15 ft	6 - 11 ft	10 - 15 ft	7 - 12 ft
Sample Description									--	--	--	--	--	--	--	--
Inorganics - Metals (ug/l)																
ALUMINIUM	7429-90-5	50 (V)	50 (V)	NA	NLV	NLV	NA	ID	23000	1800	1300	420	920	140000	4700	--
ANTIMONY	7440-36-0	6.0 (A)	6.0 (A)	2.0 (M,X)	NLV	NLV	NA	ID	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<10 U	<1.0 U	--
ARSENIC	7440-38-2	10 (A)	10 (A)	10	NLV	NLV	NA	ID	9.7	3.0	19	<1.0 U	3.0	150	1.5	--
BARIUM	7440-39-3	2,000 (A)	2,000 (A)	200 (G)	NLV	NLV	NA	ID	290	180	1400	380	210	3200	400	--
BERYLLIUM	7440-41-7	4.0 (A)	4.0 (A)	0.36 (G)	NLV	NLV	NA	ID	2.0	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<10 U	<1.0 U	--
BORON	7440-42-8	500 (F)	500 (F)	4,000 (X)	NLV	NLV	NA	ID	--	--	--	--	--	--	--	--
CADMIUM	7440-43-9	5.0 (A)	5.0 (A)	1.3 (G,X)	NLV	NLV	NA	ID	0.2	<0.2 U	0.3	<0.2 U	<0.2 U	6.8	<0.2 U	--
CALCIUM	7440-70-2	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
CHROMIUM	7440-47-3	100 (A,H)	100 (A,H)	40 (G,H,X)	NLV	NLV	NA	ID	89	3.7	3.8	<1.0 U	1.5	270	24	--
COBALT	7440-48-4	40	100	100	NLV	NLV	NA	ID	33	<5.0 U	<5.0 U	<5.0 U	<5.0 U	130	<5.0 U	--
COPPER	7440-50-8	1,000 (E)	1,000 (E)	4.7 (G)	NLV	NLV	NA	ID	2300	690	1100	11	13	37000	2400	--
IRON	7439-89-6	300 (E)	300 (E)	NA	NLV	NLV	NA	ID	27000	6800	3500	2000	14000	180000	16000	--
LEAD	7439-92-1	4.0 (L)	4.0 (L)	11 (G,X)	NLV	NLV	NA	ID	6.5	7.6	18	<1.0 U	<1.0 U	180	1.2	--
MAGNESIUM	7439-95-4	400,000	1,100,000	NA	NLV	NLV	NA	ID	--	--	--	--	--	--	--	--
MANGANESE	7439-96-5	50 (E)	50 (E)	1,000 (G,X)	NLV	NLV	NA	ID	830	320	820	570	750	10000	770	--
MERCURY	7439-97-6	2.0 (A)	2.0 (A)	0.0013	56 (S)	56 (S)	56	ID	0.6	<0.2 U	<0.2 U	<0.2 U	<0.2 U	7.1	<0.2 U	--
NICKEL	7440-02-0	100 (A)	100 (A)	28 (G)	NLV	NLV	NA	ID	120	9.4	12	9.4	8.8	450	17	--
POTASSIUM	7440-09-7	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
SELENIUM	7782-49-2	50 (A)	50 (A)	5	NLV	NLV	NA	ID	2.8	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<10 U	<1.0 U	--
SILVER	7440-22-4	34	98	0.2 (M)	NLV	NLV	NA	ID	23	0.6	7.4	<0.2 U	<0.2 U	33	2.1	--
SODIUM	7440-23-5	230, 000 (HH)	350,000	NA	NLV	NLV	NA	ID	--	--	--	--	--	--	--	--
STRONTIUM	7440-24-6	4,600	13,000	21,000	NLV	NLV	NA	ID	--	--	--	--	--	--	--	--
TITANIUM METAL POWDER	7440-32-6	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
VANADIUM	7440-62-2	4.5	62	27	NLV	NLV	NA	ID	--	--	--	--	--	--	--	--
ZINC	7440-66-6	2,400	5,000 (E)	63 (G)	NLV	NLV	NA	ID	420	35	85	5.2	50	920	23	--
Inorganics - Cyanide (ug/l)																
									--	--	--	--	--	--	--	ND
Organics - PCBs (ug/l)																
									ND	ND	ND	ND	ND	ND	ND	ND
Organics - SVOCs (ug/l)																
ACENAPHTHENE	83-32-9	1,300	3,800	38	4,200 (S)	4,200 (S)	4,240	ID	<1.0 U	--	<1.0 U	<1.0 UJ	<1.0 UJ	<1.0 U	<1.0 UJ	--
BIS[2-ETHYLHEXYL]PHTHALATE	117-81-7	6.0 (A)	6.0 (A)	25	NLV	NLV	340	NA	--	--	--	--	--	--	--	--
NAPHTHALENE (SVOC)	91-20-3S	520	1,500	11	31,000 (S)	31,000 (S)	31,000	NA	<1.0 UJ	--	<1.0 UJ	<1.0 UJ	<1.0 UJ	<1.0 UJ	<1.0 UJ	--
PHENANTHRENE	85-01-8	52	150	2.0 (M)	1,000 (S)	1,000 (S)	1,000	ID	<1.0 U	--	<1.0 U	<1.0 UJ	<1.0 UJ	<1.0 U	<1.0 UJ	--

DETAILED FINDINGS REPORT
LAKE LINDEN RECREATION AREA

TABLE 7-2
Sample Analytical Summary - Groundwater
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Station Name	CAS Number	Residential Drinking Water Criteria	Nonresidential Drinking Water Criteria	Groundwater Surface Water Interface Criteria	Residential Groundwater Volatilization to Indoor Air Inhalation Criteria	Nonresidential Groundwater Volatilization to Indoor Air Inhalation Criteria	Water Solubility	Flammability and Explosivity Screening Level	CHLL-GW04	CHLL-GW08	CHLL-GW09	CHLL-GW10	CHLL-GW11	CHLL-GW35	CHLL-GW38	CHLL-GW42
Field Sample ID									CHLL-GW 04 28-33'	CHLL-GW 08 12'-17'	CHLL-GW 09 12'-17'	CHLL-GW 10 12'-17'	CHLL-GW 11 10'-15'	CHLL-GW 35 6'-11'	CHLL-GW 38 10'-15'	CHLL-GW-42 7-12'
Sample Date									6/16/2014	6/14/2014	6/14/2014	6/14/2014	6/14/2014	6/14/2014	6/14/2014	8/20/2014
Sample Interval (bgs)									28 - 33 ft	12 - 17 ft	12 - 17 ft	12 - 17 ft	10 - 15 ft	6 - 11 ft	10 - 15 ft	7 - 12 ft
Sample Description									--	--	--	--	--	--	--	--
Organics - VOCs (ug/l)																
1,2,3-TRIMETHYLBENZENE	526-73-8	NA	NA	NA	NA	NA	NA	NA	<1.0 UJ	--	<1.0 UJ	<1.0 UJ	<1.0 UJ	<1.0 UJ	1.1 J	--
1,2,4-TRIMETHYLBENZENE	95-63-6	63 (E,I)	63 (E,I)	17 (I)	56,000 (I,S)	56,000 (I,S)	55,890 (I)	56,000 (I,S)	<1.0 UJ	--	<1.0 UJ	<1.0 UJ	<1.0 UJ	<1.0 UJ	1.9 J	--
1,4-DICHLOROBENZENE	106-46-7	75 (A)	75 (A)	17	16,000	74,000 (S)	73,800	NA	<1.0 UJ	--	<1.0 UJ	<1.0 UJ	<1.0 UJ	<1.0 UJ	<1.0 UJ	--
BENZENE	71-43-2	5.0 (A,I)	5.0 (A,I)	12 (I,X)	5,600 (I)	35,000 (I)	1,750,000 (I)	68,000 (I)	<1.0 UJ	--	<1.0 UJ	<1.0 UJ	<1.0 UJ	<1.0 UJ	100 J	--
CHLOROBENZENE	108-90-7	100 (A,I)	100 (A,I)	25 (I)	210,000 (I)	470,000 (I,S)	472,000 (I)	160,000 (I)	<1.0 UJ	--	<1.0 UJ	<1.0 UJ	<1.0 UJ	<1.0 UJ	<1.0 UJ	--
CHLOROETHANE	75-00-3	430	1,700	170 (X)	5,700,000 (S)	5,700,000 (S)	5,740,000	110,000	<5.0 UJ	--	<5.0 UJ	<5.0 UJ	<5.0 UJ	<5.0 UJ	<5.0 UJ	--
CHLOROMETHANE	74-87-3	260 (I)	1,100 (I)	ID	8,600 (I)	45,000 (I)	6,340,000 (I)	36,000 (I)	<5.0 UJ	--	<5.0 UJ	<5.0 UJ	<5.0 UJ	26 J	<5.0 UJ	--
CYCLOHEXANE	110-82-7	NA	NA	NA	NA	NA	NA	NA	<5.0 UJ	--	<5.0 UJ	<5.0 UJ	<5.0 UJ	<5.0 UJ	8.1 J	--
ETHYLBENZENE	100-41-4	74 (E,I)	74 (E,I)	18 (I)	110,000 (I)	170,000 (I,S)	169,000 (I)	43,000 (I)	<1.0 UJ	--	<1.0 UJ	<1.0 UJ	<1.0 UJ	<1.0 UJ	7.4 J	--
M,P-XYLENE	1330-20-7	NA	NA	NA	NA	NA	NA	NA	<2.0 UJ	--	<2.0 UJ	<2.0 UJ	<2.0 UJ	<2.0 UJ	7.9 J	--
O-XYLENE	95-47-6	NA	NA	NA	NA	NA	NA	NA	<1.0 UJ	--	<1.0 UJ	<1.0 UJ	<1.0 UJ	<1.0 UJ	1.5 J	--
TOLUENE	108-88-3	790 (E,I)	790 (E,I)	270 (I)	530,000 (I,S)	530,000 (I,S)	526,000 (I)	61,000 (I)	<1.0 UJ	--	<1.0 UJ	<1.0 UJ	<1.0 UJ	<1.0 UJ	2.8 J	--
XYLENE - TOTAL	1330-20-7 95-47-6	280 (E,I)	280 (E,I)	41 (I)	190,000 (I,S)	190,000 (I,S)	186,000 (I)	70,000 (I)	ND	--	ND	ND	ND	ND	9.4 J	--
Other (mg/l)																
AMMONIA	7664-41-7	10 (N)	10 (N)	(CC)	3,200	7,100	530,000	ID	--	--	--	--	--	--	--	--
COD	COD	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
NITROGEN	7727-37-9	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
TOC	7440-44-0	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
TOTAL KJELDAHL NITROGEN	TKN	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
TOTAL PHOSPHORUS	7723-14-0	63	240	1 (EE)	NLV	NLV	NA	ID	--	--	--	--	--	--	--	--
Field Measurements																
Conductivity (mS/cm)	NA	NA	NA	NA	NA	NA	NA	NA	--	0.61	0.433	0.64	0.468	0.392	0.89	0.6
DO (%)	NA	NA	NA	NA	NA	NA	NA	NA	--	0.9	7.5	3.6	15.6	62.3	95	3.0
pH	NA	NA	NA	NA	NA	NA	NA	NA	--	7.04	7.5	7.02	6.63	7.33	7.32	7.52
Temperature (°C)	NA	NA	NA	NA	NA	NA	NA	NA	--	8.0	7.0	8.6	9.2	9.7	12.2	14.7

Note: Analytical and Criteria Footnotes
are included on the last page of the table.

TABLE 7-2
Sample Analytical Summary - Groundwater
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

DETAILED FINDINGS REPORT
LAKE LINDEN RECREATION AREA

Station Name	CAS Number	Residential Drinking Water Criteria	Nonresidential Drinking Water Criteria	Groundwater Surface Water Interface Criteria	Residential Groundwater Volatilization to Indoor Air Inhalation Criteria	Nonresidential Groundwater Volatilization to Indoor Air Inhalation Criteria	Water Solubility	Flammability and Explosivity Screening Level	CHLL-GW43	CHLL-GW44		CHLL-GW45	CHLL-GW46	CHLL-GW47	CHLL-GW48	CHLL-GW49
Field Sample ID									CHLL-GW-43 8-13	CHLL-GW-44 7-12	CHLL-GW-44 7-12 DUP	CHLL-GW-45 9-14'	CHLL-GW-46 10-15	CHLL-GW-47 6-11'	CHLL-GW-48 8-13	CHLL-GW-49 8-13'
Sample Date									8/20/2014	8/20/2014	8/20/2014	8/20/2014	8/20/2014	8/20/2014	8/20/2014	8/21/2014
Sample Interval (bgs)									8 - 13 ft	7 - 12 ft	7 - 12 ft	9 - 14 ft	10 - 15 ft	6 - 11 ft	8 - 13 ft	8 - 13 ft
Sample Description									--	--	Field Duplicate	--	--	--	--	--
Inorganics - Metals (ug/l)																
ALUMINUM	7429-90-5	50 (V)	50 (V)	NA	NLV	NLV	NA	ID	--	--	--	--	--	--	--	--
ANTIMONY	7440-36-0	6.0 (A)	6.0 (A)	2.0 (M,X)	NLV	NLV	NA	ID	--	--	--	--	--	--	--	--
ARSENIC	7440-38-2	10 (A)	10 (A)	10	NLV	NLV	NA	ID	--	--	--	--	--	--	--	--
BARIUM	7440-39-3	2,000 (A)	2,000 (A)	200 (G)	NLV	NLV	NA	ID	--	--	--	--	--	--	--	--
BERYLLIUM	7440-41-7	4.0 (A)	4.0 (A)	0.36 (G)	NLV	NLV	NA	ID	--	--	--	--	--	--	--	--
BORON	7440-42-8	500 (F)	500 (F)	4,000 (X)	NLV	NLV	NA	ID	--	--	--	--	--	--	--	--
CADMIUM	7440-43-9	5.0 (A)	5.0 (A)	1.3 (G,X)	NLV	NLV	NA	ID	--	--	--	--	--	--	--	--
CALCIUM	7440-70-2	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
CHROMIUM	7440-47-3	100 (A,H)	100 (A,H)	40 (G,H,X)	NLV	NLV	NA	ID	--	--	--	--	--	--	--	--
COBALT	7440-48-4	40	100	100	NLV	NLV	NA	ID	--	--	--	--	--	--	--	--
COPPER	7440-50-8	1,000 (E)	1,000 (E)	4.7 (G)	NLV	NLV	NA	ID	--	--	--	--	--	--	--	--
IRON	7439-89-6	300 (E)	300 (E)	NA	NLV	NLV	NA	ID	--	--	--	--	--	--	--	--
LEAD	7439-92-1	4.0 (L)	4.0 (L)	11 (G,X)	NLV	NLV	NA	ID	--	--	--	--	--	--	--	--
MAGNESIUM	7439-95-4	400,000	1,100,000	NA	NLV	NLV	NA	ID	--	--	--	--	--	--	--	--
MANGANESE	7439-96-5	50 (E)	50 (E)	1,000 (G,X)	NLV	NLV	NA	ID	--	--	--	--	--	--	--	--
MERCURY	7439-97-6	2.0 (A)	2.0 (A)	0.0013	56 (S)	56 (S)	56	ID	--	--	--	--	--	--	--	--
NICKEL	7440-02-0	100 (A)	100 (A)	28 (G)	NLV	NLV	NA	ID	--	--	--	--	--	--	--	--
POTASSIUM	7440-09-7	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
SELENIUM	7782-49-2	50 (A)	50 (A)	5	NLV	NLV	NA	ID	--	--	--	--	--	--	--	--
SILVER	7440-22-4	34	98	0.2 (M)	NLV	NLV	NA	ID	--	--	--	--	--	--	--	--
SODIUM	7440-23-5	230, 000 (HH)	350,000	NA	NLV	NLV	NA	ID	--	--	--	--	--	--	--	--
STRONTIUM	7440-24-6	4,600	13,000	21,000	NLV	NLV	NA	ID	--	--	--	--	--	--	--	--
TITANIUM METAL POWDER	7440-32-6	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
VANADIUM	7440-62-2	4.5	62	27	NLV	NLV	NA	ID	--	--	--	--	--	--	--	--
ZINC	7440-66-6	2,400	5,000 (E)	63 (G)	NLV	NLV	NA	ID	--	--	--	--	--	--	--	--
Inorganics - Cyanide (ug/l)																
									ND	ND	ND	ND	ND	ND	ND	ND
Organics - PCBs (ug/l)																
									ND	ND	ND	ND	ND	ND	ND	ND
Organics - SVOCs (ug/l)																
ACENAPHTHENE	83-32-9	1,300	3,800	38	4,200 (S)	4,200 (S)	4,240	ID	--	--	--	--	--	--	--	--
BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	6.0 (A)	6.0 (A)	25	NLV	NLV	340	NA	--	--	--	--	--	--	--	--
NAPHTHALENE (SVOC)	91-20-3S	520	1,500	11	31,000 (S)	31,000 (S)	31,000	NA	--	--	--	--	--	--	--	--
PHENANTHRENE	85-01-8	52	150	2.0 (M)	1,000 (S)	1,000 (S)	1,000	ID	--	--	--	--	--	--	--	--

DETAILED FINDINGS REPORT
LAKE LINDEN RECREATION AREA

TABLE 7-2
Sample Analytical Summary - Groundwater
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Station Name	CAS Number	Residential Drinking Water Criteria	Nonresidential Drinking Water Criteria	Groundwater Surface Water Interface Criteria	Residential Groundwater Volatilization to Indoor Air Inhalation Criteria	Nonresidential Groundwater Volatilization to Indoor Air Inhalation Criteria	Water Solubility	Flammability and Explosivity Screening Level	CHLL-GW43	CHLL-GW44		CHLL-GW45	CHLL-GW46	CHLL-GW47	CHLL-GW48	CHLL-GW49
Field Sample ID									CHLL-GW-43 8-13	CHLL-GW-44 7-12	CHLL-GW-44 7-12 DUP	CHLL-GW-45 9-14'	CHLL-GW-46 10-15	CHLL-GW-47 6-11'	CHLL-GW-48 8-13	CHLL-GW-49 8-13'
Sample Date									8/20/2014	8/20/2014	8/20/2014	8/20/2014	8/20/2014	8/20/2014	8/20/2014	8/21/2014
Sample Interval (bgs)									8 - 13 ft	7 - 12 ft	7 - 12 ft	9 - 14 ft	10 - 15 ft	6 - 11 ft	8 - 13 ft	8 - 13 ft
Sample Description									--	--	Field Duplicate	--	--	--	--	--
Organics - VOCs (ug/l)																
1,2,3-TRIMETHYLBENZENE	526-73-8	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
1,2,4-TRIMETHYLBENZENE	95-63-6	63 (E,I)	63 (E,I)	17 (I)	56,000 (I,S)	56,000 (I,S)	55,890 (I)	56,000 (I,S)	--	--	--	--	--	--	--	--
1,4-DICHLOROBENZENE	106-46-7	75 (A)	75 (A)	17	16,000	74,000 (S)	73,800	NA	--	--	--	--	--	--	--	--
BENZENE	71-43-2	5.0 (A,I)	5.0 (A,I)	12 (I,X)	5,600 (I)	35,000 (I)	1,750,000 (I)	68,000 (I)	--	--	--	--	--	--	--	--
CHLOROBENZENE	108-90-7	100 (A,I)	100 (A,I)	25 (I)	210,000 (I)	470,000 (I,S)	472,000 (I)	160,000 (I)	--	--	--	--	--	--	--	--
CHLOROETHANE	75-00-3	430	1,700	170 (X)	5,700,000 (S)	5,700,000 (S)	5,740,000	110,000	--	--	--	--	--	--	--	--
CHLOROMETHANE	74-87-3	260 (I)	1,100 (I)	ID	8,600 (I)	45,000 (I)	6,340,000 (I)	36,000 (I)	--	--	--	--	--	--	--	--
CYCLOHEXANE	110-82-7	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
ETHYLBENZENE	100-41-4	74 (E,I)	74 (E,I)	18 (I)	110,000 (I)	170,000 (I,S)	169,000 (I)	43,000 (I)	--	--	--	--	--	--	--	--
M,P-XYLENE	1330-20-7	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
O-XYLENE	95-47-6	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
TOLUENE	108-88-3	790 (E,I)	790 (E,I)	270 (I)	530,000 (I,S)	530,000 (I,S)	526,000 (I)	61,000 (I)	--	--	--	--	--	--	--	--
XYLENE - TOTAL	1330-20-7 95-47-6	280 (E,I)	280 (E,I)	41 (I)	190,000 (I,S)	190,000 (I,S)	186,000 (I)	70,000 (I)	--	--	--	--	--	--	--	--
Other (mg/l)																
AMMONIA	7664-41-7	10 (N)	10 (N)	(CC)	3,200	7,100	530,000	ID	--	--	--	--	--	--	--	--
COD	COD	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
NITROGEN	7727-37-9	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
TOC	7440-44-0	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
TOTAL KJELDAHL NITROGEN	TKN	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
TOTAL PHOSPHORUS	7723-14-0	63	240	1 (EE)	NLV	NLV	NA	ID	--	--	--	--	--	--	--	--
Field Measurements																
Conductivity (mS/cm)	NA	NA	NA	NA	NA	NA	NA	NA	0.58	0.56	--	0.69	0.74	0.57	0.425	0.433
DO (%)	NA	NA	NA	NA	NA	NA	NA	NA	2.7	2.2	--	42	59.5	4.5	54.1	1.0
pH	NA	NA	NA	NA	NA	NA	NA	NA	7.6	7.52	--	8.4	8.19	7.37	7.09	7.43
Temperature (°C)	NA	NA	NA	NA	NA	NA	NA	NA	13.8	15.7	--	16.7	18	15.2	15.6	13.2

Note: Analytical and Criteria Footnotes
are included on the last page of the table.

DETAILED FINDINGS REPORT
LAKE LINDEN RECREATION AREA

TABLE 7-2
Sample Analytical Summary - Groundwater
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Station Name	CAS Number	Residential Drinking Water Criteria	Nonresidential Drinking Water Criteria	Groundwater Surface Water Interface Criteria	Residential Groundwater Volatilization to Indoor Air Inhalation Criteria	Nonresidential Groundwater Volatilization to Indoor Air Inhalation Criteria	Water Solubility	Flammability and Explosivity Screening Level	CHLL-GW50	CHLL-GW51	CHLL-GW52	CHLL-GW53	CHLL-GW54	CHLL-GW55	CHLL-GW56
Field Sample ID									CHLL-GW-50 8-13'	CHLL-GW-51 8-13	CHLL-GW-52 9-14	CHLL-GW-53 8-13	CHLL-GW-54 10-15	CHLL-GW-55 9-14	CHLL-GW-56 9-14
Sample Date									8/21/2014	8/20/2014	8/20/2014	8/20/2014	8/20/2014	8/20/2014	8/20/2014
Sample Interval (bgs)									8 - 13 ft	8 - 13 ft	9 - 14 ft	8 - 13 ft	10 - 15 ft	9 - 14 ft	9 - 14 ft
Sample Description									--	--	--	--	--	--	--
Inorganics - Metals (ug/l)															
ALUMINUM	7429-90-5	50 (V)	50 (V)	NA	NLV	NLV	NA	ID	--	--	--	--	--	--	--
ANTIMONY	7440-36-0	6.0 (A)	6.0 (A)	2.0 (M,X)	NLV	NLV	NA	ID	--	--	--	--	--	--	--
ARSENIC	7440-38-2	10 (A)	10 (A)	10	NLV	NLV	NA	ID	--	--	--	--	--	--	--
BARIUM	7440-39-3	2,000 (A)	2,000 (A)	200 (G)	NLV	NLV	NA	ID	--	--	--	--	--	--	--
BERYLLIUM	7440-41-7	4.0 (A)	4.0 (A)	0.36 (G)	NLV	NLV	NA	ID	--	--	--	--	--	--	--
BORON	7440-42-8	500 (F)	500 (F)	4,000 (X)	NLV	NLV	NA	ID	--	--	--	--	--	--	--
CADMIUM	7440-43-9	5.0 (A)	5.0 (A)	1.3 (G,X)	NLV	NLV	NA	ID	--	--	--	--	--	--	--
CALCIUM	7440-70-2	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--
CHROMIUM	7440-47-3	100 (A,H)	100 (A,H)	40 (G,H,X)	NLV	NLV	NA	ID	--	--	--	--	--	--	--
COBALT	7440-48-4	40	100	100	NLV	NLV	NA	ID	--	--	--	--	--	--	--
COPPER	7440-50-8	1,000 (E)	1,000 (E)	4.7 (G)	NLV	NLV	NA	ID	--	--	--	--	--	--	--
IRON	7439-89-6	300 (E)	300 (E)	NA	NLV	NLV	NA	ID	--	--	--	--	--	--	--
LEAD	7439-92-1	4.0 (L)	4.0 (L)	11 (G,X)	NLV	NLV	NA	ID	--	--	--	--	--	--	--
MAGNESIUM	7439-95-4	400,000	1,100,000	NA	NLV	NLV	NA	ID	--	--	--	--	--	--	--
MANGANESE	7439-96-5	50 (E)	50 (E)	1,000 (G,X)	NLV	NLV	NA	ID	--	--	--	--	--	--	--
MERCURY	7439-97-6	2.0 (A)	2.0 (A)	0.0013	56 (S)	56 (S)	56	ID	--	--	--	--	--	--	--
NICKEL	7440-02-0	100 (A)	100 (A)	28 (G)	NLV	NLV	NA	ID	--	--	--	--	--	--	--
POTASSIUM	7440-09-7	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--
SELENIUM	7782-49-2	50 (A)	50 (A)	5	NLV	NLV	NA	ID	--	--	--	--	--	--	--
SILVER	7440-22-4	34	98	0.2 (M)	NLV	NLV	NA	ID	--	--	--	--	--	--	--
SODIUM	7440-23-5	230, 000 (HH)	350,000	NA	NLV	NLV	NA	ID	--	--	--	--	--	--	--
STRONTIUM	7440-24-6	4,600	13,000	21,000	NLV	NLV	NA	ID	--	--	--	--	--	--	--
TITANIUM METAL POWDER	7440-32-6	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--
VANADIUM	7440-62-2	4.5	62	27	NLV	NLV	NA	ID	--	--	--	--	--	--	--
ZINC	7440-66-6	2,400	5,000 (E)	63 (G)	NLV	NLV	NA	ID	--	--	--	--	--	--	--
Inorganics - Cyanide (ug/l)															
									ND	ND	ND	ND	ND	ND	ND
Organics - PCBs (ug/l)															
									ND	ND	ND	ND	ND	ND	ND
Organics - SVOCs (ug/l)															
ACENAPHTHENE	83-32-9	1,300	3,800	38	4,200 (S)	4,200 (S)	4,240	ID	--	--	--	--	<1.0 U	<1.0 U	<1.0 U
BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	6.0 (A)	6.0 (A)	25	NLV	NLV	340	NA	--	--	--	--	--	--	--
NAPHTHALENE (SVOC)	91-20-3S	520	1,500	11	31,000 (S)	31,000 (S)	31,000	NA	--	--	--	--	<1.0 U	<1.0 U	<1.0 U
PHENANTHRENE	85-01-8	52	150	2.0 (M)	1,000 (S)	1,000 (S)	1,000	ID	--	--	--	--	<1.0 U	<1.0 U	<1.0 U

TABLE 7-2
Sample Analytical Summary - Groundwater
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

DETAILED FINDINGS REPORT
LAKE LINDEN RECREATION AREA

Station Name	CAS Number	Residential Drinking Water Criteria	Nonresidential Drinking Water Criteria	Groundwater Surface Water Interface Criteria	Residential Groundwater Volatilization to Indoor Air Inhalation Criteria	Nonresidential Groundwater Volatilization to Indoor Air Inhalation Criteria	Water Solubility	Flammability and Explosivity Screening Level	CHLL-GW50	CHLL-GW51	CHLL-GW52	CHLL-GW53	CHLL-GW54	CHLL-GW55	CHLL-GW56
Field Sample ID									CHLL-GW-50 8-13'	CHLL-GW-51 8-13	CHLL-GW-52 9-14	CHLL-GW-53 8-13	CHLL-GW-54 10-15	CHLL-GW-55 9-14	CHLL-GW-56 9-14
Sample Date									8/21/2014	8/20/2014	8/20/2014	8/20/2014	8/20/2014	8/20/2014	8/20/2014
Sample Interval (bgs)									8 - 13 ft	8 - 13 ft	9 - 14 ft	8 - 13 ft	10 - 15 ft	9 - 14 ft	9 - 14 ft
Sample Description									--	--	--	--	--	--	--
Organics - VOCs (ug/l)															
1,2,3-TRIMETHYLBENZENE	526-73-8	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--
1,2,4-TRIMETHYLBENZENE	95-63-6	63 (E,I)	63 (E,I)	17 (I)	56,000 (I,S)	56,000 (I,S)	55,890 (I)	56,000 (I,S)	--	--	--	--	--	--	--
1,4-DICHLOROBENZENE	106-46-7	75 (A)	75 (A)	17	16,000	74,000 (S)	73,800	NA	--	--	--	--	--	--	--
BENZENE	71-43-2	5.0 (A,I)	5.0 (A,I)	12 (I,X)	5,600 (I)	35,000 (I)	1,750,000 (I)	68,000 (I)	--	--	--	--	--	--	--
CHLOROBENZENE	108-90-7	100 (A,I)	100 (A,I)	25 (I)	210,000 (I)	470,000 (I,S)	472,000 (I)	160,000 (I)	--	--	--	--	--	--	--
CHLOROETHANE	75-00-3	430	1,700	170 (X)	5,700,000 (S)	5,700,000 (S)	5,740,000	110,000	--	--	--	--	--	--	--
CHLOROMETHANE	74-87-3	260 (I)	1,100 (I)	ID	8,600 (I)	45,000 (I)	6,340,000 (I)	36,000 (I)	--	--	--	--	--	--	--
CYCLOHEXANE	110-82-7	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--
ETHYLBENZENE	100-41-4	74 (E,I)	74 (E,I)	18 (I)	110,000 (I)	170,000 (I,S)	169,000 (I)	43,000 (I)	--	--	--	--	--	--	--
M,P-XYLENE	1330-20-7	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--
O-XYLENE	95-47-6	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--
TOLUENE	108-88-3	790 (E,I)	790 (E,I)	270 (I)	530,000 (I,S)	530,000 (I,S)	526,000 (I)	61,000 (I)	--	--	--	--	--	--	--
XYLENE - TOTAL	1330-20-7 95-47-6	280 (E,I)	280 (E,I)	41 (I)	190,000 (I,S)	190,000 (I,S)	186,000 (I)	70,000 (I)	--	--	--	--	--	--	--
Other (mg/l)															
AMMONIA	7664-41-7	10 (N)	10 (N)	(CC)	3,200	7,100	530,000	ID	--	--	--	--	--	--	--
COD	COD	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--
NITROGEN	7727-37-9	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--
TOC	7440-44-0	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--
TOTAL KJELDAHL NITROGEN	TKN	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--
TOTAL PHOSPHORUS	7723-14-0	63	240	1 (EE)	NLV	NLV	NA	ID	--	--	--	--	--	--	--
Field Measurements															
Conductivity (mS/cm)	NA	NA	NA	NA	NA	NA	NA	NA	0.33	0.404	0.418	0.408	0.94	1.42	0.98
DO (%)	NA	NA	NA	NA	NA	NA	NA	NA	1.3	2.2	3.8	2.8	61	2.3	3.4
pH	NA	NA	NA	NA	NA	NA	NA	NA	7.4	7.43	7.63	8.13	7.09	8.1	8.05
Temperature (°C)	NA	NA	NA	NA	NA	NA	NA	NA	15.1	11.9	13.2	14.2	13.8	12	12.5

Note: Analytical and Criteria Footnotes
are included on the last page of the table.

TABLE 7-2
Sample Analytical Summary - Groundwater
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

DETAILED FINDINGS REPORT
LAKE LINDEN RECREATION AREA

Station Name	CAS Number	Residential Drinking Water Criteria	Nonresidential Drinking Water Criteria	Groundwater Surface Water Interface Criteria	Residential Groundwater Volatilization to Indoor Air Inhalation Criteria	Nonresidential Groundwater Volatilization to Indoor Air Inhalation Criteria	Water Solubility	Flammability and Explosivity Screening Level	CHLL-GW76		CHLL-GW77	CHLL-GW78	LL ML2	MW-04	MW-05	
Field Sample ID									CHLL-GW76-10'-15'	CHLL-GW76-10'-15' DUP	CHLL-GW77-10'-15'	CHLL-GW78-10'-15'	LLML2-30'bg\$	MW-04	MW-05	MW-05D
Sample Date									8/19/2015	8/19/2015	8/19/2015	8/19/2015	10/13/2011	10/11/2011	10/11/2011	10/11/2011
Sample Interval (bgs)									10 - 15 ft	10 - 15 ft	10 - 15 ft	10 - 15 ft	0 - 0 ft	4.54 - 9.54 ft	2.9 - 7.9 ft	2.9 - 7.9 ft
Sample Description									--	Field Duplicate	--	--	--	--	--	Field Duplicate
Inorganics - Metals (ug/l)																
ALUMINIUM	7429-90-5	50 (V)	50 (V)	NA	NLV	NLV	NA	ID	--	--	--	--	500	541	78.4 J	46.4 J
ANTIMONY	7440-36-0	6.0 (A)	6.0 (A)	2.0 (M,X)	NLV	NLV	NA	ID	--	--	--	--	<1 U	<60 U	<60 U	<60 U
ARSENIC	7440-38-2	10 (A)	10 (A)	10	NLV	NLV	NA	ID	--	--	--	--	51	15.3	6 J	5.3 J
BARIUM	7440-39-3	2,000 (A)	2,000 (A)	200 (G)	NLV	NLV	NA	ID	--	--	--	--	1100	1580 J	738 J	742 J
BERYLLIUM	7440-41-7	4.0 (A)	4.0 (A)	0.36 (G)	NLV	NLV	NA	ID	--	--	--	--	<1 U	<5 U	<5 U	<5 U
BORON	7440-42-8	500 (F)	500 (F)	4,000 (X)	NLV	NLV	NA	ID	--	--	--	--	320	--	--	--
CADMIUM	7440-43-9	5.0 (A)	5.0 (A)	1.3 (G,X)	NLV	NLV	NA	ID	--	--	--	--	<0.2 U	0.4 J	0.33 J	0.31 J
CALCIUM	7440-70-2	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	103000 J	96500 J	96900 J
CHROMIUM	7440-47-3	100 (A,H)	100 (A,H)	40 (G,H,X)	NLV	NLV	NA	ID	--	--	--	--	1.3	<10 U	<10 U	<10 U
COBALT	7440-48-4	40	100	100	NLV	NLV	NA	ID	--	--	--	--	<15 U	<50 U	<50 U	<50 U
COPPER	7440-50-8	1,000 (E)	1,000 (E)	4.7 (G)	NLV	NLV	NA	ID	--	--	--	--	71	415	614	457
IRON	7439-89-6	300 (E)	300 (E)	NA	NLV	NLV	NA	ID	--	--	--	--	12000	5350	985	880
LEAD	7439-92-1	4.0 (L)	4.0 (L)	11 (G,X)	NLV	NLV	NA	ID	--	--	--	--	3.1	51.3	60.8	32
MAGNESIUM	7439-95-4	400,000	1,100,000	NA	NLV	NLV	NA	ID	--	--	--	--	--	7650 J	5650 J+	5660 J+
MANGANESE	7439-96-5	50 (E)	50 (E)	1,000 (G,X)	NLV	NLV	NA	ID	--	--	--	--	1700	624 J	167 J	163 J
MERCURY	7439-97-6	2.0 (A)	2.0 (A)	0.0013	56 (S)	56 (S)	56	ID	--	--	--	--	<0.2 U	<0.2 U	<0.2 U	0.22
NICKEL	7440-02-0	100 (A)	100 (A)	28 (G)	NLV	NLV	NA	ID	--	--	--	--	2.8	2.3 J	3.4 J	2.3 J
POTASSIUM	7440-09-7	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	<5000 U	<5000 U	<5000 U
SELENIUM	7782-49-2	50 (A)	50 (A)	5	NLV	NLV	NA	ID	--	--	--	--	<1 U	<35 U	<35 U	<35 U
SILVER	7440-22-4	34	98	0.2 (M)	NLV	NLV	NA	ID	--	--	--	--	<0.2 U	<10 U	<10 U	<10 U
SODIUM	7440-23-5	230, 000 (HH)	350,000	NA	NLV	NLV	NA	ID	--	--	--	--	--	22300 J+	8220 J+	7490 J+
STRONTIUM	7440-24-6	4,600	13,000	21,000	NLV	NLV	NA	ID	--	--	--	--	340	--	--	--
TITANIUM METAL POWDER	7440-32-6	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	130	--	--	--
VANADIUM	7440-62-2	4.5	62	27	NLV	NLV	NA	ID	--	--	--	--	2.1	<50 U	<50 U	<50 U
ZINC	7440-66-6	2,400	5,000 (E)	63 (G)	NLV	NLV	NA	ID	--	--	--	--	<10 U	<60 U	<60 U	<60 U
Inorganics - Cyanide (ug/l)																
									--	--	--	--	--	ND	ND	ND
Organics - PCBs (ug/l)																
									ND	ND	ND	ND	--	ND	ND	ND
Organics - SVOCs (ug/l)																
ACENAPHTHENE	83-32-9	1,300	3,800	38	4,200 (S)	4,200 (S)	4,240	ID	<1.0 U	<1.0 U	<1.0 U	<1.0 U	--	0.88 J	<5 U	<5 U
BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	6.0 (A)	6.0 (A)	25	NLV	NLV	340	NA	--	--	--	--	--	<5 U	<5 U	<5 U
NAPHTHALENE (SVOC)	91-20-35	520	1,500	11	31,000 (S)	31,000 (S)	31,000	NA	<1.0 U	<1.0 U	<1.0 U	<1.0 U	--	1 J	<5 U	<5 U
PHENANTHRENE	85-01-8	52	150	2.0 (M)	1,000 (S)	1,000 (S)	1,000	ID	<1.0 U	<1.0 U	<1.0 U	<1.0 U	--	<5 U	0.47 J	<5 U

TABLE 7-2
Sample Analytical Summary - Groundwater
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Station Name	CAS Number	Residential Drinking Water Criteria	Nonresidential Drinking Water Criteria	Groundwater Surface Water Interface Criteria	Residential Groundwater Volatilization to Indoor Air Inhalation Criteria	Nonresidential Groundwater Volatilization to Indoor Air Inhalation Criteria	Water Solubility	Flammability and Explosivity Screening Level	CHLL-GW76		CHLL-GW77	CHLL-GW78	LL ML2	MW-04	MW-05	
Field Sample ID									CHLL-GW76-10'-15'	CHLL-GW76-10'-15' DUP	CHLL-GW77-10'-15'	CHLL-GW78-10'-15'	LLML2-30'bgs	MW-04	MW-05	MW-05D
Sample Date									8/19/2015	8/19/2015	8/19/2015	8/19/2015	10/13/2011	10/11/2011	10/11/2011	10/11/2011
Sample Interval (bgs)									10 - 15 ft	10 - 15 ft	10 - 15 ft	10 - 15 ft	0 - 0 ft	4.54 - 9.54 ft	2.9 - 7.9 ft	2.9 - 7.9 ft
Sample Description									--	Field Duplicate	--	--	--	--	--	Field Duplicate
Organics - VOCs (ug/l)																
1,2,3-TRIMETHYLBENZENE	526-73-8	NA	NA	NA	NA	NA	NA	NA	<1.0 U	<1.0 U	<1.0 U	<1.0 U	--	--	--	--
1,2,4-TRIMETHYLBENZENE	95-63-6	63 (E,I)	63 (E,I)	17 (I)	56,000 (I,S)	56,000 (I,S)	55,890 (I)	56,000 (I,S)	<1.0 U	<1.0 U	1.5	<1.0 U	--	--	--	--
1,4-DICHLOROBENZENE	106-46-7	75 (A)	75 (A)	17	16,000	74,000 (S)	73,800	NA	<1.0 U	<1.0 U	<1.0 U	<1.0 U	--	0.44 J	0.4 J	0.14 J
BENZENE	71-43-2	5.0 (A,I)	5.0 (A,I)	12 (I,X)	5,600 (I)	35,000 (I)	1,750,000 (I)	68,000 (I)	4.4	4.8	31	8.1	--	<5 U	<5 U	<5 U
CHLOROBENZENE	108-90-7	100 (A,I)	100 (A,I)	25 (I)	210,000 (I)	470,000 (I,S)	472,000 (I)	160,000 (I)	<1.0 U	<1.0 U	<1.0 U	<1.0 U	--	<5 U	0.21 J	<5 U
CHLOROETHANE	75-00-3	430	1,700	170 (X)	5,700,000 (S)	5,700,000 (S)	5,740,000	110,000	<5.0 U	<5.0 U	<5.0 U	<5.0 U	--	<5 U	<5 U	<5 U
CHLOROMETHANE	74-87-3	260 (I)	1,100 (I)	ID	8,600 (I)	45,000 (I)	6,340,000 (I)	36,000 (I)	<5.0 U	<5.0 U	<5.0 U	<5.0 U	--	<5 U	<5 U	<5 U
CYCLOHEXANE	110-82-7	NA	NA	NA	NA	NA	NA	NA	<5.0 U	<5.0 U	<5.0 U	<5.0 U	--	<5 U	<5 U	<5 U
ETHYLBENZENE	100-41-4	74 (E,I)	74 (E,I)	18 (I)	110,000 (I)	170,000 (I,S)	169,000 (I)	43,000 (I)	<1.0 U	<1.0 U	<1.0 U	<1.0 U	--	<5 U	<5 U	<5 U
M,P-XYLENE	1330-20-7	NA	NA	NA	NA	NA	NA	NA	<2.0 U	<2.0 U	5.5	<2.0 U	--	0.13 J	<5 U	<5 U
O-XYLENE	95-47-6	NA	NA	NA	NA	NA	NA	NA	<1.0 U	<1.0 U	<1.0 U	<1.0 U	--	0.18 J	<5 U	<5 U
TOLUENE	108-88-3	790 (E,I)	790 (E,I)	270 (I)	530,000 (I,S)	530,000 (I,S)	526,000 (I)	61,000 (I)	<1.0 U	<1.0 U	1.1	<1.0 U	--	<5 U	<5 U	<5 U
XYLENE - TOTAL	1330-20-7 95-47-6	280 (E,I)	280 (E,I)	41 (I)	190,000 (I,S)	190,000 (I,S)	186,000 (I)	70,000 (I)	ND	ND	5.5	ND	--	0.31	ND	ND
Other (mg/l)																
AMMONIA	7664-41-7	10 (N)	10 (N)	(CC)	3,200	7,100	530,000	ID	--	--	--	--	0.87	--	0.18	--
COD	COD	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	12	--	6.1	--
NITROGEN	7727-37-9	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	0.1	--	0.1	--
TOC	7440-44-0	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	5.1	--	3.1	--
TOTAL KJELDAHL NITROGEN	TKN	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	2.32	--	0.5	--
TOTAL PHOSPHORUS	7723-14-0	63	240	1 (EE)	NLV	NLV	NA	ID	--	--	--	--	0.087	--	0.063	--
Field Measurements																
Conductivity (mS/cm)	NA	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
DO (%)	NA	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
pH	NA	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
Temperature (°C)	NA	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--

Note: Analytical and Criteria Footnotes
are included on the last page of the table.

DETAILED FINDINGS REPORT
LAKE LINDEN RECREATION AREA

TABLE 7-2
Sample Analytical Summary - Groundwater
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Station Name	CAS Number	Residential Drinking Water Criteria	Nonresidential Drinking Water Criteria	Groundwater Surface Water Interface Criteria	Residential Groundwater Volatilization to Indoor Air Inhalation Criteria	Nonresidential Groundwater Volatilization to Indoor Air Inhalation Criteria	Water Solubility	Flammability and Explosivity Screening Level	MW-06	MW-07	MW-08	MW-09	MW-12
Field Sample ID									MW-06	MW-07	MW-08	MW-09	MW 12
Sample Date									10/11/2011	10/11/2011	10/12/2011	10/12/2011	10/13/2011
Sample Interval (bgs)									2.47 - 7.47 ft	2.28 - 7.28 ft	7.34 - 12.34 ft	12.23 - 17.23 ft	7.73 - 12.73 ft
Sample Description									--	--	--	--	--
Inorganics - Metals (ug/l)													
ALUMINUM	7429-90-5	50 (V)	50 (V)	NA	NLV	NLV	NA	ID	69.4 J	9020	384	1970	8500
ANTIMONY	7440-36-0	6.0 (A)	6.0 (A)	2.0 (M,X)	NLV	NLV	NA	ID	<60 U	7.5 J	<60 U	<60 U	1.1
ARSENIC	7440-38-2	10 (A)	10 (A)	10	NLV	NLV	NA	ID	6.4 J	136	2.5 J	<10 U	220
BARIUM	7440-39-3	2,000 (A)	2,000 (A)	200 (G)	NLV	NLV	NA	ID	778 J	587 J	<200 UJ	257 J	26000
BERYLLIUM	7440-41-7	4.0 (A)	4.0 (A)	0.36 (G)	NLV	NLV	NA	ID	<5 U	1.5 J	<5 U	<5 U	<1 U
BORON	7440-42-8	500 (F)	500 (F)	4,000 (X)	NLV	NLV	NA	ID	--	--	--	--	140
CADMIUM	7440-43-9	5.0 (A)	5.0 (A)	1.3 (G,X)	NLV	NLV	NA	ID	0.16 J	3.7 J	0.18 J	0.15 J	<0.2 U
CALCIUM	7440-70-2	NA	NA	NA	NA	NA	NA	NA	104000 J	159000 J	80200 J	50700 J	--
CHROMIUM	7440-47-3	100 (A,H)	100 (A,H)	40 (G,H,X)	NLV	NLV	NA	ID	<10 U	46.1 J+	<10 U	<10 U	9.2
COBALT	7440-48-4	40	100	100	NLV	NLV	NA	ID	<50 U	10.7 J	<50 U	1.4 J	<15 U
COPPER	7440-50-8	1,000 (E)	1,000 (E)	4.7 (G)	NLV	NLV	NA	ID	210	24700	480	71.7	1200
IRON	7439-89-6	300 (E)	300 (E)	NA	NLV	NLV	NA	ID	<100 U	22900	2500	1800	4000
LEAD	7439-92-1	4.0 (L)	4.0 (L)	11 (G,X)	NLV	NLV	NA	ID	3.2 J	282	21.9	2.7 J	310
MAGNESIUM	7439-95-4	400,000	1,100,000	NA	NLV	NLV	NA	ID	<5000 UJ	15400 J	8140 J	27400 J	--
MANGANESE	7439-96-5	50 (E)	50 (E)	1,000 (G,X)	NLV	NLV	NA	ID	104 J	744 J	470 J	369 J	290
MERCURY	7439-97-6	2.0 (A)	2.0 (A)	0.0013	56 (S)	56 (S)	56	ID	<0.2 U	0.7	0.19 J	<0.2 U	<0.2 U
NICKEL	7440-02-0	100 (A)	100 (A)	28 (G)	NLV	NLV	NA	ID	1.4 J	65.1	16.2 J	5.4 J	15
POTASSIUM	7440-09-7	NA	NA	NA	NA	NA	NA	NA	<5000 U	6700	5890	17600	--
SELENIUM	7782-49-2	50 (A)	50 (A)	5	NLV	NLV	NA	ID	<35 U	<35 U	<35 U	<35 U	<1 U
SILVER	7440-22-4	34	98	0.2 (M)	NLV	NLV	NA	ID	1.1 J	75.4	<10 U	<10 U	1.1
SODIUM	7440-23-5	230, 000 (HH)	350,000	NA	NLV	NLV	NA	ID	<5000 U	37800 J+	16100 J+	75600	--
STRONTIUM	7440-24-6	4,600	13,000	21,000	NLV	NLV	NA	ID	--	--	--	--	800
TITANIUM METAL POWDER	7440-32-6	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	190
VANADIUM	7440-62-2	4.5	62	27	NLV	NLV	NA	ID	<50 U	<50 U	<50 U	<50 U	29
ZINC	7440-66-6	2,400	5,000 (E)	63 (G)	NLV	NLV	NA	ID	<60 U	404	<60 U	<60 U	57
Inorganics - Cyanide (ug/l)													
									ND	ND	ND	ND	--
Organics - PCBs (ug/l)													
									ND	ND	ND	ND	--
Organics - SVOCs (ug/l)													
ACENAPHTHENE	83-32-9	1,300	3,800	38	4,200 (S)	4,200 (S)	4,240	ID	<5 U	<5 U	<5 U	<5 U	--
BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	6.0 (A)	6.0 (A)	25	NLV	NLV	340	NA	<5 U	<5 U	<5 U	3.1 J	--
NAPHTHALENE (SVOC)	91-20-3S	520	1,500	11	31,000 (S)	31,000 (S)	31,000	NA	<5 U	<5 U	<5 U	<5 U	--
PHENANTHRENE	85-01-8	52	150	2.0 (M)	1,000 (S)	1,000 (S)	1,000	ID	<5 U	<5 UJ	<5 U	<5 U	--

DETAILED FINDINGS REPORT
LAKE LINDEN RECREATION AREA

TABLE 7-2
Sample Analytical Summary - Groundwater
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Station Name	CAS Number	Residential Drinking Water Criteria	Nonresidential Drinking Water Criteria	Groundwater Surface Water Interface Criteria	Residential Groundwater Volatilization to Indoor Air Inhalation Criteria	Nonresidential Groundwater Volatilization to Indoor Air Inhalation Criteria	Water Solubility	Flammability and Explosivity Screening Level	MW-06	MW-07	MW-08	MW-09	MW-12
Field Sample ID									MW-06	MW-07	MW-08	MW-09	MW 12
Sample Date									10/11/2011	10/11/2011	10/12/2011	10/12/2011	10/13/2011
Sample Interval (bgs)									2.47 - 7.47 ft	2.28 - 7.28 ft	7.34 - 12.34 ft	12.23 - 17.23 ft	7.73 - 12.73 ft
Sample Description									--	--	--	--	--
Organics - VOCs (ug/l)													
1,2,3-TRIMETHYLBENZENE	526-73-8	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--
1,2,4-TRIMETHYLBENZENE	95-63-6	63 (E,I)	63 (E,I)	17 (I)	56,000 (I,S)	56,000 (I,S)	55,890 (I)	56,000 (I,S)	--	--	--	--	--
1,4-DICHLOROBENZENE	106-46-7	75 (A)	75 (A)	17	16,000	74,000 (S)	73,800	NA	<5 U	<5 U	<5 U	<5 U	--
BENZENE	71-43-2	5.0 (A,I)	5.0 (A,I)	12 (I,X)	5,600 (I)	35,000 (I)	1,750,000 (I)	68,000 (I)	<5 U	<5 U	<5 U	<5 U	--
CHLOROBENZENE	108-90-7	100 (A,I)	100 (A,I)	25 (I)	210,000 (I)	470,000 (I,S)	472,000 (I)	160,000 (I)	<5 U	<5 U	<5 U	<5 U	--
CHLOROETHANE	75-00-3	430	1,700	170 (X)	5,700,000 (S)	5,700,000 (S)	5,740,000	110,000	<5 U	0.48 J	<5 U	<5 U	--
CHLOROMETHANE	74-87-3	260 (I)	1,100 (I)	ID	8,600 (I)	45,000 (I)	6,340,000 (I)	36,000 (I)	<5 U	<5 U	<5 U	<5 U	--
CYCLOHEXANE	110-82-7	NA	NA	NA	NA	NA	NA	NA	<5 U	<5 U	<5 U	<5 U	--
ETHYLBENZENE	100-41-4	74 (E,I)	74 (E,I)	18 (I)	110,000 (I)	170,000 (I,S)	169,000 (I)	43,000 (I)	<5 U	<5 U	<5 U	<5 U	--
M,P-XYLENE	1330-20-7	NA	NA	NA	NA	NA	NA	NA	<5 U	<5 U	<5 U	<5 U	--
O-XYLENE	95-47-6	NA	NA	NA	NA	NA	NA	NA	<5 U	<5 U	<5 U	<5 U	--
TOLUENE	108-88-3	790 (E,I)	790 (E,I)	270 (I)	530,000 (I,S)	530,000 (I,S)	526,000 (I)	61,000 (I)	<5 U	<5 U	<5 U	<5 U	--
XYLENE - TOTAL	1330-20-7 95-47-6	280 (E,I)	280 (E,I)	41 (I)	190,000 (I,S)	190,000 (I,S)	186,000 (I)	70,000 (I)	ND	ND	ND	ND	--
Other (mg/l)													
AMMONIA	7664-41-7	10 (N)	10 (N)	(CC)	3,200	7,100	530,000	ID	--	--	23	28	28
COD	COD	NA	NA	NA	NA	NA	NA	NA	--	--	15	15	14
NITROGEN	7727-37-9	NA	NA	NA	NA	NA	NA	NA	--	--	0.1	2.9	1.8
TOC	7440-44-0	NA	NA	NA	NA	NA	NA	NA	--	--	6.7	6	5.5
TOTAL KJELDAHL NITROGEN	TKN	NA	NA	NA	NA	NA	NA	NA	--	--	24	32	27
TOTAL PHOSPHORUS	7723-14-0	63	240	1 (EE)	NLV	NLV	NA	ID	--	--	0.29	0.14	0.44
Field Measurements													
Conductivity (mS/cm)	NA	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--
DO (%)	NA	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--
pH	NA	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--
Temperature (°C)	NA	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--

Note: Analytical and Criteria Footnotes
are included on the last page of the table.

DETAILED FINDINGS REPORT
LAKE LINDEN RECREATION AREA

TABLE 7-2
Sample Analytical Summary - Groundwater
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Groundwater Table Footnotes:

- MDEQ Part 201 residential and non-residential generic cleanup criteria and screening levels criteria were originally promulgated December 21, 2002 within the Administrative Rules for Part 201, Environmental Remediation, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. This table reflects revisions to the criteria pursuant to the December 2010 Part 201 amendments and new criteria consistent with the provisions of R299.5706a.Remediation, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. Release Date: December 30, 2013.

- Only detected analytes are listed - Gray rows indicate requested analyses. If no analytes are listed below a gray row then all analytes of that group were either not analyzed or not detected. ND indicates that one or more analyte of that group was tested and not detected and a – indicates not analyzed.

- Bold values are concentrations detected above the reporting limit.

- Shaded values indicate analyte concentration exceed applicable criteria. Color presented is the criteria below with the highest value that was exceeded:

Residential Drinking Water Criteria
Nonresidential Drinking Water Criteria
Groundwater Surface Water Interface Criteria
Residential Groundwater Volatilization to Indoor Air Inhalation Criteria
Nonresidential Groundwater Volatilization to Indoor Air Inhalation Criteria
Water Solubility
Flammability and Explosivity Screening Level

-- = Not analyzed/Not reported

bgs = Below ground surface

DO = Dissolved oxygen

ft = Feet

in = Inches

mg/L = Milligrams per liter

PCBs = Polychlorinated biphenyls

SVOC = Semi-volatile organic compound

ug/l = Micrograms per liter

VOC = Volatile organic compound

°C = Degrees Celsius

mS/cm = MilliSiemens per centimeter

% = Percent

Groundwater Table Footnotes:

ID = Insufficient data to develop criterion.

NA = A criterion or value is not available

NLL = Hazardous substance is not likely to leach under most soil conditions.

NLV = Hazardous substance is not likely to volatilize under most conditions.

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

(BB) = The state drinking water standard for asbestos (fibers greater than 10 micrometers in length) is in units of a million fibers per liter of water (MFL). Soil concentrations of asbestos are determined by polarized light microscopy.

(D) = Calculated criterion exceeds 100 percent, hence it is reduced to 100 percent or 1.0E+9 parts per billion (ppb).

(E) = Criterion is the aesthetic drinking water value, as required by Section 20120a(5) of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA). A notice of aesthetic impact may be employed as an institutional control mechanism if groundwater concentrations exceed the aesthetic drinking water criterion, but do not exceed the applicable health-based drinking water value provided in a table available on the Department of Environmental Quality (DEQ) internet web site. (See R 299.49 Footnotes for generic cleanup criteria tables for additional information)

(G) = Groundwater surface water interface (GSI) criterion depends on the pH or water hardness, or both, of the receiving surface water. The final chronic value (FCV) for the protection of aquatic life shall be calculated based on the pH or hardness of the receiving surface water. Where water hardness exceeds 400 mg CaCO3/L, use 400 mg CaCO3/L for the FCV calculation. The FCV formula provides values in units of ug/L or ppb. The generic GSI criterion is the lesser of the calculated FCV, the wildlife value (WV), and the surface water human non-drinking water value (HNDV). The soil GSI protection criteria for these hazardous substances are the greater of the 20 times the GSI criterion or the GSI soil-water partition values using the GSI criteria developed with the procedure described in this footnote. A spreadsheet that may be used to calculate GSI and GSI protection criteria for (G)-footnoted hazardous substances is available on the Department of Environmental Quality (DEQ) internet web site.

(H) = Valence-specific chromium data (Cr III and Cr VI) shall be compared to the corresponding valence-specific cleanup criteria. If both Cr III and Cr VI are present in groundwater, the total concentration of both cannot exceed the drinking water criterion of 100 ug/L. If analytical data are provided for total chromium only, they shall be compared to the cleanup criteria for Cr VI. Cr III soil cleanu

(HH) = The residential criterion for sodium is 230,000 ug/l in accordance with the Sodium Advisory Council recommendation and revised Groundwater Discharge Standards.

(I) = Hazardous substance may exhibit the characteristic of ignitability as defined in 40 C.F.R. §261.21 (revised as of July 1, 2001), which is adopted by reference in these rules and is available for inspection at the DEQ, 525 West Allegan Street, Lansing, Michigan. Copies of the regulation may be purchased, at a cost as of the time of adoption of these rules of \$45, from the Superintendent of documents, Government Printing Office, Washington, DC 20401 (stock number 869-044-00155-1), or from the DEQ, Remediation and Redevelopment Division (RRD), 525 West Allegan Street, Lansing, Michigan 48933, at cost.

(J) = Hazardous substance may be present in several isomer forms. Isomer-specific concentrations shall be added together for comparison to criteria.

(L) = Criteria for lead are derived using a biologically based model, as allowed for under Section 20120a(9) of the NREPA, and are not calculated using the algorithms and assumptions specified in pathway-specific rules. The generic residential drinking water criterion of 4 ug/L is linked to the generic residential soil direct contact criterion of 400 mg/kg. A higher concentration in the drinking water, up to the state action level of 15 ug/L, may be allowed as a site-specific remedy and still allow for drinking water use, under Section 20120a(2) and 20120b of the NREPA if soil concentrations are appropriately lower than 400 mg/kg. If a site-specific criterion is approved based on this subdivision, a notice shall be filed on the deed for all property where the groundwater concentrations will exceed 4 ug/L to provide notice of the potential for unacceptable risk if soil or groundwater concentrations increase. Acceptable combinations of site-specific soil and drinking water concentrations are presented in a table available on the Department of Environmental Quality (DEQ) internet web site (See R 299.49 Footnotes for generic cleanup criteria tables for additional information).

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

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

(P) = Amenable cyanide methods or method OIA-1677 shall be used to quantify cyanide concentrations for compliance with all groundwater criteria. Total cyanide methods or method OIA-1677 shall be used to quantify cyanide concentrations for compliance with soil criteria. Nonresidential direct contact criteria may not be protective of the potential for release of hydrogen cyanide gas. Additional land or resource use restrictions may be necessary to protect for the acute inhalation concerns associated with hydrogen cyanide gas.

(Q) = Criteria for carcinogenic polycyclic aromatic hydrocarbons were developed using relative potential potencies to benzo(a)pyrene.

(R) = Hazardous substance may exhibit the characteristic of reactivity as defined in 40 C.F.R. §261.23 (revised as of July 1, 2001), which is adopted by reference in these rules and is available for inspection at the DEQ, 525 West Allegan Street, Lansing, Michigan. Copies of the regulation may be purchased, at a cost as of the time of adoption of these rules of \$45, from the Superintendent of Documents, Government Printing Office, Washington, DC 20401 (stock number 869-044-00155-1), or from the DEQ, RRD, 525 West Allegan Street, Lansing, Michigan 48933, at cost.

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

(T) = Refer to the federal Toxic Substances Control Act (TSCA), 40 C.F.R. §761, Subpart D and 40 C.F.R. §761, Subpart G, to determine the applicability of TSCA cleanup standards. Subpart D and Subpart G of 40 C.F.R. §761 (July 1, 2001) are adopted by reference in these rules and are available for inspection at the DEQ, 525 West Allegan Street, Lansing, Michigan. Copies of the regulations may be purchased, at a cost as of the time of adoption of these rules of \$55, from the Superintendent of Documents, Government Printing Office, Washington, DC 20401, or from the DEQ, RRD, 525 West Allegan Street, Lansing, Michigan 48933, at cost. Alternatives to compliance with the TSCA standards listed below are possible under 40 C.F.R. §761 Subpart D. New releases may be subject to the standards identified in 40 C.F.R. §761, Subpart G. Use Part 201 soil direct contact cleanup criteria in the published table if TSCA standards are not applicable.

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

(X) = The GSI criterion shown in the generic cleanup criteria tables is not protective for surface water that is used as a drinking water source. (See R 299.49 Footnotes for generic cleanup criteria tables for additional information.)

(Z) = Mercury is typically measured as total mercury. The generic cleanup criteria, however, are based on data for different species of mercury. Specifically, data for elemental mercury, chemical abstract service (CAS) number 7439976, serve as the basis for the soil volatilization to indoor air criteria, groundwater volatilization to indoor air, and soil inhalation criteria. Data for methyl mercury, CAS number 22967926, serve as the basis for the GSI criterion; and data for mercuric chloride, CAS number 7487947, serve as the basis for the drinking water, groundwater contact, soil direct contact, and the groundwater protection criteria. Comparison to criteria shall be based on species-specific analytical data only if sufficient facility characterization has been conducted to rule out the presence of other species of mercury.

Laboratory Footnotes:

ND = Not detected

J = Estimated result

U = Analyte analyzed for but not detected above the reported sample reporting limit.

DETAILED FINDINGS REPORT
LAKE LINDEN RECREATION AREA

TABLE 7-3
Sample Analytical Summary - Sediment
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Station Name	CAS Number	EPA Region 5 Ecological Screening Level (ESL)	Threshold Effect Concentration (TEC)	Probable Effect Concentration (PEC)	CHLL-SD12		CHLL-SD13			CHLL-SD14			CHLL-SD15	
Field Sample ID					CHLL-SD 12-0"-6"	CHLL-SD 12-1'-2.5'	CHLL-SD13-0"-6"	CHLL-SD 13-1'-2'	CHLL-SD 13-1'-2' dup	CHLL-SD-14-0"-6"	CHLL-SD-14-1'-3'	CHLL-SD-14-3'-4'	CHLL-SD 15-0-6"	CHLL-SD 15-1'-2.7'
Sample Date					6/15/2014	6/15/2014	6/15/2014	6/15/2014	6/15/2014	7/11/2014	7/11/2014	7/11/2014	6/16/2014	6/16/2014
Sample Interval (bgs)					0 - 0.5 ft	1 - 2.5 ft	0 - 0.5 ft	1 - 2 ft	1 - 2 ft	0 - 0.5 ft	1 - 3 ft	3 - 4 ft	0 - 0.5 ft	1 - 2.7 ft
Sample Description					SAND, Fine to medium grained, Reddish brown	SAND, Fine to medium grained, Reddish brown	SAND, Fine to medium grained, Reddish brown	SAND, Fine to medium grained, Reddish brown	Field Duplicate	SILT, Dark brown	SILT, Reddish brown	SILT, Reddish brown	SILT, Reddish brown	SAND, Silty, Fine grained, Reddish brown
Inorganics - Metals (mg/kg)														
ALUMINUM	7429-90-5	NA	NA	NA	--	--	7700	--	--	15000	--	--	--	--
ANTIMONY	7440-36-0	NA	NA	NA	--	--	<0.6 U	--	--	15	--	--	--	--
ARSENIC	7440-38-2	9.79	9.79	33.0	--	--	1.9	--	--	16	--	--	--	--
BARIUM	7440-39-3	NA	NA	NA	--	--	26	--	--	2300 J	--	--	--	--
BERYLLIUM	7440-41-7	NA	NA	NA	--	--	0.8	--	--	1.3	--	--	--	--
CADMIUM	7440-43-9	0.99	0.99	4.98	--	--	<0.2 U	--	--	3.6	--	--	--	--
CALCIUM	7440-70-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
CHROMIUM	7440-47-3	43.4	43.4	111	--	--	19	--	--	42	--	--	--	--
COBALT	7440-48-4	50	NA	NA	--	--	8.8	--	--	19	--	--	--	--
COPPER	7440-50-8	31.6	31.6	149	--	--	550	--	--	9800	--	--	--	--
IRON	7439-89-6	NA	NA	NA	--	--	14000	--	--	31000	--	--	--	--
LEAD	7439-92-1	35.8	35.8	128	--	--	4.3	--	--	2200	--	--	--	--
LITHIUM	7439-93-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
MAGNESIUM	7439-95-4	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
MANGANESE	7439-96-5	NA	NA	NA	--	--	270 J	--	--	420	--	--	--	--
MERCURY	7439-97-6	0.174	0.18	1.06	--	--	<0.07 U	--	--	0.3	--	--	--	--
NICKEL	7440-02-0	22.7	22.7	48.6	--	--	25	--	--	52	--	--	--	--
SELENIUM	7782-49-2	NA	NA	NA	--	--	<0.4 U	--	--	1.6	--	--	--	--
SILVER	7440-22-4	0.5	NA	NA	--	--	1.7	--	--	26	--	--	--	--
SODIUM	7440-23-5	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
VANADIUM	7440-62-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
ZINC	7440-66-6	121	121	459	--	--	61	--	--	430	--	--	--	--
Inorganics - Cyanide (mg/kg)														
					--	--	ND	--	--	ND	--	--	--	--
Organics - PCBs (ug/kg)														
AROCLOR-1242	53469-21-9	NA	NA	NA	<140 U	<130 U	<140 U	<130 U	<130 U	340 J	<300 U	<290 U	<240 UJ	<210 U
AROCLOR-1248	12672-29-6	NA	NA	NA	<140 U	<130 U	<140 U	<130 U	<130 U	<340 UJ	<300 U	<290 U	230 J	<210 U
AROCLOR-1254	11097-69-1	NA	NA	NA	<140 U	<130 U	<140 U	<130 U	<130 U	390 J	<300 U	<290 U	270 J	<180 U
AROCLOR-1262	37324-23-5	NA	NA	NA	<140 U	<130 U	<140 U	<130 U	<130 U	<230 UJ	<300 U	<290 U	<170 UJ	290
TOTAL PCBs	TPCB	59.8	59.8	676	ND	ND	ND	ND	ND	730 J	ND	ND	500 J	290
Organics - SVOCs (ug/kg)														
ACETOPHENONE	98-86-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
FLUORANTHENE	206-44-0	423	423	2,230	--	--	<280 UJ	--	--	<1100 U	--	--	--	--
PYRENE	129-00-0	195	195	1,520	--	--	<280 UJ	--	--	<1100 U	--	--	--	--
Organics - VOCs (ug/kg)														
					--	--	--	--	--	--	--	--	--	--
DRO/ORO (ug/kg)														
Diesel Range Organics (C10-C20)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--
Oil Range Organics (C20-C34)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--

Note: Analytical and Criteria Footnotes
are included on the last page of the table.

DETAILED FINDINGS REPORT
LAKE LINDEN RECREATION AREA

TABLE 7-3
Sample Analytical Summary - Sediment
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Station Name	CAS Number	EPA Region 5 Ecological Screening Level (ESL)	Threshold Effect Concentration (TEC)	Probable Effect Concentration (PEC)	CHLL-SD16				CHLL-SD17			CHLL-SD18	
Field Sample ID					CHLL-SD-16-0"-6"	CHLL-SD-16-1'-3'	CHLL-SD-16-3'-4'	CHLL-SD-16-3'-4' DUP	CHLL-SD 17-0"-6"	CHLL-SD 17-1'-3'	CHLL-SD 17-3'-5'	CHLL-SD 18-0"-6"	CHLL-SD 18-1'-2.7'
Sample Date					7/11/2014	7/11/2014	7/11/2014	7/11/2014	7/12/2014	7/12/2014	7/12/2014	7/12/2014	7/12/2014
Sample Interval (bgs)					0 - 0.5 ft	1 - 3 ft	3 - 4 ft	3 - 4 ft	0 - 0.5 ft	1 - 3 ft	3 - 5 ft	0 - 0.5 ft	1 - 2.7 ft
Sample Description					SILT, Dark brown	SILT, Clayey, Reddish brown	SILT, Clayey, Reddish brown	Field Duplicate	SILT, Dark brown	SILT, Clayey, Reddish brown	SILT, Clayey, Reddish brown	SAND, Silty, Fine grained, Reddish brown	SAND, Silty, Poorly sorted, Reddish brown
Inorganics - Metals (mg/kg)													
ALUMINUM	7429-90-5	NA	NA	NA	--	--	--	--	--	--	--	4800	3200
ANTIMONY	7440-36-0	NA	NA	NA	--	--	--	--	--	--	--	<0.3 U	17
ARSENIC	7440-38-2	9.79	9.79	33.0	--	--	--	--	--	--	--	1.7	2.3
BARIUM	7440-39-3	NA	NA	NA	--	--	--	--	--	--	--	78 J	2700 J
BERYLLIUM	7440-41-7	NA	NA	NA	--	--	--	--	--	--	--	0.5	1.0
CADMIUM	7440-43-9	0.99	0.99	4.98	--	--	--	--	--	--	--	<0.2 U	3.1
CALCIUM	7440-70-2	NA	NA	NA	--	--	--	--	--	--	--	--	--
CHROMIUM	7440-47-3	43.4	43.4	111	--	--	--	--	--	--	--	9.0	13
COBALT	7440-48-4	50	NA	NA	--	--	--	--	--	--	--	4.5	6.4
COPPER	7440-50-8	31.6	31.6	149	--	--	--	--	--	--	--	130	4400
IRON	7439-89-6	NA	NA	NA	--	--	--	--	--	--	--	12000	9900
LEAD	7439-92-1	35.8	35.8	128	--	--	--	--	--	--	--	27	1600
LITHIUM	7439-93-2	NA	NA	NA	--	--	--	--	--	--	--	--	--
MAGNESIUM	7439-95-4	NA	NA	NA	--	--	--	--	--	--	--	--	--
MANGANESE	7439-96-5	NA	NA	NA	--	--	--	--	--	--	--	160	120
MERCURY	7439-97-6	0.174	0.18	1.06	--	--	--	--	--	--	--	<0.07 U	0.1
NICKEL	7440-02-0	22.7	22.7	48.6	--	--	--	--	--	--	--	12	17
SELENIUM	7782-49-2	NA	NA	NA	--	--	--	--	--	--	--	<0.2 U	1.1
SILVER	7440-22-4	0.5	NA	NA	--	--	--	--	--	--	--	0.3	13
SODIUM	7440-23-5	NA	NA	NA	--	--	--	--	--	--	--	--	--
VANADIUM	7440-62-2	NA	NA	NA	--	--	--	--	--	--	--	--	--
ZINC	7440-66-6	121	121	459	--	--	--	--	--	--	--	24	220
Inorganics - Cyanide (mg/kg)													
					--	--	--	--	--	--	--	ND	ND
Organics - PCBs (ug/kg)													
AROCLOR-1242	53469-21-9	NA	NA	NA	340 J	<300 U	<300 U	<290 U	760 J	<300 U	<150 U	<140 U	360 J
AROCLOR-1248	12672-29-6	NA	NA	NA	<430 UJ	<300 U	<300 U	<290 U	<790 UJ	<300 U	<150 U	<140 U	<370 UJ
AROCLOR-1254	11097-69-1	NA	NA	NA	220 J	<300 U	<300 U	<290 U	890 J	<300 U	<150 U	<140 U	360 J
AROCLOR-1262	37324-23-5	NA	NA	NA	<430 UJ	<300 U	<300 U	<290 U	<420 UJ	<300 U	<150 U	<140 U	<120 UJ
TOTAL PCBs	TPCB	59.8	59.8	676	560 J	ND	ND	ND	1650 J	ND	ND	ND	720 J
Organics - SVOCs (ug/kg)													
ACETOPHENONE	98-86-2	NA	NA	NA	--	--	--	--	--	--	--	--	--
FLUORANTHENE	206-44-0	423	423	2,230	--	--	--	--	--	--	--	<700 U	<620 U
PYRENE	129-00-0	195	195	1,520	--	--	--	--	--	--	--	<700 U	<620 U
Organics - VOCs (ug/kg)													
					--	--	--	--	--	--	--	--	--
DRO/ORO (ug/kg)													
Diesel Range Organics (C10-C20)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--
Oil Range Organics (C20-C34)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--

Note: Analytical and Criteria Footnotes
are included on the last page of the table.

DETAILED FINDINGS REPORT
LAKE LINDEN RECREATION AREA

TABLE 7-3
Sample Analytical Summary - Sediment
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Station Name	CAS Number	EPA Region 5 Ecological Screening Level (ESL)	Threshold Effect Concentration (TEC)	Probable Effect Concentration (PEC)	CHLL-SD19		CHLL-SD20		CHLL-SD21	CHLL-SD22			CHLL-SD23	
Field Sample ID					CHLL-SD 19-0"-6"	CHLL-SD-19-1'-2.4'	CHLL-SD 20-0-6"	CHLL-SD 20-1'-2'	CHLL-SD21-0"-6"	CHLL-SD 22-0-6"	CHLL-SD 22-0-6" dup	CHLL-SD 22-1'-1.5'	CHLL-SD23-0"-6"	CHLL-SD-23-1'-1.5'
Sample Date					7/12/2014	7/12/2014	6/16/2014	6/16/2014	7/10/2014	6/16/2014	6/16/2014	6/16/2014	7/10/2014	7/10/2014
Sample Interval (bgs)					0 - 0.5 ft	1 - 2.4 ft	0 - 0.5 ft	1 - 2 ft	0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft	1 - 1.5 ft	0 - 0.5 ft	1 - 1.5 ft
Sample Description					SAND, Poorly sorted, Brown	SAND, Poorly sorted, Few Pebbles, Brown	SAND, Fine grained, Reddish brown	SAND, Poorly sorted, Reddish brown	SAND, Poorly sorted, Reddish brown	SAND, Poorly sorted, Reddish brown	Field Duplicate	SAND, Poorly sorted, Reddish brown	SAND, Silty, Fine grained, Dark brown, With wood debris	SAND, Silty, Fine grained, Reddish brown
Inorganics - Metals (mg/kg)														
ALUMINUM	7429-90-5	NA	NA	NA	4400	3800	--	--	--	--	--	--	--	--
ANTIMONY	7440-36-0	NA	NA	NA	<0.3 U	<0.3 U	--	--	--	--	--	--	--	--
ARSENIC	7440-38-2	9.79	9.79	33.0	1.2	1.4	--	--	--	--	--	--	--	--
BARIUM	7440-39-3	NA	NA	NA	31 J	20 J	--	--	--	--	--	--	--	--
BERYLLIUM	7440-41-7	NA	NA	NA	0.4	0.3	--	--	--	--	--	--	--	--
CADMIUM	7440-43-9	0.99	0.99	4.98	<0.2 U	<0.2 U	--	--	--	--	--	--	--	--
CALCIUM	7440-70-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
CHROMIUM	7440-47-3	43.4	43.4	111	8.5	8.5	--	--	--	--	--	--	--	--
COBALT	7440-48-4	50	NA	NA	4.5	4.5	--	--	--	--	--	--	--	--
COPPER	7440-50-8	31.6	31.6	149	89	140	--	--	--	--	--	--	--	--
IRON	7439-89-6	NA	NA	NA	10000	9000	--	--	--	--	--	--	--	--
LEAD	7439-92-1	35.8	35.8	128	5.6	5.4	--	--	--	--	--	--	--	--
LITHIUM	7439-93-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
MAGNESIUM	7439-95-4	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
MANGANESE	7439-96-5	NA	NA	NA	130	110	--	--	--	--	--	--	--	--
MERCURY	7439-97-6	0.174	0.18	1.06	<0.08 U	<0.07 U	--	--	--	--	--	--	--	--
NICKEL	7440-02-0	22.7	22.7	48.6	12	12	--	--	--	--	--	--	--	--
SELENIUM	7782-49-2	NA	NA	NA	<0.2 U	<0.2 U	--	--	--	--	--	--	--	--
SILVER	7440-22-4	0.5	NA	NA	<0.1 U	0.2	--	--	--	--	--	--	--	--
SODIUM	7440-23-5	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
VANADIUM	7440-62-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
ZINC	7440-66-6	121	121	459	23	25	--	--	--	--	--	--	--	--
Inorganics - Cyanide (mg/kg)														
					ND	--	--	--	--	--	--	--	--	--
Organics - PCBs (ug/kg)														
AROCLOR-1242	53469-21-9	NA	NA	NA	<150 U	<130 U	<150 U	<120 U	<260 U	<120 U	<110 U	<110 U	<320 U	<150 U
AROCLOR-1248	12672-29-6	NA	NA	NA	<150 U	<130 U	<150 U	<120 U	<260 U	<120 U	<110 U	<110 U	<320 U	<150 U
AROCLOR-1254	11097-69-1	NA	NA	NA	<150 U	<130 U	<150 U	<120 U	<260 U	<120 U	<110 U	<110 U	<320 U	<150 U
AROCLOR-1262	37324-23-5	NA	NA	NA	<150 U	<130 U	<150 U	<120 U	<260 U	<120 U	<110 U	<110 U	<320 U	<150 U
TOTAL PCBs	TPCB	59.8	59.8	676	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Organics - SVOCs (ug/kg)														
ACETOPHENONE	98-86-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
FLUORANTHENE	206-44-0	423	423	2,230	<750 U	<660 U	--	--	--	--	--	--	--	--
PYRENE	129-00-0	195	195	1,520	<750 U	<660 U	--	--	--	--	--	--	--	--
Organics - VOCs (ug/kg)														
					--	--	--	--	--	--	--	--	--	--
DRO/ORO (ug/kg)														
Diesel Range Organics (C10-C20)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--
Oil Range Organics (C20-C34)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--

Note: Analytical and Criteria Footnotes
are included on the last page of the table.

DETAILED FINDINGS REPORT
LAKE LINDEN RECREATION AREA

TABLE 7-3
Sample Analytical Summary - Sediment
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Station Name	CAS Number	EPA Region 5 Ecological Screening Level (ESL)	Threshold Effect Concentration (TEC)	Probable Effect Concentration (PEC)	CHLL-SD73				CHLL-SD74			CHLL-SD75		
Field Sample ID					CHLL-SD-73 0'-6"	CHLL-SD-73 1'-3'	CHLL-SD-73 1'-3' DUP	CHLL-SD-73 3'-4.9'	CHLL-SD-74 0'-6"	CHLL-SD-74 1'-3'	CHLL-SD-74 3'-5'	CHLL-SD-75 0'-6"	CHLL-SD-75 1'-3'	CHLL-SD-75 3'-5'
Sample Date					5/27/2015	5/27/2015	5/27/2015	5/27/2015	5/27/2015	5/27/2015	5/27/2015	5/27/2015	5/27/2015	5/27/2015
Sample Interval (bgs)					0 - 0.5 ft	1 - 3 ft	1 - 3 ft	3 - 4.9 ft	0 - 0.5 ft	1 - 3 ft	3 - 5 ft	0 - 0.5 ft	1 - 3 ft	3 - 5 ft
Sample Description					SILT, Dark Brown, sandy	SAND, Reddish brown, fine grained, silty to 2.1 ft; SILT, Reddish brown	Field Duplicate	Reddish brown	SILT, Dark brown	SILT, Reddish brown	SILT, Reddish brown to 3.9 ft; SAND, Reddish brown, fine-medium grained, silty	SAND, Brown, poorly sorted	SAND, Reddish brown, poorly sorted to 2 ft; SAND, Reddish brown, fine to medium grained	SAND, Reddish brown, fine to medium grained
Inorganics - Metals (mg/kg)														
ALUMINUM	7429-90-5	NA	NA	NA	7100	--	--	--	11000	--	--	5000	--	--
ANTIMONY	7440-36-0	NA	NA	NA	13	--	--	--	7.5	--	--	<0.3 U	--	--
ARSENIC	7440-38-2	9.79	9.79	33.0	4.8	--	--	--	12	--	--	1.3	--	--
BARIUM	7440-39-3	NA	NA	NA	2300	--	--	--	570	--	--	17	--	--
BERYLLIUM	7440-41-7	NA	NA	NA	0.8	--	--	--	<2.0 U	--	--	0.4	--	--
CADMIUM	7440-43-9	0.99	0.99	4.98	2.7	--	--	--	2.6	--	--	<0.2 U	--	--
CALCIUM	7440-70-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
CHROMIUM	7440-47-3	43.4	43.4	111	19	--	--	--	30	--	--	12	--	--
COBALT	7440-48-4	50	NA	NA	8.9	--	--	--	13	--	--	6.2	--	--
COPPER	7440-50-8	31.6	31.6	149	3800	--	--	--	4000	--	--	480	--	--
IRON	7439-89-6	NA	NA	NA	12000	--	--	--	20000	--	--	7200	--	--
LEAD	7439-92-1	35.8	35.8	128	1900	--	--	--	1100	--	--	8.2	--	--
LITHIUM	7439-93-2	NA	NA	NA	6.8	--	--	--	10	--	--	3.4	--	--
MAGNESIUM	7439-95-4	NA	NA	NA	6000	--	--	--	8600	--	--	4900	--	--
MANGANESE	7439-96-5	NA	NA	NA	190	--	--	--	320	--	--	150	--	--
MERCURY	7439-97-6	0.174	0.18	1.06	0.1	--	--	--	0.2	--	--	<0.06 U	--	--
NICKEL	7440-02-0	22.7	22.7	48.6	27	--	--	--	43	--	--	17	--	--
SELENIUM	7782-49-2	NA	NA	NA	0.4	--	--	--	<2.0 U	--	--	<0.2 U	--	--
SILVER	7440-22-4	0.5	NA	NA	13	--	--	--	7.8	--	--	1.7	--	--
SODIUM	7440-23-5	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
VANADIUM	7440-62-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
ZINC	7440-66-6	121	121	459	290	--	--	--	440	--	--	40	--	--
Inorganics - Cyanide (mg/kg)														
					<0.20 U	--	--	--	<0.23 U	--	--	<0.13 U	--	--
Organics - PCBs (ug/kg)														
AROCLOR-1242	53469-21-9	NA	NA	NA	<400 UJ	<330 UJ	<320 UJ	<300 U	<450 UJ	<300 U	<260 U	<250 U	<110 U	<120 U
AROCLOR-1248	12672-29-6	NA	NA	NA	<400 UJ	<330 UJ	<320 UJ	<300 U	<450 UJ	<300 U	<260 U	<250 U	<110 U	<120 U
AROCLOR-1254	11097-69-1	NA	NA	NA	180 J	250 J	230 J	<300 U	210 J	<300 U	<260 U	<250 U	<110 U	<120 U
AROCLOR-1262	37324-23-5	NA	NA	NA	<400 UJ	<330 UJ	<320 UJ	<300 U	160 J	<300 U	<260 U	<250 U	<110 U	<120 U
TOTAL PCBs	TPCB	59.8	59.8	676	180 J	250 J	230 J	ND	370 J	ND	ND	ND	ND	ND
Organics - SVOCs (ug/kg)														
ACETOPHENONE	98-86-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
FLUORANTHENE	206-44-0	423	423	2,230	--	940 J	1200	--	--	<740 U	--	--	<230 U	--
PYRENE	129-00-0	195	195	1,520	--	700 J	890	--	--	<740 U	--	--	<230 U	--
Organics - VOCs (ug/kg)														
					--	--	--	--	--	--	--	--	--	--
DRO/ORO (ug/kg)														
Diesel Range Organics (C10-C20)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--
Oil Range Organics (C20-C34)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--

Note: Analytical and Criteria Footnotes
are included on the last page of the table.

DETAILED FINDINGS REPORT
LAKE LINDEN RECREATION AREA

TABLE 7-3
Sample Analytical Summary - Sediment
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Station Name	CAS Number	EPA Region 5 Ecological Screening Level (ESL)	Threshold Effect Concentration (TEC)	Probable Effect Concentration (PEC)	CHLL-SD76				CHLL-SD77			CHLL-SD78		
Field Sample ID					CHLL-SD-76 0-6"	CHLL-SD-76 1'-3'	CHLL-SD-76 1'-3' DUP	CHLL-SD-76 3'-5'	CHLL-SD-77 0-6"	CHLL-SD-77 1'-3'	CHLL-SD-77 3'-5'	CHLL-SD-78 0-6"	CHLL-SD-78 1'-3'	CHLL-SD-78 3'-5'
Sample Date					5/28/2015	5/28/2015	5/28/2015	5/28/2015	5/28/2015	5/28/2015	5/28/2015	5/28/2015	5/28/2015	5/28/2015
Sample Interval (bgs)					0 - 0.5 ft	1 - 3 ft	1 - 3 ft	3 - 5 ft	0 - 0.5 ft	1 - 3 ft	3 - 5 ft	0 - 0.5 ft	1 - 3 ft	3 - 5 ft
Sample Description					SAND, Reddish brown, fine to medium grained	SAND, Reddish brown, poorly sorted to 3.75 ft; SAND, Reddish brown, fine grained	Field Duplicate	SAND, Reddish brown, fine to medium grained	SAND, Reddish brown, fine to medium grained	SAND, Reddish brown, fine to medium grained	SAND, Reddish brown, fine to medium grained, Silty	SILT, Dark Brown	SILT, Reddish brown, Clayey	SAND, Reddish brown, fine grained
Inorganics - Metals (mg/kg)														
ALUMINUM	7429-90-5	NA	NA	NA	7400	--	--	--	6600	--	--	12000	--	--
ANTIMONY	7440-36-0	NA	NA	NA	<0.3 U	--	--	--	<0.3 U	--	--	1.5	--	--
ARSENIC	7440-38-2	9.79	9.79	33.0	1.8	--	--	--	1.5	--	--	10	--	--
BARIUM	7440-39-3	NA	NA	NA	20	--	--	--	32	--	--	77	--	--
BERYLLIUM	7440-41-7	NA	NA	NA	0.7	--	--	--	0.7	--	--	<2.0 U	--	--
CADMIUM	7440-43-9	0.99	0.99	4.98	<0.2 U	--	--	--	<0.2 U	--	--	0.6	--	--
CALCIUM	7440-70-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
CHROMIUM	7440-47-3	43.4	43.4	111	18	--	--	--	17	--	--	32	--	--
COBALT	7440-48-4	50	NA	NA	9.4	--	--	--	9.3	--	--	17	--	--
COPPER	7440-50-8	31.6	31.6	149	490	--	--	--	490	--	--	1900	--	--
IRON	7439-89-6	NA	NA	NA	11000	--	--	--	10000	--	--	23000	--	--
LEAD	7439-92-1	35.8	35.8	128	16	--	--	--	3.7	--	--	330	--	--
LITHIUM	7439-93-2	NA	NA	NA	5.0	--	--	--	4.7	--	--	7.5	--	--
MAGNESIUM	7439-95-4	NA	NA	NA	7900	--	--	--	7800	--	--	12000	--	--
MANGANESE	7439-96-5	NA	NA	NA	240	--	--	--	230	--	--	410	--	--
MERCURY	7439-97-6	0.174	0.18	1.06	<0.06 U	--	--	--	<0.07 U	--	--	0.1	--	--
NICKEL	7440-02-0	22.7	22.7	48.6	25	--	--	--	24	--	--	46	--	--
SELENIUM	7782-49-2	NA	NA	NA	<0.2 U	--	--	--	<0.2 U	--	--	<2.0 U	--	--
SILVER	7440-22-4	0.5	NA	NA	3.0	--	--	--	2.2	--	--	5.5	--	--
SODIUM	7440-23-5	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
VANADIUM	7440-62-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
ZINC	7440-66-6	121	121	459	68	--	--	--	65	--	--	150	--	--
Inorganics - Cyanide (mg/kg)														
					<0.13 U	--	--	--	<0.14 U	--	--	<0.18 U	--	--
Organics - PCBs (ug/kg)														
AROCLOR-1242	53469-21-9	NA	NA	NA	<130 U	<120 U	<120 U	<120 U	<140 U	<130 U	<280 UJ	<350 U	<290 U	<290 U
AROCLOR-1248	12672-29-6	NA	NA	NA	<130 U	<120 U	<120 U	<120 U	<140 U	<130 U	<280 UJ	<350 U	<290 U	<290 U
AROCLOR-1254	11097-69-1	NA	NA	NA	<130 U	<120 U	<120 U	<130 U	<140 U	<130 U	88 J	<350 U	<290 U	<290 U
AROCLOR-1262	37324-23-5	NA	NA	NA	<130 U	<120 U	<120 U	<120 U	<140 U	<130 U	<280 UJ	<350 U	<290 U	<290 U
TOTAL PCBs	TPCB	59.8	59.8	676	ND	ND	ND	ND	ND	ND	88 J	ND	ND	ND
Organics - SVOCs (ug/kg)														
ACETOPHENONE	98-86-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
FLUORANTHENE	206-44-0	423	423	2,230	--	<230 U	<250 U	--	--	<260 U	--	--	<720 U	--
PYRENE	129-00-0	195	195	1,520	--	<230 U	<250 U	--	--	<260 U	--	--	<720 U	--
Organics - VOCs (ug/kg)														
					--	--	--	--	--	--	--	--	--	--
DRO/ORO (ug/kg)														
Diesel Range Organics (C10-C20)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--
Oil Range Organics (C20-C34)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--

Note: Analytical and Criteria Footnotes
are included on the last page of the table.

DETAILED FINDINGS REPORT
LAKE LINDEN RECREATION AREA

TABLE 7-3
Sample Analytical Summary - Sediment
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Station Name	CAS Number	EPA Region 5 Ecological Screening Level (ESL)	Threshold Effect Concentration (TEC)	Probable Effect Concentration (PEC)	CHLL-SD79				CHLL-SD80			CHLL-SD81		
Field Sample ID					CHLL-SD-79 0'-6"	CHLL-SD-79 1'-3'	CHLL-SD-79 1'-3' DUP	CHLL-SD-79 3'-4.75'	CHLL-SD-80 0'-6"	CHLL-SD-80 1'-3'	CHLL-SD-80 3'-4.75'	CHLL-SD-81 0'-6"	CHLL-SD-81 1'-3'	CHLL-SD-81 3'-4'
Sample Date					5/28/2015	5/28/2015	5/28/2015	5/28/2015	5/27/2015	5/27/2015	5/27/2015	5/27/2015	5/27/2015	5/27/2015
Sample Interval (bgs)					0 - 0.5 ft	1 - 3 ft	1 - 3 ft	3 - 4.75 ft	0 - 0.5 ft	1 - 3 ft	3 - 4.75 ft	0 - 0.5 ft	1 - 3 ft	3 - 4 ft
Sample Description					SILT, Dark Brown	SILT, Reddish brown, Clayey	Field Duplicate	SILT, Reddish brown, Clayey	SILT, Dark Brown	SILT, Reddish brown, Clayey	SILT, Reddish brown, Clayey	SILT, Dark Brown	SILT, Reddish brown	SILT, Reddish brown
Inorganics - Metals (mg/kg)														
ALUMINUM	7429-90-5	NA	NA	NA	17000	--	--	--	15000	--	--	10000	--	--
ANTIMONY	7440-36-0	NA	NA	NA	14	--	--	--	11	--	--	12	--	--
ARSENIC	7440-38-2	9.79	9.79	33.0	14	--	--	--	14	--	--	6.8	--	--
BARIUM	7440-39-3	NA	NA	NA	1000	--	--	--	660	--	--	800	--	--
BERYLLIUM	7440-41-7	NA	NA	NA	1.2	--	--	--	<2.0 U	--	--	1.3	--	--
CADMIUM	7440-43-9	0.99	0.99	4.98	3.8	--	--	--	2.7	--	--	2.9	--	--
CALCIUM	7440-70-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
CHROMIUM	7440-47-3	43.4	43.4	111	40	--	--	--	40	--	--	23	--	--
COBALT	7440-48-4	50	NA	NA	21	--	--	--	19	--	--	13	--	--
COPPER	7440-50-8	31.6	31.6	149	11000	--	--	--	6700	--	--	9900	--	--
IRON	7439-89-6	NA	NA	NA	27000	--	--	--	23000	--	--	18000	--	--
LEAD	7439-92-1	35.8	35.8	128	2800	--	--	--	1800	--	--	1700	--	--
LITHIUM	7439-93-2	NA	NA	NA	15	--	--	--	15	--	--	21	--	--
MAGNESIUM	7439-95-4	NA	NA	NA	16000	--	--	--	12000	--	--	11000	--	--
MANGANESE	7439-96-5	NA	NA	NA	480	--	--	--	450	--	--	340	--	--
MERCURY	7439-97-6	0.174	0.18	1.06	0.2	--	--	--	0.3	--	--	0.3	--	--
NICKEL	7440-02-0	22.7	22.7	48.6	53	--	--	--	51	--	--	33	--	--
SELENIUM	7782-49-2	NA	NA	NA	0.5	--	--	--	<2.0 U	--	--	0.6	--	--
SILVER	7440-22-4	0.5	NA	NA	28	--	--	--	16	--	--	20	--	--
SODIUM	7440-23-5	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
VANADIUM	7440-62-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
ZINC	7440-66-6	121	121	459	330	--	--	--	310	--	--	290	--	--
Inorganics - Cyanide (mg/kg)														
					<0.22 U	--	--	--	<0.27 U	--	--	<0.18 U	--	--
Organics - PCBs (ug/kg)														
AROCLOR-1242	53469-21-9	NA	NA	NA	<440 UJ	<290 U	<300 U	<300 U	<550 UJ	<300 U	<300 U	<360 UJ	<290 U	<290 U
AROCLOR-1248	12672-29-6	NA	NA	NA	<440 UJ	<290 U	<300 U	<300 U	<550 UJ	<300 U	<300 U	<360 UJ	<290 U	<290 U
AROCLOR-1254	11097-69-1	NA	NA	NA	140 J	<290 U	<300 U	<300 U	210 J	<300 U	<300 U	130 J	<290 U	<290 U
AROCLOR-1262	37324-23-5	NA	NA	NA	<440 UJ	<290 U	<300 U	<300 U	<550 UJ	<300 U	<300 U	<360 UJ	<290 U	<290 U
TOTAL PCBs	TPCB	59.8	59.8	676	140 J	ND	ND	ND	210 J	ND	ND	130 J	ND	ND
Organics - SVOCs (ug/kg)														
ACETOPHENONE	98-86-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
FLUORANTHENE	206-44-0	423	423	2,230	--	<740 U	<740 U	--	--	<750 U	--	--	<720 U	--
PYRENE	129-00-0	195	195	1,520	--	<740 U	<740 U	--	--	<750 U	--	--	<720 U	--
Organics - VOCs (ug/kg)														
					--	--	--	--	--	--	--	--	--	--
DRO/ORO (ug/kg)														
Diesel Range Organics (C10-C20)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--
Oil Range Organics (C20-C34)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--

Note: Analytical and Criteria Footnotes
are included on the last page of the table.

TABLE 7-3
Sample Analytical Summary - Sediment
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

DETAILED FINDINGS REPORT
LAKE LINDEN RECREATION AREA

Station Name	CAS Number	EPA Region 5 Ecological Screening Level (ESL)	Threshold Effect Concentration (TEC)	Probable Effect Concentration (PEC)	CHLL-SD82			CHLL-SD101			CHLL-SD102		
Field Sample ID					CHLL-SD-82 0"-6"	CHLL-SD-82 1'-3'	CHLL-SD-82 3'-4.75'	CHLL-SD-101-0-6"	CHLL-SD-101-1-3'	CHLL-SD-101-3-4.75'	CHLL-SD-102-0-6"	CHLL-SD-102-1-3'	CHLL-SD-102-3-5'
Sample Date					5/28/2015	5/28/2015	5/28/2015	7/12/2015	7/12/2015	7/12/2015	7/12/2015	7/12/2015	7/12/2015
Sample Interval (bgs)					0 - 0.5 ft	1 - 3 ft	3 - 4.75 ft	0 - 0.5 ft	1 - 3 ft	3 - 4.75 ft	0 - 0.5 ft	1 - 3 ft	3 - 5 ft
Sample Description					SILT, Dark Brown, Sandy	SILT, Dark Brown, Sandy to 2 ft; SAND, Reddish-Brown, fine to medium grained	SAND, Reddish-Brown, fine to medium grained	SILT WITH ORGANICS, dark brown to black, wet, soft	CLAY WITH SILT, dark brown, wet, soft; SILT WITH TRACE SAND, dark brown, wet, soft to firm	SILT WITH TRACE SAND, dark brown, wet, soft to firm	SILT WITH SAND, light brown to black, wet, soft	SAND WITH SILT, dark brown, wet, loose to medium dense, fine to medium, angular to1.75 ft; SILT WITH SAND, dark brown, wet, firm, angular	SILTWITH SAND, dark brown, wet, firm, silt with fine angular sand
Inorganics - Metals (mg/kg)													
ALUMINUM	7429-90-5	NA	NA	NA	10000	--	--	--	--	--	--	--	--
ANTIMONY	7440-36-0	NA	NA	NA	0.9	--	--	--	--	--	--	--	--
ARSENIC	7440-38-2	9.79	9.79	33.0	2.2	--	--	--	--	--	--	--	--
BARIUM	7440-39-3	NA	NA	NA	160	--	--	--	--	--	--	--	--
BERYLLIUM	7440-41-7	NA	NA	NA	0.7	--	--	--	--	--	--	--	--
CADMIUM	7440-43-9	0.99	0.99	4.98	0.4	--	--	--	--	--	--	--	--
CALCIUM	7440-70-2	NA	NA	NA	--	--	--	--	--	--	--	--	--
CHROMIUM	7440-47-3	43.4	43.4	111	15	--	--	--	--	--	--	--	--
COBALT	7440-48-4	50	NA	NA	7.4	--	--	--	--	--	--	--	--
COPPER	7440-50-8	31.6	31.6	149	110	--	--	--	--	--	--	--	--
IRON	7439-89-6	NA	NA	NA	15000	--	--	--	--	--	--	--	--
LEAD	7439-92-1	35.8	35.8	128	85	--	--	--	--	--	160	--	--
LITHIUM	7439-93-2	NA	NA	NA	13	--	--	--	--	--	--	--	--
MAGNESIUM	7439-95-4	NA	NA	NA	5300	--	--	--	--	--	--	--	--
MANGANESE	7439-96-5	NA	NA	NA	230	--	--	--	--	--	--	--	--
MERCURY	7439-97-6	0.174	0.18	1.06	<0.1 UJ	--	--	--	--	--	--	--	--
NICKEL	7440-02-0	22.7	22.7	48.6	18	--	--	--	--	--	--	--	--
SELENIUM	7782-49-2	NA	NA	NA	0.3	--	--	--	--	--	--	--	--
SILVER	7440-22-4	0.5	NA	NA	1.5	--	--	--	--	--	--	--	--
SODIUM	7440-23-5	NA	NA	NA	--	--	--	--	--	--	--	--	--
VANADIUM	7440-62-2	NA	NA	NA	--	--	--	--	--	--	--	--	--
ZINC	7440-66-6	121	121	459	210	--	--	--	--	--	--	--	--
Inorganics - Cyanide (mg/kg)													
					--	--	--	--	--	--	--	--	--
Organics - PCBs (ug/kg)													
AROCLOR-1242	53469-21-9	NA	NA	NA	<430 U	<410 UJ	<120 U	<490 U	<300 U	<290 U	<360 U	<310 U	<290 U
AROCLOR-1248	12672-29-6	NA	NA	NA	<430 U	400 J	<120 U	<490 U	<300 U	<290 U	<360 U	<310 U	<290 U
AROCLOR-1254	11097-69-1	NA	NA	NA	<430 U	500 J	<120 U	<490 U	<300 U	<290 U	<360 U	<310 U	<290 U
AROCLOR-1262	37324-23-5	NA	NA	NA	<430 U	<320 UJ	<120 U	<490 U	<300 U	<290 U	<360 U	920	<290 U
TOTAL PCBs	TPCB	59.8	59.8	676	ND	900 J	ND	ND	ND	ND	ND	920	ND
Organics - SVOCs (ug/kg)													
ACETOPHENONE	98-86-2	NA	NA	NA	--	--	--	--	--	--	--	--	--
FLUORANTHENE	206-44-0	423	423	2,230	--	--	--	--	--	--	--	--	--
PYRENE	129-00-0	195	195	1,520	--	--	--	--	--	--	--	--	--
Organics - VOCs (ug/kg)													
					--	--	--	--	--	--	--	--	--
DRO/ORO (ug/kg)													
Diesel Range Organics (C10-C20)	ug/kg	--	--	--	--	--	--	--	--	--	75,000	60,000	--
Oil Range Organics (C20-C34)	ug/kg	--	--	--	--	--	--	--	--	--	420,000	370,000	--

Note: Analytical and Criteria Footnotes
are included on the last page of the table.

TABLE 7-3
Sample Analytical Summary - Sediment
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

DETAILED FINDINGS REPORT
LAKE LINDEN RECREATION AREA

Station Name	CAS Number	EPA Region 5 Ecological Screening Level (ESL)	Threshold Effect Concentration (TEC)	Probable Effect Concentration (PEC)	LLV-1		LLV-3		LLV-4		LLV-5	
Field Sample ID					LLV-1A	LLV-1B	LLV-3A	LLV-3B	LLV-4A	LLV-4B	LLV-5A	LLV-5B
Sample Date					7/30/2007	7/30/2007	7/30/2007	7/30/2007	7/30/2007	7/30/2007	7/30/2007	7/30/2007
Sample Interval (bgs)					0 - 0.25 ft	1 - 1.5 ft	0 - 0.25 ft	1 - 1.5 ft	0 - 0.25 ft	1 - 1.5 ft	0 - 0.25 ft	1 - 1.5 ft
Sample Description					--	--	--	--	--	--	--	--
Inorganics - Metals (mg/kg)												
ALUMINUM	7429-90-5	NA	NA	NA	--	--	--	--	--	--	--	--
ANTIMONY	7440-36-0	NA	NA	NA	2.5	3.1	2.6	2.6	2.5	2.4	2.6	2.4
ARSENIC	7440-38-2	9.79	9.79	33.0	2.6	2.1	6.5	7.0	1.5	1.7	1.7	1.4
BARIUM	7440-39-3	NA	NA	NA	20	21	12	10	21	19	17	16
BERYLLIUM	7440-41-7	NA	NA	NA	--	--	--	--	--	--	--	--
CADMIUM	7440-43-9	0.99	0.99	4.98	--	--	--	--	--	--	--	--
CALCIUM	7440-70-2	NA	NA	NA	--	--	--	--	--	--	--	--
CHROMIUM	7440-47-3	43.4	43.4	111	--	--	--	--	--	--	--	--
COBALT	7440-48-4	50	NA	NA	--	--	--	--	--	--	--	--
COPPER	7440-50-8	31.6	31.6	149	1900	7100	810	1200	770	1500	6400	1300
IRON	7439-89-6	NA	NA	NA	--	--	--	--	--	--	--	--
LEAD	7439-92-1	35.8	35.8	128	23	40	19	14	16	8.3	20	20
LITHIUM	7439-93-2	NA	NA	NA	--	--	--	--	--	--	--	--
MAGNESIUM	7439-95-4	NA	NA	NA	--	--	--	--	--	--	--	--
MANGANESE	7439-96-5	NA	NA	NA	--	--	--	--	--	--	--	--
MERCURY	7439-97-6	0.174	0.18	1.06	--	--	--	--	--	--	--	--
NICKEL	7440-02-0	22.7	22.7	48.6	--	--	--	--	--	--	--	--
SELENIUM	7782-49-2	NA	NA	NA	--	--	--	--	--	--	--	--
SILVER	7440-22-4	0.5	NA	NA	--	--	--	--	--	--	--	--
SODIUM	7440-23-5	NA	NA	NA	--	--	--	--	--	--	--	--
VANADIUM	7440-62-2	NA	NA	NA	--	--	--	--	--	--	--	--
ZINC	7440-66-6	121	121	459	--	--	--	--	--	--	--	--
Inorganics - Cyanide (mg/kg)												
					--	--	--	--	--	--	--	--
Organics - PCBs (ug/kg)												
AROCLOR-1242	53469-21-9	NA	NA	NA	<100 U	<100 U	<110 U	<100 U	<100 U	<100 U	<110 U	<100 U
AROCLOR-1248	12672-29-6	NA	NA	NA	<100 U	<100 U	<110 U	<100 U	<100 U	<100 U	<110 U	<100 U
AROCLOR-1254	11097-69-1	NA	NA	NA	<100 U	<100 U	<110 U	<100 U	<100 U	<100 U	<110 U	<100 U
AROCLOR-1262	37324-23-5	NA	NA	NA	--	--	--	--	--	--	--	--
TOTAL PCBs	TPCB	59.8	59.8	676	ND	ND	ND	ND	ND	ND	ND	ND
Organics - SVOCs (ug/kg)												
ACETOPHENONE	98-86-2	NA	NA	NA	--	--	--	--	--	--	--	--
FLUORANTHENE	206-44-0	423	423	2,230	--	--	--	--	--	--	--	--
PYRENE	129-00-0	195	195	1,520	--	--	--	--	--	--	--	--
Organics - VOCs (ug/kg)												
					--	--	--	--	--	--	--	--
DRO/ORO (ug/kg)												
Diesel Range Organics (C10-C20)	ug/kg	--	--	--	--	--	--	--	--	--	--	--
Oil Range Organics (C20-C34)	ug/kg	--	--	--	--	--	--	--	--	--	--	--

Note: Analytical and Criteria Footnotes
are included on the last page of the table.

TABLE 7-3
Sample Analytical Summary - Sediment
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

DETAILED FINDINGS REPORT
LAKE LINDEN RECREATION AREA

Station Name	CAS Number	EPA Region 5 Ecological Screening Level (ESL)	Threshold Effect Concentration (TEC)	Probable Effect Concentration (PEC)	LLV-6		LLV-7				LLV-8		LLV-9	
Field Sample ID					LLV-6A	LLV-6B	LLV-7A	LLV-7A DUP	LLV-7B	LLV-7B DUP	LLV-8A	LLV-8B	LLV-9A	LLV-9B
Sample Date					7/30/2007	7/30/2007	7/30/2007	7/30/2007	7/30/2007	7/30/2007	7/30/2007	7/30/2007	7/30/2007	7/30/2007
Sample Interval (bgs)					0 - 0.25 ft	1 - 1.5 ft	0 - 0.25 ft	0 - 0.25 ft	1 - 1.5 ft	1 - 1.5 ft	0 - 0.25 ft	1 - 1.5 ft	0 - 0.25 ft	1 - 1.5 ft
Sample Description					--	--	--	Field Duplicate	--	Field Duplicate	--	--	--	--
Inorganics - Metals (mg/kg)														
ALUMINUM	7429-90-5	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
ANTIMONY	7440-36-0	NA	NA	NA	2.6	2.3	2.5	2.4	2.6	2.4	2.2	2.3	2.1	2.4
ARSENIC	7440-38-2	9.79	9.79	33.0	2.4	2.3	3.0	3.1	1.8	1.6	1.1	1.2	1.6	1.6
BARIUM	7440-39-3	NA	NA	NA	14	11	16	14	11	9.3	7.2	7.4	11	12
BERYLLIUM	7440-41-7	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
CADMIUM	7440-43-9	0.99	0.99	4.98	--	--	--	--	--	--	--	--	--	--
CALCIUM	7440-70-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
CHROMIUM	7440-47-3	43.4	43.4	111	--	--	--	--	--	--	--	--	--	--
COBALT	7440-48-4	50	NA	NA	--	--	--	--	--	--	--	--	--	--
COPPER	7440-50-8	31.6	31.6	149	2600	3900	1000	1100	560	470	1500	1000	1700	2200
IRON	7439-89-6	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
LEAD	7439-92-1	35.8	35.8	128	35	13	27	25	22	18	11	14	59	36
LITHIUM	7439-93-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
MAGNESIUM	7439-95-4	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
MANGANESE	7439-96-5	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
MERCURY	7439-97-6	0.174	0.18	1.06	--	--	--	--	--	--	--	--	--	--
NICKEL	7440-02-0	22.7	22.7	48.6	--	--	--	--	--	--	--	--	--	--
SELENIUM	7782-49-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
SILVER	7440-22-4	0.5	NA	NA	--	--	--	--	--	--	--	--	--	--
SODIUM	7440-23-5	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
VANADIUM	7440-62-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
ZINC	7440-66-6	121	121	459	--	--	--	--	--	--	--	--	--	--
Inorganics - Cyanide (mg/kg)														
					--	--	--	--	--	--	--	--	--	--
Organics - PCBs (ug/kg)														
AROCLOR-1242	53469-21-9	NA	NA	NA	<100 U	<94 U	<100 U	<98 U	<110 U	<100 U	<95 U	<97 U	<92 U	<97 U
AROCLOR-1248	12672-29-6	NA	NA	NA	<100 U	<94 U	<100 U	<98 U	<110 U	<100 U	<95 U	<97 U	<92 U	<97 U
AROCLOR-1254	11097-69-1	NA	NA	NA	<100 U	<94 U	<100 U	<98 U	<110 U	<100 U	<95 U	<97 U	<92 U	<97 U
AROCLOR-1262	37324-23-5	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
TOTAL PCBs	TPCB	59.8	59.8	676	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Organics - SVOCs (ug/kg)														
ACETOPHENONE	98-86-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
FLUORANTHENE	206-44-0	423	423	2,230	--	--	--	--	--	--	--	--	--	--
PYRENE	129-00-0	195	195	1,520	--	--	--	--	--	--	--	--	--	--
Organics - VOCs (ug/kg)														
					--	--	--	--	--	--	--	--	--	--
DRO/ORO (ug/kg)														
Diesel Range Organics (C10-C20)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--
Oil Range Organics (C20-C34)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--

Note: Analytical and Criteria Footnotes
are included on the last page of the table.

DETAILED FINDINGS REPORT
LAKE LINDEN RECREATION AREA

TABLE 7-3
Sample Analytical Summary - Sediment
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Station Name	CAS Number	EPA Region 5 Ecological Screening Level (ESL)	Threshold Effect Concentration (TEC)	Probable Effect Concentration (PEC)	LLV-10		LLV-11		LLV-13				LLV-14	
Field Sample ID					LLV-10A	LLV-10B	LLV-11A	LLV-11B	LLV-13A	LLV-13A DUP	LLV-13B	LLV-13B DUP	LLV-14A	LLV-14B
Sample Date					7/30/2007	7/30/2007	7/30/2007	7/30/2007	7/30/2007	7/30/2007	7/30/2007	7/30/2007	7/31/2007	7/31/2007
Sample Interval (bgs)					0 - 0.25 ft	1 - 1.5 ft	0 - 0.25 ft	1 - 1.5 ft	0 - 0.25 ft	0 - 0.25 ft	1 - 1.5 ft	1 - 1.5 ft	0 - 0.25 ft	1 - 1.5 ft
Sample Description					--	--	--	--	--	Field Duplicate	--	Field Duplicate	--	--
Inorganics - Metals (mg/kg)														
ALUMINUM	7429-90-5	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
ANTIMONY	7440-36-0	NA	NA	NA	2.5	2.3	2.2	2.4	2.5	2.6	2.6	2.6	2.4	2.3
ARSENIC	7440-38-2	9.79	9.79	33.0	2.2	1.2	2.7	1.3	1.7	1.7	3.2	2.0	1.2	11
BARIUM	7440-39-3	NA	NA	NA	14	8.0	43	41	54	49	100	41	19	110
BERYLLIUM	7440-41-7	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
CADMIUM	7440-43-9	0.99	0.99	4.98	--	--	--	--	--	--	--	--	--	--
CALCIUM	7440-70-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
CHROMIUM	7440-47-3	43.4	43.4	111	--	--	--	--	--	--	--	--	--	--
COBALT	7440-48-4	50	NA	NA	--	--	--	--	--	--	--	--	--	--
COPPER	7440-50-8	31.6	31.6	149	910	970	800	780	300	440	1100	300	72	1500
IRON	7439-89-6	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
LEAD	7439-92-1	35.8	35.8	128	74	18	79	16	23	20	49	20	4.5	470
LITHIUM	7439-93-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
MAGNESIUM	7439-95-4	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
MANGANESE	7439-96-5	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
MERCURY	7439-97-6	0.174	0.18	1.06	--	--	--	--	--	--	--	--	--	--
NICKEL	7440-02-0	22.7	22.7	48.6	--	--	--	--	--	--	--	--	--	--
SELENIUM	7782-49-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
SILVER	7440-22-4	0.5	NA	NA	--	--	--	--	--	--	--	--	--	--
SODIUM	7440-23-5	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
VANADIUM	7440-62-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
ZINC	7440-66-6	121	121	459	--	--	--	--	--	--	--	--	--	--
Inorganics - Cyanide (mg/kg)														
					--	--	--	--	--	--	--	--	--	--
Organics - PCBs (ug/kg)														
AROCLOR-1242	53469-21-9	NA	NA	NA	<100 U	<96 U	<92 U	<94 U	<100 U	<110 U	<100 U	<110 U	<97 U	<100 U
AROCLOR-1248	12672-29-6	NA	NA	NA	<100 U	<96 U	<92 U	<94 U	<100 U	<110 U	<100 U	<110 U	<97 U	<100 U
AROCLOR-1254	11097-69-1	NA	NA	NA	<100 U	<96 U	<92 U	<94 U	<100 U	<110 U	<100 U	<110 U	<97 U	<100 U
AROCLOR-1262	37324-23-5	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
TOTAL PCBs	TPCB	59.8	59.8	676	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Organics - SVOCs (ug/kg)														
ACETOPHENONE	98-86-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
FLUORANTHENE	206-44-0	423	423	2,230	--	--	--	--	--	--	--	--	--	--
PYRENE	129-00-0	195	195	1,520	--	--	--	--	--	--	--	--	--	--
Organics - VOCs (ug/kg)														
					--	--	--	--	--	--	--	--	--	--
DRO/ORO (ug/kg)														
Diesel Range Organics (C10-C20)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--
Oil Range Organics (C20-C34)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--

Note: Analytical and Criteria Footnotes
are included on the last page of the table.

TABLE 7-3
Sample Analytical Summary - Sediment
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

DETAILED FINDINGS REPORT
LAKE LINDEN RECREATION AREA

Station Name	CAS Number	EPA Region 5 Ecological Screening Level (ESL)	Threshold Effect Concentration (TEC)	Probable Effect Concentration (PEC)	LLV-15				LLV-16		LLV-17		LLV-18	
Field Sample ID					LLV-15A	LLV-15A DUP	LLV-15B	LLV-15B DUP	LLV-16A	LLV-16B	LLV-17A	LLV-17B	LLV-18A	LLV-18B
Sample Date					7/31/2007	7/31/2007	7/31/2007	7/31/2007	7/31/2007	7/31/2007	7/31/2007	7/31/2007	7/31/2007	7/31/2007
Sample Interval (bgs)					0 - 0.25 ft	0 - 0.25 ft	1 - 1.5 ft	1 - 1.5 ft	0 - 0.25 ft	1 - 1.5 ft	0 - 0.25 ft	1 - 1.5 ft	0 - 0.25 ft	1 - 1.5 ft
Sample Description					--	Field Duplicate	--	Field Duplicate	--	--	--	--	--	--
Inorganics - Metals (mg/kg)														
ALUMINUM	7429-90-5	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
ANTIMONY	7440-36-0	NA	NA	NA	2.3	2.3	2.4	2.4	2.3	2.5	2.4	2.5	2.2	2.4
ARSENIC	7440-38-2	9.79	9.79	33.0	1.2	1.2	2.6	3.1	1.2	1.6	2.2	2.2	2.0	1.2
BARIUM	7440-39-3	NA	NA	NA	15	13	21	22	14	23	21	40	17	20
BERYLLIUM	7440-41-7	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
CADMIUM	7440-43-9	0.99	0.99	4.98	--	--	--	--	--	--	--	--	--	--
CALCIUM	7440-70-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
CHROMIUM	7440-47-3	43.4	43.4	111	--	--	--	--	--	--	--	--	--	--
COBALT	7440-48-4	50	NA	NA	--	--	--	--	--	--	--	--	--	--
COPPER	7440-50-8	31.6	31.6	149	130	130	590	550	160	380	390	440	290	930
IRON	7439-89-6	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
LEAD	7439-92-1	35.8	35.8	128	2.5	2.4	20	27	2.7	16	10	49	9.4	13
LITHIUM	7439-93-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
MAGNESIUM	7439-95-4	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
MANGANESE	7439-96-5	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
MERCURY	7439-97-6	0.174	0.18	1.06	--	--	--	--	--	--	--	--	--	--
NICKEL	7440-02-0	22.7	22.7	48.6	--	--	--	--	--	--	--	--	--	--
SELENIUM	7782-49-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
SILVER	7440-22-4	0.5	NA	NA	--	--	--	--	--	--	--	--	--	--
SODIUM	7440-23-5	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
VANADIUM	7440-62-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
ZINC	7440-66-6	121	121	459	--	--	--	--	--	--	--	--	--	--
Inorganics - Cyanide (mg/kg)														
					--	--	--	--	--	--	--	--	--	--
Organics - PCBs (ug/kg)														
AROCLOR-1242	53469-21-9	NA	NA	NA	<96 U	<94 U	<100 U	<99 U	<95 U	<96 U	<100 U	<100 U	<87 U	<98 U
AROCLOR-1248	12672-29-6	NA	NA	NA	<96 U	<94 U	<100 U	<99 U	<95 U	<96 U	<100 U	<100 U	<87 U	<98 U
AROCLOR-1254	11097-69-1	NA	NA	NA	<96 U	<94 U	<100 U	<99 U	<95 U	<96 U	<100 U	<100 U	<87 U	<98 U
AROCLOR-1262	37324-23-5	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
TOTAL PCBs	TPCB	59.8	59.8	676	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Organics - SVOCs (ug/kg)														
ACETOPHENONE	98-86-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
FLUORANTHENE	206-44-0	423	423	2,230	--	--	--	--	--	--	--	--	--	--
PYRENE	129-00-0	195	195	1,520	--	--	--	--	--	--	--	--	--	--
Organics - VOCs (ug/kg)														
					--	--	--	--	--	--	--	--	--	--
DRO/ORO (ug/kg)														
Diesel Range Organics (C10-C20)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--
Oil Range Organics (C20-C34)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--

Note: Analytical and Criteria Footnotes
are included on the last page of the table.

DETAILED FINDINGS REPORT
LAKE LINDEN RECREATION AREA

TABLE 7-3
Sample Analytical Summary - Sediment
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Station Name	CAS Number	EPA Region 5 Ecological Screening Level (ESL)	Threshold Effect Concentration (TEC)	Probable Effect Concentration (PEC)	LLV-19		LLV-20		LLV-21		LLV-22			
Field Sample ID					LLV-19A	LLV-19B	LLV-20A	LLV-20B	LLV-21A	LLV-21B	LLV-22A	LLV-22A DUP	LLV-22B	LLV-22B DUP
Sample Date					7/31/2007	7/31/2007	7/30/2007	7/30/2007	7/30/2007	7/30/2007	7/30/2007	7/30/2007	7/30/2007	7/30/2007
Sample Interval (bgs)					0 - 0.25 ft	1 - 1.5 ft	0 - 0.25 ft	1 - 1.5 ft	0 - 0.25 ft	1 - 1.5 ft	0 - 0.25 ft	0 - 0.25 ft	1 - 1.5 ft	1 - 1.5 ft
Sample Description					--	--	--	--	--	--	--	Field Duplicate	--	Field Duplicate
Inorganics - Metals (mg/kg)														
ALUMINUM	7429-90-5	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
ANTIMONY	7440-36-0	NA	NA	NA	2.3	2.7	2.5	2.4	2.3	2.5	2.3	2.4	2.4	2.3
ARSENIC	7440-38-2	9.79	9.79	33.0	2.8	2.1	3.9	1.5	10	5.0	2.3	1.9	1.7	1.6
BARIUM	7440-39-3	NA	NA	NA	19	25	28	23	57	49	22	21	22	18
BERYLLIUM	7440-41-7	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
CADMIUM	7440-43-9	0.99	0.99	4.98	--	--	--	--	--	--	--	--	--	--
CALCIUM	7440-70-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
CHROMIUM	7440-47-3	43.4	43.4	111	--	--	--	--	--	--	--	--	--	--
COBALT	7440-48-4	50	NA	NA	--	--	--	--	--	--	--	--	--	--
COPPER	7440-50-8	31.6	31.6	149	440	930	410	850	3200	760	580	720	580	570
IRON	7439-89-6	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
LEAD	7439-92-1	35.8	35.8	128	4.7	39	9.7	4.0	10	9.6	8.5	3.9	2.5	2.2
LITHIUM	7439-93-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
MAGNESIUM	7439-95-4	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
MANGANESE	7439-96-5	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
MERCURY	7439-97-6	0.174	0.18	1.06	--	--	--	--	--	--	--	--	--	--
NICKEL	7440-02-0	22.7	22.7	48.6	--	--	--	--	--	--	--	--	--	--
SELENIUM	7782-49-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
SILVER	7440-22-4	0.5	NA	NA	--	--	--	--	--	--	--	--	--	--
SODIUM	7440-23-5	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
VANADIUM	7440-62-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
ZINC	7440-66-6	121	121	459	--	--	--	--	--	--	--	--	--	--
Inorganics - Cyanide (mg/kg)														
					--	--	--	--	--	--	--	--	--	--
Organics - PCBs (ug/kg)														
AROCLOR-1242	53469-21-9	NA	NA	NA	<95 U	<100 U	<100 U	<99 U	<100 U	<100 U	<99 U	<100 U	<95 U	<98 U
AROCLOR-1248	12672-29-6	NA	NA	NA	<95 U	<100 U	<100 U	<99 U	<100 U	<100 U	<99 U	<100 U	<95 U	<98 U
AROCLOR-1254	11097-69-1	NA	NA	NA	<95 U	<100 U	<100 U	<99 U	<100 U	<100 U	<99 U	<100 U	<95 U	<98 U
AROCLOR-1262	37324-23-5	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
TOTAL PCBs	TPCB	59.8	59.8	676	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Organics - SVOCs (ug/kg)														
ACETOPHENONE	98-86-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
FLUORANTHENE	206-44-0	423	423	2,230	--	--	--	--	--	--	--	--	--	--
PYRENE	129-00-0	195	195	1,520	--	--	--	--	--	--	--	--	--	--
Organics - VOCs (ug/kg)														
					--	--	--	--	--	--	--	--	--	--
DRO/ORO (ug/kg)														
Diesel Range Organics (C10-C20)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--
Oil Range Organics (C20-C34)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--

Note: Analytical and Criteria Footnotes
are included on the last page of the table.

DETAILED FINDINGS REPORT
LAKE LINDEN RECREATION AREA

TABLE 7-3
Sample Analytical Summary - Sediment
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Station Name	CAS Number	EPA Region 5 Ecological Screening Level (ESL)	Threshold Effect Concentration (TEC)	Probable Effect Concentration (PEC)	LLV-23		LLV-24		LLV-MP3	LLV-MP4	LLV-MP5	LLV-MP6	LLV-MP7	LLV-MP8
Field Sample ID					LLV-23A	LLV-23B	LLV-24A	LLV-24B	LLV-MP3-01	LLV-MP4-01	LLV-MP5-01	LLV-MP6-01	LLV-MP7-01	LLV-MP8-01
Sample Date					7/30/2007	7/30/2007	7/30/2007	7/30/2007	8/7/2007	8/7/2007	8/7/2007	8/7/2007	8/7/2007	8/7/2007
Sample Interval (bgs)					0 - 0.25 ft	1 - 1.5 ft	0 - 0.25 ft	1 - 1.5 ft	0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft
Sample Description					--	--	--	--	--	--	--	--	--	--
Inorganics - Metals (mg/kg)														
ALUMINUM	7429-90-5	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
ANTIMONY	7440-36-0	NA	NA	NA	2.6	2.2	2.5	2.3	4.7	5.2	4.8	6.2	5.0	7.4
ARSENIC	7440-38-2	9.79	9.79	33.0	5.0	1.6	4.6	2.1	2.3	2.6	2.4	3.1	2.5	4.1
BARIUM	7440-39-3	NA	NA	NA	66	27	80	23	29	25	170	120	32	150
BERYLLIUM	7440-41-7	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
CADMIUM	7440-43-9	0.99	0.99	4.98	--	--	--	--	--	--	--	--	--	--
CALCIUM	7440-70-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
CHROMIUM	7440-47-3	43.4	43.4	111	--	--	--	--	--	--	--	--	--	--
COBALT	7440-48-4	50	NA	NA	--	--	--	--	--	--	--	--	--	--
COPPER	7440-50-8	31.6	31.6	149	630	880	750	570	200	340	310	330	100	540
IRON	7439-89-6	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
LEAD	7439-92-1	35.8	35.8	128	15	3.0	5.6	3.7	40	21	130	110	11	68
LITHIUM	7439-93-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
MAGNESIUM	7439-95-4	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
MANGANESE	7439-96-5	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
MERCURY	7439-97-6	0.174	0.18	1.06	--	--	--	--	--	--	--	--	--	--
NICKEL	7440-02-0	22.7	22.7	48.6	--	--	--	--	--	--	--	--	--	--
SELENIUM	7782-49-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
SILVER	7440-22-4	0.5	NA	NA	--	--	--	--	--	--	--	--	--	--
SODIUM	7440-23-5	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
VANADIUM	7440-62-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
ZINC	7440-66-6	121	121	459	--	--	--	--	--	--	--	--	--	--
Inorganics - Cyanide (mg/kg)														
					--	--	--	--	--	--	--	--	--	--
Organics - PCBs (ug/kg)														
AROCLOR-1242	53469-21-9	NA	NA	NA	<100 U	<100 U	<110 U	<100 U	<100 U	<110 U	<100 U	<130 U	<110 U	<150 U
AROCLOR-1248	12672-29-6	NA	NA	NA	<100 U	<100 U	<110 U	<100 U	<100 U	<110 U	<100 U	<130 U	<110 U	<150 U
AROCLOR-1254	11097-69-1	NA	NA	NA	<100 U	<100 U	<110 U	<100 U	<100 U	<110 U	<100 U	<130 U	<110 U	<150 U
AROCLOR-1262	37324-23-5	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
TOTAL PCBs	TPCB	59.8	59.8	676	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Organics - SVOCs (ug/kg)														
ACETOPHENONE	98-86-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--
FLUORANTHENE	206-44-0	423	423	2,230	--	--	--	--	--	--	--	--	--	--
PYRENE	129-00-0	195	195	1,520	--	--	--	--	--	--	--	--	--	--
Organics - VOCs (ug/kg)														
					--	--	--	--	--	--	--	--	--	--
DRO/ORO (ug/kg)														
Diesel Range Organics (C10-C20)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--
Oil Range Organics (C20-C34)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--

Note: Analytical and Criteria Footnotes
are included on the last page of the table.

DETAILED FINDINGS REPORT
LAKE LINDEN RECREATION AREA

TABLE 7-3
Sample Analytical Summary - Sediment
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Station Name	CAS Number	EPA Region 5 Ecological Screening Level (ESL)	Threshold Effect Concentration (TEC)	Probable Effect Concentration (PEC)	SD-03		TL07-01				TL07-02		
Field Sample ID					SD-03	SD-03D	TL07-01 0-6	TL07-01 6-24	TL07-01 24-43	TL07-01 43-64	TL07-02 0-28	TL07-02 28-48	TL07-02 48-64
Sample Date					10/12/2011	10/12/2011	8/7/2007	8/7/2007	8/7/2007	8/7/2007	8/7/2007	8/7/2007	8/7/2007
Sample Interval (bgs)					0 - 3 in	0 - 3 in	0 - 6 in	6 - 24 in	24 - 43 in	43 - 64 in	0 - 28 in	28 - 48 in	48 - 64 in
Sample Description					--	Field Duplicate	--	--	--	--	--	--	--
Inorganics - Metals (mg/kg)													
ALUMINUM	7429-90-5	NA	NA	NA	2060	2140	--	--	--	--	--	--	--
ANTIMONY	7440-36-0	NA	NA	NA	0.27 J	0.34 J	--	--	--	--	--	--	--
ARSENIC	7440-38-2	9.79	9.79	33.0	<1.0 UJ	1.4 J-	1.0	1.3	2.7	49	2.3	38	8.2
BARIUM	7440-39-3	NA	NA	NA	20.7 J	26.5	22	52	220	130000	310	84000	4100
BERYLLIUM	7440-41-7	NA	NA	NA	0.28 J	0.33 J	--	--	--	--	--	--	--
CADMIUM	7440-43-9	0.99	0.99	4.98	0.51 J	0.56	<0.2 U	<0.2 U	0.33	85	0.27	38	3.6
CALCIUM	7440-70-2	NA	NA	NA	1630	1600	--	--	--	--	--	--	--
CHROMIUM	7440-47-3	43.4	43.4	111	8.4	7.9	9.5	11	15	200	13	130	38
COBALT	7440-48-4	50	NA	NA	3.2 J	2.8 J	--	--	--	--	--	--	--
COPPER	7440-50-8	31.6	31.6	149	164	97.7	140	430	670	120000	370	78000	8600
IRON	7439-89-6	NA	NA	NA	8430	9320	--	--	--	--	--	--	--
LEAD	7439-92-1	35.8	35.8	128	7.6	8.5	9.2	110	150	75000	100	44000	2500
LITHIUM	7439-93-2	NA	NA	NA	--	--	--	--	--	--	--	--	--
MAGNESIUM	7439-95-4	NA	NA	NA	1910	1680	--	--	--	--	--	--	--
MANGANESE	7439-96-5	NA	NA	NA	101	107	--	--	--	--	--	--	--
MERCURY	7439-97-6	0.174	0.18	1.06	<0.1 U	<0.1 U	<0.05 U	<0.05 U	0.09	1.5	<0.05 U	1.7	0.3
NICKEL	7440-02-0	22.7	22.7	48.6	8.6	7.3	--	--	--	--	--	--	--
SELENIUM	7782-49-2	NA	NA	NA	<3.5 U	<3.5 U	<0.2 U	<0.2 U	0.27	20	0.27	18	2.6
SILVER	7440-22-4	0.5	NA	NA	<1.0 U	<1 U	0.22	1.3	1.2	450	0.87	290	39
SODIUM	7440-23-5	NA	NA	NA	313 J	145 J	--	--	--	--	--	--	--
VANADIUM	7440-62-2	NA	NA	NA	15.6	18.4	--	--	--	--	--	--	--
ZINC	7440-66-6	121	121	459	28.4	26	23	40	80	6800	54	3500	430
Inorganics - Cyanide (mg/kg)													
					ND	ND	--	--	--	--	--	--	--
Organics - PCBs (ug/kg)													
AROCOR-1242	53469-21-9	NA	NA	NA	<48 U	<45 U	<130 U	<120 U	<170 U	5100	<180 U	3000	<140 U
AROCOR-1248	12672-29-6	NA	NA	NA	<48 U	<45 U	<130 U	<120 U	<170 U	<5200 U	<180 U	<3100 U	130
AROCOR-1254	11097-69-1	NA	NA	NA	<48 U	<45 U	<130 U	<120 U	<170 U	3800	<180 U	2800	150
AROCOR-1262	37324-23-5	NA	NA	NA	<48 U	<45 U	<130 U	<120 U	<170 U	<1000 U	<180 U	<970 U	<140 U
TOTAL PCBs	TPCB	59.8	59.8	676	ND	ND	ND	ND	ND	8900	ND	5800	280
Organics - SVOCs (ug/kg)													
ACETOPHENONE	98-86-2	NA	NA	NA	130 J	<170 U	--	--	--	--	--	--	--
FLUORANTHENE	206-44-0	423	423	2,230	<170 UJ	<170 UJ	--	--	--	--	--	--	--
PYRENE	129-00-0	195	195	1,520	<170 U	<170 UJ	--	--	--	--	--	--	--
Organics - VOCs (ug/kg)													
					--	--	--	--	--	--	--	--	--
DRO/ORO (ug/kg)													
Diesel Range Organics (C10-C20)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--
Oil Range Organics (C20-C34)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--

Note: Analytical and Criteria Footnotes
are included on the last page of the table.

DETAILED FINDINGS REPORT
LAKE LINDEN RECREATION AREA

TABLE 7-3
Sample Analytical Summary - Sediment
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Station Name	CAS Number	EPA Region 5 Ecological Screening Level (ESL)	Threshold Effect Concentration (TEC)	Probable Effect Concentration (PEC)	TL07-03			TL07-04				TL07-13				
Field Sample ID					TL07-03 0-21	TL07-03 21-41	TL07-03 41-70	TL07-04 0-6	TL07-04 6-26	TL07-04 36-60	TL07-04 60-95	TL07-13 0-6	TL07-13 6-26	TL07-13 26-40	TL07-13 40-66	TL07-13 40-66 D
Sample Date					8/7/2007	8/7/2007	8/7/2007	8/7/2007	8/7/2007	8/7/2007	8/7/2007	8/8/2007	8/8/2007	8/8/2007	8/8/2007	8/8/2007
Sample Interval (bgs)					0 - 21 in	21 - 41 in	41 - 70 in	0 - 6 in	6 - 26 in	36 - 60 in	60 - 95 in	0 - 6 in	6 - 26 in	26 - 40 in	40 - 66 in	40 - 66 in
Sample Description					--	--	--	--	--	--	--	--	--	--	--	Field Duplicate
Inorganics - Metals (mg/kg)																
ALUMINUM	7429-90-5	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--
ANTIMONY	7440-36-0	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--
ARSENIC	7440-38-2	9.79	9.79	33.0	1.6	55	5.6	26	5.7	5.8	4.7	7.5	8.7	18	3.8	2.6
BARIUM	7440-39-3	NA	NA	NA	150	99000	620	12000	410	88	71	15	19	21	17	15
BERYLLIUM	7440-41-7	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--
CADMIUM	7440-43-9	0.99	0.99	4.98	<0.2 U	37	0.59	<0.2 U	0.6	<0.2 U	<0.2 U	<0.2 U	0.22	0.27	<0.2 U	<0.2 U
CALCIUM	7440-70-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--
CHROMIUM	7440-47-3	43.4	43.4	111	8.7	120	44	51	45	44	44	28	27	32	20	18
COBALT	7440-48-4	50	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--
COPPER	7440-50-8	31.6	31.6	149	160	120000	3500	28000	3900	3400	3000	800	1300	2400	7100	5800
IRON	7439-89-6	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--
LEAD	7439-92-1	35.8	35.8	128	19	42000	300	7800	400	39	23	34	70	72	10	7.8
LITHIUM	7439-93-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--
MAGNESIUM	7439-95-4	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--
MANGANESE	7439-96-5	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--
MERCURY	7439-97-6	0.174	0.18	1.06	<0.05 U	2.6	0.12	0.6	0.13	0.07	0.07	<0.05 U	0.09	0.12	0.07	<0.05 U
NICKEL	7440-02-0	22.7	22.7	48.6	--	--	--	--	--	--	--	--	--	--	--	--
SELENIUM	7782-49-2	NA	NA	NA	<0.2 U	23	0.31	5	0.4	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	0.21
SILVER	7440-22-4	0.5	NA	NA	0.31	380	9.3	80	11	6.1	5.4	3.3	4.0	8.1	8.0	6.9
SODIUM	7440-23-5	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--
VANADIUM	7440-62-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--
ZINC	7440-66-6	121	121	459	38	4100	140	1000	180	110	110	98	120	120	78	65
Inorganics - Cyanide (mg/kg)																
					--	--	--	--	--	--	--	--	--	--	--	--
Organics - PCBs (ug/kg)																
AROCLOR-1242	53469-21-9	NA	NA	NA	<140 U	3200	<130 U	460	<140 U	<140 U	<140 U	<130 U	<130 U	<130 U	<130 U	<130 U
AROCLOR-1248	12672-29-6	NA	NA	NA	<140 U	<3200 U	<130 U	470	<140 U	<140 U	<140 U	<130 U	<130 U	<130 U	<130 U	<130 U
AROCLOR-1254	11097-69-1	NA	NA	NA	<140 U	2900	<130 U	450	180	<140 U	<140 U	<130 U	<130 U	<130 U	<130 U	<130 U
AROCLOR-1262	37324-23-5	NA	NA	NA	<140 U	<1000 U	<130 U	<210 U	<140 U	<140 U	50	<130 U	<130 U	<130 U	<130 U	<130 U
TOTAL PCBs	TPCB	59.8	59.8	676	ND	6100	ND	910	180	ND	50	ND	ND	ND	ND	ND
Organics - SVOCs (ug/kg)																
ACETOPHENONE	98-86-2	NA	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--
FLUORANTHENE	206-44-0	423	423	2,230	--	--	--	--	--	--	--	--	--	--	--	--
PYRENE	129-00-0	195	195	1,520	--	--	--	--	--	--	--	--	--	--	--	--
Organics - VOCs (ug/kg)																
					--	--	--	--	--	--	--	--	--	--	--	--
DRO/ORO (ug/kg)																
Diesel Range Organics (C10-C20)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Oil Range Organics (C20-C34)	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Note: Analytical and Criteria Footnotes
are included on the last page of the table.

DETAILED FINDINGS REPORT
LAKE LINDEN RECREATION AREA

TABLE 7-3
Sample Analytical Summary - Sediment
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Sediment Table Footnotes:

- ESLs, TECs, and PECs are adapted from Appendix A and Appendix B of Michigan Department of Environmental Quality - Remediation and Redevelopment Division Operational Memorandum No. 4 Attachment 3, Interim Final August 2, 2006
- Only detected analytes are listed - Gray rows indicate requested analyses. If no analytes are listed below a gray row then all analytes of that group were either not analyzed or not detected. ND indicates that one or more analyte of that goup was tested and not detected and a -- indicates not analyzed.
- **Bold** values are concentrations detected above the reporting limit.
- **Shaded values indicate analyte concentration exceed applicable criteria. Color presented is the criteria with the highest value that was exceeded:**

EPA Region 5 RCRA ESLs dated August 22, 2003
TECs from MacDonald <i>et al.</i> 2000
PECs from MacDonald <i>et al.</i> 2000

- = Not analyzed/Not Reported
- bgs = Below ground surface
- ESL = Ecological Screening Level
- DRO/ORO = Diesel Rande Organics and Oil Range Organics
- ft = Feet
- in = Inches
- mg/kg = Milligrams per kilogram.
- PCBs = Polychlorindated biphenyls
- PEC = Probable Effect Concentration
- RCRA = Resource Conservation and Recovery Act
- SVOC = Semi-volatile organic compound
- TEC = Threshold Effect Concentration
- ug/kg = Micrograms per kilogram
- VOC = Volatile organic compound

Criteria Footnotes:

- NA = A criterion or value is not available

Laboratory Footnotes:

- J = Estimated result
- ND = Analyte analyzed for but not detected above the reported sample reporting limit.
- U = Analyte analyzed for but not detected above the reported sample reporting limit.

TABLE 7-4
Sample Analytical Summary - Surface Water and SPMD
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

DETAILED FINDINGS REPORT
LAKE LINDEN RECREATION AREA

Station Name	CASNumber	EPA Region 5 Ecological Screening Level	Rule 57 HCV Drink	Rule 57 HNV Drink	Rule 57 WV	CHLL-SW01	CHLL-SW02	CHLL-SW03	CHLL-SW04	LLV-Beach1	LLV-Creek1	SPMD Site #3	SW-03	
Field Sample ID						CHLL-SW01- 6.7-7.7'	CHLL-SW02-12.5-13.5'	CHLL-SW03-18.4-19.4'	CHLL-SW04-11.5-12.5'	LLV Beach 1	LLV Creek 1	SPMD Site #3	SW-03	SW-03D
Sample Date						5/27/2015	5/27/2015	5/28/2015	5/28/2015	7/26/2007	7/26/2007	11/18/2005	10/12/2011	10/12/2011
Sample Interval						6.7 - 7.7 ft	12.5 - 13.5 ft	18.4 - 19.4 ft	11.5 - 12.5 ft	0 - 0 ft	0 - 0 ft	3 - 3 ft	0 - 6 in	0 - 6 in
Inorganics - Metals (ug/l)														Field Duplicate
ALUMINUM	7429-90-5	NA	NA	NA	NA	--	--	--	--	3100	3900	--	16.7 J	22.6 J
ANTIMONY	7440-36-0	80	NA	1.7	NA	--	--	--	--	<2 U	3.0	--	<60 U	<60 U
ARSENIC	7440-38-2	148	10	10	NA	--	--	--	--	9.0	20	--	<10 U	<10 U
BARIUM	7440-39-3	220	NA	1,900	NA	--	--	--	--	270	530	--	44.1 J	39.6 J
CADMIUM	7440-43-9	0.15	NA	2.5	NA	--	--	--	--	<1 U	1.0	--	<5 U	<5 U
CALCIUM	7440-70-2	NA	NA	NA	NA	--	--	--	--	57000	33000	--	17300	16900
CHROMIUM	7440-47-3	42	NA	120	NA	--	--	--	--	<10 U	14	--	1.1 J	<10 U
COPPER	7440-50-8	1.58	NA	470	na	--	--	--	--	240	990	--	19.6 J	28.2
IRON	7439-89-6	NA	NA	NA	NA	--	--	--	--	2800	14000	--	<100 U	110
LEAD	7439-92-1	1.17	NA	14	NA	--	--	--	--	44	550	--	1.5 J	<10 U
MAGNESIUM	7439-95-4	NA	NA	NA	NA	--	--	--	--	5000	7000	--	1220 J	2330 J
MANGANESE	7439-96-5	NA	NA	1,300	NA	--	--	--	--	180	720	--	5.5 J	11.5 J
NICKEL	7440-02-0	28.9	NA	2,600	NA	--	--	--	--	<20 U	<20 U	--	1.8 J	1.3 J
Potassium	7440-09-7	NA	NA	NA	NA	--	--	--	--	1600	3800	--	<5000 U	<5000 U
SILVER	7440-22-4	0.12	NA	130	NA	--	--	--	--	0.8	4.0	--	<10 U	<10 U
SODIUM	7440-23-5	NA	NA	NA	NA	--	--	--	--	7700	14000	--	3610000	1700000
VANADIUM	7440-62-2	12	NA	53	NA	--	--	--	--	7.0	20	--	<50 U	<50 U
ZINC	7440-66-6	65.7	NA	3,300	NA	--	--	--	--	<50 U	110	--	<60 U	<60 U
Inorganics - Cyanide (ug/l)														
CYANIDE	57-12-5	5.2	NA	600	NA	--	--	--	--	<5 U	<5 U	--	20.7 J	<10 UJ
Organics - PCBs (ug/l)														
PCB 018	PCB 018	NA	NA	NA	NA	--	--	--	--	--	--	1.300	--	--
PCB 028	PCB 028	NA	NA	NA	NA	--	--	--	--	--	--	3.300	--	--
PCB 031	PCB 031	NA	NA	NA	NA	--	--	--	--	--	--	2.400	--	--
PCB 033	PCB 033	NA	NA	NA	NA	--	--	--	--	--	--	1.900	--	--
PCB 037-042	PCB 037-042	NA	NA	NA	NA	--	--	--	--	--	--	2.500	--	--
PCB 044	PCB 044	NA	NA	NA	NA	--	--	--	--	--	--	2.700	--	--
PCB 049	PCB 049	NA	NA	NA	NA	--	--	--	--	--	--	6.500	--	--
PCB 052	PCB 052	NA	NA	NA	NA	--	--	--	--	--	--	5.300	--	--
PCB 056-060	PCB 056-060	NA	NA	NA	NA	--	--	--	--	--	--	1.100	--	--
PCB 064	PCB 064	NA	NA	NA	NA	--	--	--	--	--	--	1.500	--	--
PCB 066-095	PCB 066-095	NA	NA	NA	NA	--	--	--	--	--	--	5.200	--	--
PCB 070	PCB 070	NA	NA	NA	NA	--	--	--	--	--	--	2.800	--	--
PCB 074	PCB 074	NA	NA	NA	NA	--	--	--	--	--	--	1.100	--	--
PCB 077a-110	PCB 077a-110	NA	NA	NA	NA	--	--	--	--	--	--	8.500	--	--
PCB 084	PCB 084	NA	NA	NA	NA	--	--	--	--	--	--	0.900	--	--
PCB 087	PCB 087	NA	NA	NA	NA	--	--	--	--	--	--	2.300	--	--
PCB 090-101	PCB 090-101	NA	NA	NA	NA	--	--	--	--	--	--	4.900	--	--
PCB 091	PCB 091	NA	NA	NA	NA	--	--	--	--	--	--	0.600	--	--
PCB 092	PCB 092	NA	NA	NA	NA	--	--	--	--	--	--	0.700	--	--
PCB 097	PCB 097	NA	NA	NA	NA	--	--	--	--	--	--	1.400	--	--
PCB 099	PCB 099	NA	NA	NA	NA	--	--	--	--	--	--	2.200	--	--
PCB 105a	PCB 105a	NA	NA	NA	NA	--	--	--	--	--	--	1.300	--	--
PCB 118a	PCB 118a	NA	NA	NA	NA	--	--	--	--	--	--	3.600	--	--
PCB 128	PCB 128	NA	NA	NA	NA	--	--	--	--	--	--	0.600	--	--
PCB 132	PCB 132	NA	NA	NA	NA	--	--	--	--	--	--	1.000	--	--
PCB 138a-163	PCB 138a-163	NA	NA	NA	NA	--	--	--	--	--	--	3.300	--	--
PCB 149	PCB 149	NA	NA	NA	NA	--	--	--	--	--	--	0.700	--	--
PCB 151	PCB 151	NA	NA	NA	NA	--	--	--	--	--	--	0.700	--	--
PCB 153	PCB 153	NA	NA	NA	NA	--	--	--	--	--	--	2.500	--	--
PCB 158a	PCB 158a	NA	NA	NA	NA	--	--	--	--	--	--	0.600	--	--
PCB 170	PCB 170	NA	NA	NA	NA	--	--	--	--	--	--	0.200	--	--
PCB 174	PCB 174	NA	NA	NA	NA	--	--	--	--	--	--	1.000	--	--
PCB 180	PCB 180	NA	NA	NA	NA	--	--	--	--	--	--	0.500	--	--
TOTAL PCBs	TPCB	0.00012	0.000026	NLS	0.00012	ND	ND	ND	ND	<0.2 U	<0.2 U	74	<1 U	<1 U

TABLE 7-4
Sample Analytical Summary - Surface Water and SPMD
Lake Linden Recreation Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Station Name	CASNumber	EPA Region 5 Ecological Screening Level	Rule 57 HCV Drink	Rule 57 HNV Drink	Rule 57 WV	CHLL-SW01	CHLL-SW02	CHLL-SW03	CHLL-SW04	LLV-Beach1	LLV-Creek1	SPMD Site #3	SW-03	
Field Sample ID						CHLL-SW01- 6.7-7.7'	CHLL-SW02-12.5-13.5'	CHLL-SW03-18.4-19.4'	CHLL-SW04-11.5-12.5'	LLV Beach 1	LLV Creek 1	SPMD Site #3	SW-03	SW-03D
Sample Date						5/27/2015	5/27/2015	5/28/2015	5/28/2015	7/26/2007	7/26/2007	11/18/2005	10/12/2011	10/12/2011
Sample Interval						6.7 - 7.7 ft	12.5 - 13.5 ft	18.4 - 19.4 ft	11.5 - 12.5 ft	0 - 0 ft	0 - 0 ft	3 - 3 ft	0 - 6 in	0 - 6 in
Organics - SVOCs (ug/l)														
BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	0.3	25	120	NA	--	--	--	--	<5.0 U	<5.0 U	--	<5 U	3.6 J
Organics - VOCs (ug/l)														
1,4-DICHLOROBENZENE	106-46-7	9.4	24	1,100	NA	--	--	--	--	<5.0 U	<5.0 U	--	0.12 J	<5 U
Other														
pH	PH	NA	NA	NA	NA	--	--	--	--	7.55	7.72	--	--	--

Surface Water Table Footnotes:

- MDEQ Rule 57 values derived from the Michigan Department of Environmental Quality, Water Bureau, Water Resources Protection, filed with the Secretary of State on January 13, 2006. Part 4 Water Quality Standards, Rule 323.1057 Toxic Substances, as amended. Updated on February 27, 2014.
- ESLs are adapted from Appendix A and Appendix B of Michigan Department of Environmental Quality - Remediation and Redevelopment Division Operational Memorandum No. 4 Attachment 3, Interim Final August 2, 2006
- Only detected analytes are listed - Gray rows indicate requested analyses. If no analytes are listed below a gray row then all analytes of that group were either not analyzed or not detected. ND indicates that one or more analyte of that goup was tested and not detected and a -- indicates not analyzed.
- SPMD results are not compared to surface water criteria.
- **Bold** values are concentrations detected above the reporting limit.
- **Shaded values indicate analyte concentration exceed applicable criteria. Color presented is the criteria with the highest value that was exceeded:**

EPA Region 5 RCRA ESLs dated August 22, 2003
MDEQ Rule 57 Water Quality Value, HCV, drinking water source, dated February 27, 2014
MDEQ Rule 57 Water Quality Value, HNV, drinking water source, dated February 27, 2014
MDEQ Rule 57 Water Quality Value, WV, dated February 27, 2014

- = Not analyzed/Not reported
- bgs = below ground surface
- EPA = United States Environmental Protection Agency
- ESL = Ecological Screening Level
- ft = feet
- HCV = Human Non-Cancer Value
- HNV = Human Cancer Value
- in = Inches
- MDEQ = Michigan Department of Environmental Quality
- mS/cm = MilliSiemens per centimeter
- NTU = Nephelometric Turbidity Unit
- PCBs = Polychlorindated biphenyls
- RCRA = Resource Conservation and Recovery Act
- SPMD = Semi-permeable membrane device
- SVOC = Semi-volatile organic compound
- ug/l = Micrograms per liter
- VOC = Volatile organic compound
- WV = Wildlife Value

Criteria Footnotes:

- NA = a criterion or value is not available
- NLS = no literature search has been conducted

Laboratory Footnotes:

- J = estimated result
- ND = not detected
- U = analyte analyzed for but not detected above the reported sample reporting limit.