7. DETAILED FINDINGS REPORT – TAMARACK SANDS AREA

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

7.1 SITE INSPECTION AND INVESTIGATION RESULTS

The implementation of the site inspection and investigation activities provides critical lines of evidence that link the historical documentation and 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 and offshore environment of Torch Lake.

7.1.1 Site Inspection

The site inspection at the Tamarack Sands Area included the inventory and locating of historical structures and similar surficial artifacts associated with the former industrial operations in the area. 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.

On 28 May 2015, a field team comprised of WESTON and Michigan Department of Environmental Quality (MDEQ) personnel performed reconnaissance activities at the majority of the properties in the Tamarack Sands Area. 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.

Six properties or grouped parcels were visually inspected and observations were recorded. The following provides a summary of the findings associated with the reconnaissance activities.

Tamarack Sands Area – Reconnaissance Summary	
Potential Chemical or Physical Hazards	**Recorded Observations**
Suspect Asbestos Containing Material (SACM)	SACM, including asphaltic roofing material was observed in a debris pile and whitish gray fibrous material was observed on and adjacent to a former railroad grade/trail which is a right of way owned by the Michigan Department of Transportation in the study area.
Residual Process Materials (RPM)	The majority of the Tamarack 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	A few abandoned containers, potentially mining era related, were observed in areas not capped by the EPA. The containers were partially buried and in one location present in a marshy area.
Soil Staining/Stressed Vegetation	No barren or stressed areas of the ground surface were documented on the inspected properties, but mining era artifacts and foundations were observed. Areas not capped by EPA are sparsely to heavily vegetated, with some areas of exposed stamp sand. MDEQ personnel observed seeps from potential upland waste deposits of an unknown, but suspect waste material in an EPA-capped area.
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 Structural Voids	Numerous debris mounds, some constructed of mine rock or concrete debris, partially buried pipe segments, stormwater outfalls, concrete piping, metal debris, SACM, abandoned containers, and building debris were observed in the area.

Significant hazards were identified in the Tamarack Sands Area during the reconnaissance activities. Items of concern include abandoned containers, some of which are partially buried and potentially associated with mining era operations; SACM along a trail and present in building debris piles; and seep areas containing suspect, but unknown waste materials from potential upland waste deposits. Field logs documenting reconnaissance observations are included in **Appendix D** of the Site Investigation (SI) Report.

7.1.1.1 Targeted Inspection

The qualitative assessment of the reconnaissance findings in the Tamarack Sands Area warranted the performance of targeted inspection activities. On 29 June 2015 a Weston Solutions of

Michigan, Inc. (WESTON®) field team conducted targeted inspection activities at the Tamarack Sands Area that included the collection of bulk material samples. On 20 and 21 August 2015 a MDEQ Geological Services Unit (GSU) conducted soil and groundwater sampling activities. Sampling activities included the collection of several samples in addition to those defined in the SAP that were based on the recommendations of the reconnaissance activities. The following subsections summarize the findings of these sampling efforts.

7.1.1.1.1 Bulk Material Sampling

Based on the SACM hazards noted during the reconnaissance activities a limited asbestos survey was conducted as part of the SI to identify suspect potentially friable asbestos containing material SACM located in a debris pile and whitish gray fibrous material adjacent to a trail in the study area. The asbestos survey was conducted in open areas of the property and included sampling SACM observed on the ground surface and in debris piles. No significant mining era structures were observed in the vicinity of the sampled materials making the source of the SACM uncertain. The sampling approach used when conducting a traditional asbestos survey is based upon the building's functional spaces and homogeneous areas of intact building materials. These regulatory criteria determine the quantity and location of bulk samples to be collected. Since the asbestos survey was limited to non-intact debris, the traditional asbestos sampling approach could not be directly applied. Although the SACMs were not intact, the quantity of bulk samples collected per similar types of building materials were consistent with the sampling requirements defined in 40 Code of Federal Regulations (CFR) 763.83 "Sampling".

On 29 June 2015, a total of seven bulk samples were collected from three different SACMs in the Tamarack Sands Area. One of the sampled substances was identified as asbestos containing material (ACM) and is summarized as follows:

- White to whitish gray fibrous material (CHTC-ASBBLK09) that was damaged, weathered, and friable, located on and adjacent to a trail/rail road grade that is an MDOT-owned right of way.

During the fall of 2015, MDEQ undertook an emergency interim response to cap the area of observed ACM in the Tamarack Sands Area.

The samples were analyzed in accordance with EPA Method 600/R-93/116, "Method for the Determination of Asbestos in Bulk Building Materials" using Polarized Light Microscopy (PLM). This laboratory analytical method identifies the presence and estimated concentration of asbestos fibers in sampled building materials. The location of bulk asbestos sampling locations collected during the targeted inspection activities are depicted on **Figure 7-1**. A detailed summary of bulk asbestos sample analytical results collected from the Tamarack Sands Area during the targeted inspection are provided in **Table 7-1**. Bulk asbestos sample analytical results are depicted on **Figure 7-2**.

7.1.1.1.2 Soil and Groundwater Sampling

In addition to the collection of bulk material samples, several samples from soil and groundwater in the Tamarack Sands Area were also collected during the targeted inspection activities. On 20 and 21 August 2015, a MDEQ GSU sampling team collected samples from the following locations to assess whether soils and groundwater near identified abandoned containers, mining era structures, points of reported discharge from the Tamarack Processing Area into the Tamarack Sands Area, and seeps from potential upland waste deposits contained contaminants of concern (COCs). The soil and groundwater samples were analyzed for several COCs including PCBs, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), inorganic contaminants, and cyanide.

The following soil and groundwater samples were collected during the targeted inspection in the Tamarack Sands Area:

- Surface soil samples (CHTC-SS01 and CHTC-SS11) were collected in proximity to abandoned containers to ascertain whether COCs had migrated from the containers into surface soils.
- Soil and groundwater samples (CHTC-SB47 and CHTC-GW43) were collected in proximity to mining era structures, a partially buried pipe, to ascertain whether COCs had had been discharged from the pipe into soils or groundwater.
- Soil and groundwater samples (CHTC-SB45, CHTC-SB48, CHTC-GW40, and CHTC-GW44) were collected in the Tamarack Sands Area to ascertain whether COCs associated with waste reportedly discharged in the study area from the Tamarack Processing Area were present in soils or groundwater.

- Soil and groundwater samples (CHTC-SB38 and CHTC-GW33) were collected in an area of the Tamarack Sands Area in proximity to observed seeps from potential upland waste deposits to ascertain whether COCs were present in soils or groundwater.

The targeted inspection soil and groundwater sample locations are depicted on **Figure 7-1**. Investigative methodologies and soil sampling techniques were conducted using the procedures outlined in **Section 3**.

7.1.2 Site Investigation

The SI at the Tamarack 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 Tamarack 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.

7.1.2.1 Terrestrial Investigation

Intrusive investigation activities in the Tamarack 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 Tamarack Sands Area is comprised solely of made lands, formed by the deposition of stamp sands. In addition, areas of the stamp sand deposit were suspected to have been used as disposal locations for other wastes generated during mining era operations. The entire Tamarack Sands Area was capped and vegetated during previous remedial actions completed by the EPA. As such, the upland investigative work in the stamp sand deposit was completed in the vicinity of potential historical disposal areas, including the alleged municipal dump, historical drainage areas, and areas that would have historically been down gradient of former industrial operations. 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 Tamarack Sands Area were advanced to depths between 5 and 25 feet (ft) below the ground surface (bgs). Boring locations are depicted on **Figure 7-1**. Soil observations documented on field logs indicate that in the areas capped by EPA the subsurface is primarily comprised of fine grained stamp sands, dark gray in color. Soil observations in one boring in an EPA-capped location (CHTC-SB45) indicated that the subsurface was primarily comprised of medium to coarse sand, reddish brown in color. Soil observations documented on field logs in areas outside of the EPA-capped area indicate that the subsurface is primarily comprised of top soil underlain by fine to medium to course grained sands, ranging from brown to gray to reddish brown in color with fill noted at one location (CHTC-SB15) beneath the top soil at a depth of 0.5 to 5 ft bgs.

During groundwater sampling, temporary well points were generally established at 5 ft intervals ranging from 6 ft and 11 ft bgs to 25 ft and 30 ft bgs. Saturated soil conditions were generally encountered between depths of 1 ft and 24 ft bgs.

7.1.2.1.2 Soil Sampling Results

Terrestrial investigation activities were completed in the Tamarack Sands Area during two mobilizations. The first round of investigative work was completed on 18 May 2015 and the second on 21 and 22 August 2015. Between the two mobilizations, a total of 28 soil samples including one duplicate soil sample were collected from two surface soil and 14 boring locations.

Fourteen soil borings were advanced to characterize COCs in shallow and deep soils in the Tamarack Sands Area. Soil boring locations included four shallow soil samples, generally ranging from 0 to 6 inches (in.) in depth. The investigation also included the collection of 22 subsurface soil samples ranging from 0.5 ft to 24 ft in depth from the soil borings. During the August 2015 mobilization surface soil samples were collected from two locations to ascertain whether COCs had migrated from containers into surface soils. All samples were analyzed for PCBs. Select samples were also analyzed for other COCs including VOCs, SVOCs, inorganics, cyanide, and asbestos. 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 surface soil, and shallow and subsurface soil analytical results for the Tamarack Sands Area contained a variety of inorganic and cyanide COCs at concentrations at or above applicable regulatory criteria. PCBs were not detected in the SI samples. Historic X-ray fluorescence (XRF) soil screening results for samples from the Tamarack Sands Area did indicate the presence of inorganic COCs at concentrations at or above applicable regulatory criteria.

A detailed summary of soil analytical results collected from the Tamarack Sands Area are provided in **Table 7-2**. XRF soil screening results from the Tamarack Sands Area are depicted on **Figure 7-3**. Soil analytical results from the Tamarack Sands Area are depicted on **Figure 7-4**. Soil boring logs are included in **Appendix G** of this SI Report.

7.1.2.1.3 Groundwater Sampling Results

During the installation of soil borings in the Tamarack Sands Area 14 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 established between 6 ft and 30 ft bgs. A total of 15 groundwater samples including one duplicate sample were collected from the Tamarack Sands Area. Temporary groundwater sampling locations are depicted on **Figure 7-1**.

All groundwater samples were analyzed for PCBs. Select samples were also analyzed for other COCs including VOCs, SVOCs, and inorganics. No COCs were detected at concentrations above applicable regulatory criteria.

A detailed summary of groundwater analytical results collected from the Tamarack Sands Area are provided in **Table 7-3**. Groundwater analytical results from the Tamarack Sands Area are depicted on **Figure 7-5**. 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 Tamarack Sands 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 nearshore 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.

Offshore sediment samples were collected from the Tamarack Sands Area. The following subsections present a summary of the analytical results derived from offshore sampling activities in the Tamarack Sands Area.

7.1.2.2.1 Sediment Sampling Results

Offshore investigation activities were completed in the Tamarack Sands Area between 8 and 12 July 2015. A total of 35 sediment samples including three duplicate sediment samples were collected from 11 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 11 surficial sediment samples, ranging from 0 to 6 in. in depth. The investigation also included the collection of 24 deeper sediment samples, including three duplicate samples ranging from 1 ft to 4.75 ft in depth. All samples were analyzed for PCBs. A subset of sediment samples were selected for inorganic, SVOCs, and cyanide analyses.

The analytical results for sediment samples collected during the SI indicated multiple inorganic COCs and cyanide at concentrations that exceeded applicable regulatory criteria. Total PCBs were not detected in any of the sediment samples collected from the Tamarack Sands Area.

A detailed summary of sediment analytical results collected from the Tamarack Sands Area are provided in **Table 7-4**. Sediment analytical results from the Tamarack Sands Area are depicted on **Figure 7-6**. Sediment core logs are included in **Appendix H** of this 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 Tamarack Sands Area were reviewed and compared to the following regulatory criteria as applicable for the sampled environmental media:

- 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.

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 Tamarack 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 Tamarack Sands Area:

- 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.

- Risks posed by hazardous substances inside buildings or former building substrates.

- Risks posed by hazardous substances that are covered or capped with soil and or a vegetative cover.

- 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 direct contact with these soils in residential settings.

- Risks posed by hazardous substances in 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, t**he 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,

- The study area is part of Operable Unit (OU) 2 for which the EPA Record of Decision (ROD) remedy called for No Action. The EPA's ROD OU 2 includes groundwater, surface water, submerged tailings and sediments in Torch Lake, Portage Lake, the Portage Canal, and other area water bodies. Note that EPA's No Action determination relies on the following to mitigate the effects of stamp sand to the extent practicable:

  – The reduction of stamp sand loading to surface water bodies expected 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 Building Materials, Containers, and Wastes

During the targeted inspection activities completed in the Tamarack Sands Area, one ACM was identified in samples collected from damaged and friable materials. During the fall of 2015, MDEQ undertook an emergency interim response to cap the area of observed ACM on and adjacent to the railroad grade/trail in the Tamarack Sands Area.

The following tables provide an aggregate summary of the sample locations with respect to the total number of samples and how they compare to applicable regulatory criteria. The tables are based solely on the total number of samples, inclusive of historical samples, collected from the Tamarack Sands Area. They list only the number of samples for a specific analytical suite that contained one or more exceedance of a given criterion. Samples collected from residual process materials, drum contents, and waste piles were compared to applicable soil criteria, while bulk asbestos samples were compared to applicable National Emissions Standard for Hazardous Air Pollutants (NESHAP) standards.

Building Materials, Containers, and Wastes Analytical Result Summary	Analytical Summary			Particulate Soil Inhalation Criteria
	Total Number of Samples	Detected Analytes	Total Exceedances	
Asbestos (Bulk)	7	3	3	**3**
COCs exceeding applicable regulatory criteria in one or more sample				Asbestos

7.2.1.2 Soil Exposure Pathway Assessment

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

				Cleanup Criteria Requirements for Response Activity – Residential								
	Analytical Summary			Groundwater Protection		Indoor Air	Ambient Air (Y) (C)				Contact	Csat
Soil Analytical Result Summary Table	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	212	1	0	0	0	0	0	0	0	**1**	0
Cyanide	14	3	3	0	**3**	0	0	0	0	0	0	0
VOCs	11	5	0	0	0	0	0	0	0	0	0	0
SVOCs	13	5	0	0	0	0	0	0	0	0	0	0
Asbestos	2	1	0	0	0	0	0	0	0	0	0	0
Total PCBs	29	0	0	0	0	0	0	0	0	0	0	0
COCs exceeding applicable regulatory criteria in one or more samples				Arsenic, Cyanide								

Soil Analytical Result Summary Table	Analytical Summary			Cleanup Criteria Requirements for Response Activity – Nonresidential								
				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	212	0	0	0	0	0	0	0	0	0	0
Cyanide	14	3	3	0	**3**	0	0	0	0	0	0	0
VOCs	11	5	0	0	0	0	0	0	0	0	0	0
SVOCs	13	5	0	0	0	0	0	0	0	0	0	0
Asbestos	2	1	0	0	0	0	0	0	0	0	0	0
Total PCBs	29	0	0	0	0	0	0	0	0	0	0	0
COCs exceeding applicable regulatory criteria in one or more sample				Cyanide								

7.2.1.3 Groundwater Exposure Pathway Assessment

Groundwater analytical results from the Tamarack Sands 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	59	0	--	--	--	0	0	0	0
Cyanide	0	0	0	0	0	0	0	0	0	0
VOCs	10	2	0	0	0	0	0	0	0	0
SVOCs	10	0	0	0	0	0	0	0	0	0
Total PCBs	15	0	0	0	0	0	0	0	0	0
COCs exceeding applicable regulatory criteria in one or more sample				None						

7.2.1.4 Sediment Exposure Pathway Assessment

Sediment analytical results from the Tamarack Sands 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 Tamarack 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	6	96	14	**6**	**6**	**6**
Cyanide	6	1	1	**1**	0	0
VOCs	0	0	0	0	0	0
SVOCs	5	0	0	0	0	0
Total PCBs	40	0	0	0	0	0
COCs exceeding applicable regulatory criteria in one or more sample				Copper, Cyanide, Nickel, Silver		

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 building materials, soil, and sediment in the Tamarack Sands Area. Recalling 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 Building Materials, Containers, and Wastes Extent of Contamination

Asbestos analytical results for a white to whitish gray fibrous material that was damaged, weathered, and friable, (CHTC-ASBBLK09) confirmed that the material was ACM. This material was located on and adjacent to a railroad grade/trail in the Tamarack Sands Area, adjacent to a residential area, and was subject to migration via wind and water erosion. Asbestos concentrations in the bulk material samples contained asbestos fibers at concentrations greater than 1 percent (%).

The damaged and friable nature of these materials posed a potential risk to human health as it relates to the inhalation pathway. Although, asbestos fibers were not detected in a limited number of soil samples collected from the study area, the weathered condition of the material makes it susceptible to further degradation that could potentially impact surface soils in the Tamarack Sands Area.

The identified risks summarized in the preceding paragraphs, pose potential threats to human and ecological receptors and are a significant factor when evaluating the extent of contamination in the Tamarack Sands Area. During the fall of 2015, MDEQ undertook an emergency interim response to cap the area of observed ACM on and adjacent to the railroad grade/trail in the Tamarack Sands Area.

7.2.2.2 Soil Extent of Contamination

Tamarack Sands Area soil analytical results for a single soil sample from CHTC-SB48 exceeded the Groundwater Surface Water Interface Protection Criteria (GSIPC) for cyanide. Other shallow and subsurface soil analytical results for the Tamarack Sands Area SI did not contain any COCs at concentrations at or above applicable regulatory criteria.

Analytical results for a single SI surface soil sample (CHTC-SS01) collected near an abandoned container exceeded Direct Contact Criteria (DCC) in the residential exposure scenario for arsenic and GSIPC for cyanide. Analytical results for surface soil sample (CHTC-SS11) collected near an abandoned container also exceeded GSIPC for cyanide. Historical surface soil XRF screening results also included measured inorganic contaminant concentrations that exceeded DCC in the residential exposure scenarios in two study area sampling locations.

All samples were collected from surface and subsurface soil intervals generally located within a few feet to 2,200 ft of the shoreline of Torch Lake. The samples were collected from private and governmental owned properties, some of which are unsecured and may be accessible by trespassers.

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 Tamarack Sands Area,

elevated concentrations of inorganic contaminants include exposure risks related to dermal contact pathways, which must be a consideration when evaluating land use, property accessibility, and the extent of contamination in surface and near surface soils.

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 Tamarack Sands Area. Nevertheless, risks posed to groundwater and surface water are significant and are a factor when evaluating the extent of soil contamination in the Tamarack Sands Area.

7.2.2.3 Groundwater Extent of Contamination

Groundwater analytical results indicated that no COCs were detected at concentrations above applicable regulatory criteria. The temporary groundwater sampling locations were established in a zone roughly 400 ft to 2,200 ft to the shoreline of Torch Lake at depths of approximately 6 ft to 30 ft bgs.

The potential risks associated with using groundwater as a drinking water source as well as it's connectivity to nearby surface water bodies should be a consideration in determinations related to the extent of contamination in the Tamarack Sands Area.

7.2.2.4 Sediment Extent of Contamination

Sediment analytical results exceeded ESLs, TEC, and PEC for inorganic contaminants. Sediment samples were generally collected from a zone within 50 ft to 1,000 ft of the shoreline of Torch Lake.

The potential risks associated with inorganic constituents, though prevalent in the region, should be considered when evaluating the extent of sediment contamination in the Tamarack Sands Area.

7.3 CONCLUSIONS AND RECOMMENDATIONS

The analytical results and interpretation summarized in the preceding subsections document human health and ecological risks that are present in the Tamarack Sands Area. The following

subsections provide a synopsis of these findings and a recommended path forward for mitigating these risks in the Tamarack Sands Area.

7.3.1 Conclusions

Environmental impacts in the Tamarack Sands Area are generally characterized by detections of inorganic contaminants and cyanide in soil 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/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:

- Asbestos analytical results for a white to whitish gray fibrous material that was damaged, weathered, and friable, (CHTC-ASBBLK09) confirmed that ACM is present on and adjacent to a trail in the Tamarack Sands Area. This material is located on and adjacent to a trail, adjacent to a residential area, and was subject to migration via wind and water erosion. Asbestos concentrations in the bulk material samples contained asbestos fibers at concentrations greater than 1 %. The damaged and friable nature of these materials posed a potential risk to human health as it relates to the inhalation pathway. Although, asbestos fibers were not detected in a limited number of soil samples collected from the study area, the exposed nature of these material, makes them subject to further degradation that could potentially impact surface soils in the Tamarack Sands Area. During the fall of 2015, MDEQ undertook an emergency interim response to cap the area of observed ACM on and adjacent to the trail in the Tamarack Sands Area. Provided the remedial measures are maintained properly, the risk from the observed ACM on and adjacent to the trail would be minimized.

- Soil analytical results for a single soil sample exceeded the GSIPC for cyanide. Other shallow and subsurface soil analytical results for the Tamarack Sands Area SI did not contain any COCs at concentrations at or above applicable regulatory criteria.

- Analytical results for a single SI surface soil sample collected near an abandoned container exceeded DCC in the residential exposure scenario for arsenic and GSIPC for cyanide. Analytical results for one other surface soil sample collected near an abandoned container also exceeded GSIPC for cyanide.

- Historical surface soil XRF screening results also included measured inorganic contaminant concentrations that exceeded DCC in the residential exposure scenarios in two study area sampling locations.

- Sediment analytical results exceeded ESLs, TECs, and PECs 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 Tamarack Sands Area.

Tamarack Sands Area – Media, Criteria, Potential Receptor Summary

Media	Soil			Groundwater			Air		Sediment	Surface Water		Building Materials, Asbestos, and Abandoned Containers			
Criteria / Potential Receptor	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
Residential Human		✓	✓									✓		✓	
Nonresidential Human		✓										✓		✓	
Water Column Organism									✓						
Benthic Organism									✓						
COCs exceeding applicable regulatory criteria in one or more sample	Arsenic, Copper, Cyanide, Nickel, Silver, Asbestos														

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 Tamarack Sands 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 COCs, cyanide, and asbestos in the study area. During the fall of 2015, MDEQ undertook an emergency interim response to cap the area of observed ACM on and adjacent to the trail in the Tamarack Sands Area. Provided the remedial measures are maintained properly, the risk from the observed ACM would be minimized;

- No in-lake or terrestrial uncharacterized waste deposits were identified in the study area; and,

- Industrial ruins, including piping and other structures are present. Numerous debris mounds, some constructed of mine rock or concrete debris, partially buried pipe segments, stormwater outfalls, concrete piping, metal debris, ACM, abandoned containers, and building debris were also observed in the area.

7.3.2 Recommendations

The conclusions outlined in the preceding subsection establish that the Tamarack Sands Area is a 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 by the EPA on the majority of the study area and MDEQ's capping of the observed ACM to address these environmental issues. A summary of the remedial measures undertaken by MDEQ to cap the area of observed ACM should be provided to the property owner.

Additional characterization of the seeps associated with potential upland waste deposits observed by MDEQ GSU staff is warranted.

Based on the results of the SI and to ensure compliance with regulatory statutes, 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 RRD Superfund Section (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.

SECTION 7

DETAILED FINDINGS REPORT – TAMARACK SANDS AREA TABLES

TABLE 7-1
Sample Analytical Summary - Bulk Asbestos
Tamarack Sands Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Sample Location	Field Sample ID	Sample Date	Asbestos	Note
CHTC-ASBBLK09A	**CHTC-ASBBLK09A-062915**	**6/29/2015**	**60 %**	**chrysotile**
CHTC-ASBBLK09B	**CHTC-ASBBLK09B-062915**	**6/29/2015**	**70 %**	**chrysotile**
CHTC-ASBBLK09C	**CHTC-ASBBLK09C-062915**	**6/29/2015**	**70 %**	**chrysotile**
CHTC-ASBBLK10A	CHTC-ASBBLK10A-062915	6/29/2015	ND	
CHTC-ASBBLK10B	CHTC-ASBBLK10B-062915	6/29/2015	ND	
CHTC-ASBBLK10C	CHTC-ASBBLK10C-062915	6/29/2015	ND	
CHTC-ASBBLK11A	CHTC-ASBBLK11A-062915	6/29/2015	ND	

ND = Not detected

Results greater than the National Emissions Standard for Hazardous Air Pollutants (NESHAP) and MDEQ Particulate Soil Inhalation Criteria of 1% are highlighted yellow

TABLE 7-2
Sample Analytical Summary - Soil
Tamarack 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	CHTC-SB15		CHTC-SB34		CHTC-SB35	CHTC-SB36		CHTC-SB37
Field Sample ID									CHTC-SB-15-0-6''	CHTC-SB-15-6''-5'	CHTC-SB-34-0-6''	CHTC-SB-34-6''-2'	CHTC - SB - 35 - 0-6''	CHTC - SB - 36 - 12''-18''	CHTC - SB - 36 - 18''-4'	CHTC - SB - 37 - 6''-12''
Sample Date:									5/18/2015	5/18/2015	5/18/2015	5/18/2015	8/22/2015	8/22/2015	8/22/2015	8/22/2015
Sample Interval (bgs):									0 - 0.5 ft	0.5 - 5 ft	0 - 0.5 ft	0.5 - 2 ft	0 - 0.5 ft	1 - 1.5 ft	1.5 - 4 ft	0.5 - 1 ft
Sample Description:									TOPSOIL	FILL, Sand and gravel to 4.5 ft; SAND, Fine grained, Brown to 5 ft	TOPSOIL to .5 ft, SAND, Medium, reddish brown, saturated at 4 ft	SAND, Medium, reddish brown, saturated at 4 ft	SAND, Fine to medium, dark gray, saturated at 1 foot	CLAY CAP to .5 ft; SAND, Fine, dark gray, saturated at 4 ft.	SAND, Fine, dark gray, saturated at 4 ft.	CLAY CAP to .5 ft; SAND, Fine, dark gray, saturated at 1 ft.
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	--	--	--	--	--	--	--	--
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)	--	--	--	--	--	--	--	--
LITHIUM	7439-93-2	9.8 (B)	9.8 (B)	2.3E+06	4,200 (DD)	9.8 (B)	1,000,000	31,000 (DD)	--	--	--	--	--	--	--	--
MAGNESIUM	7439-95-4	8,000	NA	6.7E+06	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	--	--	--	--	--	--	--	--
SILVER	7440-22-4	4.5	1.0 (M)	6,700	2,500	13	2,900	9,000	--	--	--	--	--	--	--	--
ZINC	7440-66-6	2,400	62 (G)	ID	170,000	5,000	ID	630,000	--	--	--	--	--	--	--	--
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																
									ND	ND	ND	ND	ND	ND	ND	ND
Organics - SVOCs (ug/kg)																
FLUORANTHENE	206-44-0	730,000	5,500	9.3E+09	4.6E+07	730,000	4.1E+09	1.3E+08	--	--	--	--	--	--	<220 U	--
PHENANTHRENE	85-01-8	56,000	2,100	6.7E+06	1.6E+06	160,000	2.9E+06	5.2E+06	--	--	--	--	--	--	<220 U	--
PYRENE	129-00-0	480,000	ID	6.7E+09	2.9E+07	480,000	2.9E+09	8.4E+07	--	--	--	--	--	--	<220 U	--
Organics - VOCs (ug/kg)																
1,2,4-TRIMETHYLBENZENE (I)	95-63-6	2,100	570	8.2E+10	3.2E+07 (C)	2,100	3.6E+10	1E+08 (C)	--	--	--	--	--	--	--	--
O-XYLENE	95-47-6	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	--	--	--
TOLUENE (I)	108-88-3	16,000	5,400	2.7E+10	5E+07 (C)	16,000	1.2E+10	1.6E+08 (C)	--	--	--	--	--	--	--	--
XYLENE - TOTAL (I)	--	5,600	820	2.9E+11	4.1E+08 (C)	5600	1.3E+11	1E+09	--	--	--	--	--	--	--	--
Asbestos (%)																
ASBESTOS	ASB	NLL	NLL	1.0 (BB)	ID	NLL	1.0 (BB)	ID	ND	--	--	--	**<0.25 - CHRYSOTILE**	--	--	--

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

TABLE 7-2
Sample Analytical Summary - Soil
Tamarack 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	CHTC-SB38		CHTC-SB39	CHTC-SB40	
Field Sample ID									CHTC - SB - 38 - 6"-12"	CHTC - SB - 38 - 1'-17'	CHTC - SB - 39 - 6"-12"	CHTC - SB - 40 - 6"-12"	CHTC - SB - 40 - 1'-13'
Sample Date:									8/22/2015	8/22/2015	8/22/2015	8/22/2015	8/22/2015
Sample Interval (bgs):									0.5 - 1 ft	1 - 17 ft	0.5 - 1 ft	0.5 - 1 ft	1 - 13 ft
Sample Description:									CLAY CAP to .5 ft; SAND, Fine, dark gray, saturated at 17 ft.	SAND, Fine, dark gray, saturated at 17 ft.	CLAY CAP to .5 ft; SAND, Fine, dark gray, saturated at 1 ft.	CLAY CAP to .5 ft; SAND, Fine, dark gray, saturated at 13 ft.	SAND, Fine, dark gray, saturated at 13 ft.
Inorganics - Metals (mg/kg)													
ALUMINUM	7429-90-5	6,900 (B)	NA	ID	50,000 (DD)	6,900 (B)	ID	370,000 (DD)	**11000**	**14000**	--	--	--
ANTIMONY	7440-36-0	4.3	1.2 (X)	13,000	180	4.3	5,900	670	<0.3 U	<0.3 U	--	--	--
ARSENIC	7440-38-2	4.6	4.6	720	7.6	4.6	910	37	**1.4**	<5.0 U	--	--	--
BARIUM	7440-39-3	1,300 (G)	130	330,000	37,000	1,300	150,000	130,000	<10 UJ	**24 J**	--	--	--
BERYLLIUM	7440-41-7	51	4.6 (G)	1,300	410	51	590	1,600	**0.6**	<2.0 U	--	--	--
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	--	--	--
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)	**26**	**33**	--	--	--
COBALT	7440-48-4	0.8	2.0	13,000	2,600	2.0	5,900	9,000	**15**	**21**	--	--	--
COPPER	7440-50-8	5,800	32 (G)	130,000	20,000	5,800	59,000	73,000	**830**	**830**	--	--	--
IRON	7439-89-6	12,000 (B)	NA	ID	160,000	12,000 (B)	ID	580,000	**18000 J**	**21000 J**	--	--	--
LEAD	7439-92-1	700	1,900 (G,X)	100,000	400	700	44,000	900 (DD)	<10 U	<10 U	--	--	--
LITHIUM	7439-93-2	9.8 (B)	9.8 (B)	2.3E+06	4,200 (DD)	9.8 (B)	1,000,000	31,000 (DD)	**4.7**	**4.7**	--	--	--
MAGNESIUM	7439-95-4	8,000	NA	6.7E+06	1,000,000 (D)	22,000	2,900,000	1,000,000 (D)	**11000**	**13000**	--	--	--
MANGANESE	7439-96-5	440 (B)	440 (B,G,X)	3,300	25,000	440 (B)	1,500	90,000	**270**	**330**	--	--	--
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	<0.05 U	--	--	--
NICKEL	7440-02-0	100	29 (G)	13,000	40,000	100	16,000	150,000	**29**	**31**	--	--	--
SILVER	7440-22-4	4.5	1.0 (M)	6,700	2,500	13	2,900	9,000	**0.7**	**0.7**	--	--	--
ZINC	7440-66-6	2,400	62 (G)	ID	170,000	5,000	ID	630,000	**45**	**63**	--	--	--
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	<0.11 U	--	--	--
Organics - PCBs													
									ND	ND	ND	ND	ND
Organics - SVOCs (ug/kg)													
FLUORANTHENE	206-44-0	730,000	5,500	9.3E+09	4.6E+07	730,000	4.1E+09	1.3E+08	<210 U	<220 U	--	--	--
PHENANTHRENE	85-01-8	56,000	2,100	6.7E+06	1.6E+06	160,000	2.9E+06	5.2E+06	<210 U	<220 U	--	--	--
PYRENE	129-00-0	480,000	ID	6.7E+09	2.9E+07	480,000	2.9E+09	8.4E+07	<210 U	<220 U	--	--	--
Organics - VOCs (ug/kg)													
1,2,4-TRIMETHYLBENZENE (I)	95-63-6	2,100	570	8.2E+10	3.2E+07 (C)	2,100	3.6E+10	1E+08 (C)	<59 U	<61 U	--	--	--
O-XYLENE	95-47-6	NA	NA	NA	NA	NA	NA	NA	<59 U	<61 U	--	--	--
TOLUENE (I)	108-88-3	16,000	5,400	2.7E+10	5E+07 (C)	16,000	1.2E+10	1.6E+08 (C)	<59 U	<61 U	--	--	--
XYLENE - TOTAL (I)	--	5,600	820	2.9E+11	4.1E+08 (C)	5600	1.3E+11	1E+09	ND	ND	--	--	--
Asbestos (%)													
ASBESTOS	ASB	NLL	NLL	1.0 (BB)	ID	NLL	1.0 (BB)	ID	--	--	--	--	--

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

TABLE 7-2
Sample Analytical Summary - Soil
Tamarack 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	CHTC-SB41			CHTC-SB42		CHTC-SB43	
Field Sample ID									CHTC - SB - 41 - 6"-12"	CHTC - SB - 41 - 1'-17'	CHTC - SB - 41 - 1'-17' DUP	CHTC - SB42 - 6"-12"	CHTC - SB - 42 - 1'-7'	CHTC - SB43 - 6"-12"	CHTC - SB43 - 1'-5'
Sample Date:									8/22/2015	8/22/2015	8/22/2015	8/21/2015	8/21/2015	8/21/2015	8/21/2015
Sample Interval (bgs):									0.5 - 1 ft	1 - 17 ft	1 - 17 ft	0.5 - 1 ft	1 - 7 ft	0.5 - 1 ft	1 - 5 ft
Sample Description:									CLAY CAP to .5 ft; SAND, Fine, dark gray, saturated at 17 ft.	SAND, Fine, dark gray, saturated at 17 ft.	Field Duplicate	CLAY CAP to .5 ft; SAND, Fine, dark gray, saturated at 7 ft.	SAND, Fine, dark gray, saturated at 7 ft.	CLAY CAP to .5 ft; SAND, Fine, dark gray, saturated at 5 ft.	SAND, Fine, dark gray, saturated at 5 ft.
Inorganics - Metals (mg/kg)															
ALUMINUM	7429-90-5	6,900 (B)	NA	ID	50,000 (DD)	6,900 (B)	ID	370,000 (DD)	**14000**	**13000**	**14000**	--	--	**15000**	**16000**
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
ARSENIC	7440-38-2	4.6	4.6	720	7.6	4.6	910	37	**2.0**	**2.4**	<5.0 U	--	--	<5.0 U	<5.0 U
BARIUM	7440-39-3	1,300 (G)	130	330,000	37,000	1,300	150,000	130,000	**11 J**	<10 UJ	**11 J**	--	--	**9.2**	**9.0**
BERYLLIUM	7440-41-7	51	4.6 (G)	1,300	410	51	590	1,600	**0.3**	**0.3**	<2.0 U	--	--	<2.0 U	<2.0 U
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
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)	**32**	**30**	**35**	--	--	**28**	**29**
COBALT	7440-48-4	0.8	2.0	13,000	2,600	2.0	5,900	9,000	**20**	**19**	**21**	--	--	**17**	**19**
COPPER	7440-50-8	5,800	32 (G)	130,000	20,000	5,800	59,000	73,000	**950**	**860**	**800**	--	--	**500**	**510**
IRON	7439-89-6	12,000 (B)	NA	ID	160,000	12,000 (B)	ID	580,000	**22000 J**	**21000 J**	**21000 J**	--	--	**17000 J**	**18000 J**
LEAD	7439-92-1	700	1,900 (G,X)	100,000	400	700	44,000	900 (DD)	<10 U	<10 U	<10 U	--	--	**1.3**	**1.2**
LITHIUM	7439-93-2	9.8 (B)	9.8 (B)	2.3E+06	4,200 (DD)	9.8 (B)	1,000,000	31,000 (DD)	**4.8**	**4.6**	**4.6**	--	--	**4.1**	**4.2**
MAGNESIUM	7439-95-4	8,000	NA	6.7E+06	1,000,000 (D)	22,000	2,900,000	1,000,000 (D)	**14000**	**13000**	**13000**	--	--	**12000**	**12000**
MANGANESE	7439-96-5	440 (B)	440 (B,G,X)	3,300	25,000	440 (B)	1,500	90,000	**310**	**290**	**320**	--	--	**300**	**320**
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	<0.05 U	<0.05 U	--	--	<0.05 U	<0.06 U
NICKEL	7440-02-0	100	29 (G)	13,000	40,000	100	16,000	150,000	**32**	**30**	**34**	--	--	**36**	**38**
SILVER	7440-22-4	4.5	1.0 (M)	6,700	2,500	13	2,900	9,000	**0.7**	**0.7**	**0.6**	--	--	**0.7**	**0.5**
ZINC	7440-66-6	2,400	62 (G)	ID	170,000	5,000	ID	630,000	**71**	**69**	**69**	--	--	**56**	**59**
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)	<0.10 U	<0.11 U	<0.11 U	--	--	<0.10 U	<0.11 U
Organics - PCBs															
									ND	ND	ND	ND	ND	ND	ND
Organics - SVOCs (ug/kg)															
FLUORANTHENE	206-44-0	730,000	5,500	9.3E+09	4.6E+07	730,000	4.1E+09	1.3E+08	--	--	--	--	--	<210 U	<220 U
PHENANTHRENE	85-01-8	56,000	2,100	6.7E+06	1.6E+06	160,000	2.9E+06	5.2E+06	--	--	--	--	--	<210 U	<220 U
PYRENE	129-00-0	480,000	ID	6.7E+09	2.9E+07	480,000	2.9E+09	8.4E+07	--	--	--	--	--	<210 U	<220 U
Organics - VOCs (ug/kg)															
1,2,4-TRIMETHYLBENZENE (I)	95-63-6	2,100	570	8.2E+10	3.2E+07 (C)	2,100	3.6E+10	1E+08 (C)	--	--	--	--	--	<57 UJ	<61 U
O-XYLENE	95-47-6	NA	NA	NA	NA	NA	NA	NA	--	--	--	--	--	<57 UJ	<61 U
TOLUENE (I)	108-88-3	16,000	5,400	2.7E+10	5E+07 (C)	16,000	1.2E+10	1.6E+08 (C)	--	--	--	--	--	<57 UJ	<61 U
XYLENE - TOTAL (I)	--	5,600	820	2.9E+11	4.1E+08 (C)	5600	1.3E+11	1E+09	--	--	--	--	--	ND	ND
Asbestos (%)															
ASBESTOS	ASB	NLL	NLL	1.0 (BB)	ID	NLL	1.0 (BB)	ID	--	--	--	--	--	--	--

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

TABLE 7-2
Sample Analytical Summary - Soil
Tamarack 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	CHTC-SB45		CHTC-SB47		CHTC-SB48	
Field Sample ID									CHTC - SB - 45 - 15''-21''	CHTC - SB - 45 - 21''-8'	CHTC - SB - 47 - 0-6''	CHTC - SB - 47 - 6''-5'	CHTC - SB48 - 12''-18''	CHTC - SB48 - 18''-24'
Sample Date:									8/22/2015	8/22/2015	8/22/2015	8/22/2015	8/21/2015	8/21/2015
Sample Interval (bgs):									1.25 - 1.75 ft	1.75 - 8 ft	0 - 0.5 ft	0.5 - 5 ft	1 - 1.5 ft	1.5 - 24 ft
Sample Description:									CLAY CAP to 1.25 ft; SAND, Medium to coarse, reddish brown, saturated at 8 ft.	SAND; Medium to coarse, reddish brown, saturated at 8 ft.	SAND; Medium to coarse, dark gray, saturated at 15 ft.	SAND; Medium to coarse, dark gray, saturated at 15 ft.	CLAY CAP to 1 ft; SAND, Fine grained, Dark gray.	SAND, Fine grained, dark gray to 14 ft; SAND, Fine to medium, reddish brown, saturated at 24 ft.
Inorganics - Metals (mg/kg)														
ALUMINUM	7429-90-5	6,900 (B)	NA	ID	50,000 (DD)	6,900 (B)	ID	370,000 (DD)	**13000**	**8600**	**11000**	**5100**	**14000**	**10000**
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**
ARSENIC	7440-38-2	4.6	4.6	720	7.6	4.6	910	37	<5.0 U	<5.0 U	<5.0 U	<5.0 U	**2.1**	<5.0 U
BARIUM	7440-39-3	1,300 (G)	130	330,000	37,000	1,300	150,000	130,000	**12 J**	**14 J**	**24 J**	**29 J**	**19 J**	**23**
BERYLLIUM	7440-41-7	51	4.6 (G)	1,300	410	51	590	1,600	<2.0 U	<2.0 U	<2.0 U	<2.0 U	**0.4**	<2.0 U
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**	<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)	**31**	**24**	**30**	<20 U	**40**	**26**
COBALT	7440-48-4	0.8	2.0	13,000	2,600	2.0	5,900	9,000	**21**	**16**	**19**	**7.1**	**17**	**15**
COPPER	7440-50-8	5,800	32 (G)	130,000	20,000	5,800	59,000	73,000	**1200**	**3700**	**1500**	**1300**	**1600**	**4000**
IRON	7439-89-6	12,000 (B)	NA	ID	160,000	12,000 (B)	ID	580,000	**18000 J**	**16000 J**	**18000 J**	**11000 J**	**22000 J**	**15000 J**
LEAD	7439-92-1	700	1,900 (G,X)	100,000	400	700	44,000	900 (DD)	<10 U	<10 U	**17**	**18**	**13**	**14**
LITHIUM	7439-93-2	9.8 (B)	9.8 (B)	2.3E+06	4,200 (DD)	9.8 (B)	1,000,000	31,000 (DD)	**4.2**	**4.6**	**5.2**	**4.1**	**5.3**	**5.0**
MAGNESIUM	7439-95-4	8,000	NA	6.7E+06	1,000,000 (D)	22,000	2,900,000	1,000,000 (D)	**13000**	**11000**	**12000**	**4300**	**13000**	**11000**
MANGANESE	7439-96-5	440 (B)	440 (B,G,X)	3,300	25,000	440 (B)	1,500	90,000	**320**	**270**	**290**	**160**	**330**	**300**
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	<0.05 U	<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	**43**	**29**	**31**	**14**	**29**	**33**
SILVER	7440-22-4	4.5	1.0 (M)	6,700	2,500	13	2,900	9,000	**0.7**	**1.1**	**2.2**	**0.5**	**0.9**	**0.9**
ZINC	7440-66-6	2,400	62 (G)	ID	170,000	5,000	ID	630,000	**57**	**64**	**170**	**73**	**70**	**85**
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)	<0.10 U	--	<0.11 U	<0.12 U	**0.16**	<0.11 U
Organics - PCBs														
									ND	ND	ND	ND	ND	ND
Organics - SVOCs (ug/kg)														
FLUORANTHENE	206-44-0	730,000	5,500	9.3E+09	4.6E+07	730,000	4.1E+09	1.3E+08	<210 U	<210 U	**220**	**260**	<210 U	**230**
PHENANTHRENE	85-01-8	56,000	2,100	6.7E+06	1.6E+06	160,000	2.9E+06	5.2E+06	<210 U	<210 U	<220 U	<250 U	<210 U	**220**
PYRENE	129-00-0	480,000	ID	6.7E+09	2.9E+07	480,000	2.9E+09	8.4E+07	<210 U	<210 U	<220 U	<250 U	<210 U	**280**
Organics - VOCs (ug/kg)														
1,2,4-TRIMETHYLBENZENE (I)	95-63-6	2,100	570	8.2E+10	3.2E+07 (C)	2,100	3.6E+10	1E+08 (C)	<57 U	<57 U	**110**	<76 U	<55 U	<68 UJ
O-XYLENE	95-47-6	NA	NA	NA	NA	NA	NA	NA	<57 U	<57 U	**130**	<76 U	<55 U	<68 UJ
TOLUENE (I)	108-88-3	16,000	5,400	2.7E+10	5E+07 (C)	16,000	1.2E+10	1.6E+08 (C)	<57 U	<57 U	**84**	**370**	<55 U	<68 UJ
XYLENE - TOTAL (I)	--	5,600	820	2.9E+11	4.1E+08 (C)	5600	1.3E+11	1E+09	ND	ND	**130**	ND	ND	ND
Asbestos (%)														
ASBESTOS	ASB	NLL	NLL	1.0 (BB)	ID	NLL	1.0 (BB)	ID	--	--	--	--	--	--

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

TABLE 7-2
Sample Analytical Summary - Soil
Tamarack 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	CHTC-SS01	CHTC-SS11	Hub-S1-12
Field Sample ID									CHTC - SS01 - 3''-9''	CHTC - SS - 11 - 0-6''	HubS1-12
Sample Date:									8/20/2015	8/22/2015	9/12/2007
Sample Interval (bgs):									0.25 - 0.75 ft	0 - 0.5 ft	0 - 0 ft
Sample Description:									Surface Soil Sample	Surface Soil Sample	--
Inorganics - Metals (mg/kg)											
ALUMINUM	7429-90-5	6,900 (B)	NA	ID	50,000 (DD)	6,900 (B)	ID	370,000 (DD)	**8400**	**14000**	**15000**
ANTIMONY	7440-36-0	4.3	1.2 (X)	13,000	180	4.3	5,900	670	<0.3 U	**0.6**	--
ARSENIC	7440-38-2	4.6	4.6	720	7.6	4.6	910	37	**16**	<5.0 U	**4.8**
BARIUM	7440-39-3	1,300 (G)	130	330,000	37,000	1,300	150,000	130,000	**95**	**65 J**	--
BERYLLIUM	7440-41-7	51	4.6 (G)	1,300	410	51	590	1,600	**0.3**	<2.0 U	<4.5 U
CADMIUM	7440-43-9	6.0	1.6 (G,X)	1,700	550	6.0	2,200	2,100	**0.3**	**0.3**	--
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)	<20 U	**36**	**24**
COBALT	7440-48-4	0.8	2.0	13,000	2,600	2.0	5,900	9,000	**12**	**16**	**21**
COPPER	7440-50-8	5,800	32 (G)	130,000	20,000	5,800	59,000	73,000	**1300**	**560**	**6000**
IRON	7439-89-6	12,000 (B)	NA	ID	160,000	12,000 (B)	ID	580,000	**2100 J**	**24000 J**	--
LEAD	7439-92-1	700	1,900 (G,X)	100,000	400	700	44,000	900 (DD)	**14**	**66**	**11**
LITHIUM	7439-93-2	9.8 (B)	9.8 (B)	2.3E+06	4,200 (DD)	9.8 (B)	1,000,000	31,000 (DD)	**4.1**	**11**	**12**
MAGNESIUM	7439-95-4	8,000	NA	6.7E+06	1,000,000 (D)	22,000	2,900,000	1,000,000 (D)	**9700**	**10000**	--
MANGANESE	7439-96-5	440 (B)	440 (B,G,X)	3,300	25,000	440 (B)	1,500	90,000	**560**	**470**	**320**
MERCURY	7439-97-6	1.7 (Z)	0.13 (B, Z)	20000 (Z)	160 (Z)	1.7 (Z)	8800 (Z)	580 (Z)	<0.3 U	**0.3**	**0.0036 J**
NICKEL	7440-02-0	100	29 (G)	13,000	40,000	100	16,000	150,000	**24**	**33**	**39**
SILVER	7440-22-4	4.5	1.0 (M)	6,700	2,500	13	2,900	9,000	**1.4**	**0.5**	**0.99**
ZINC	7440-66-6	2,400	62 (G)	ID	170,000	5,000	ID	630,000	**100**	**150**	**95**
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)	**0.69**	**0.17**	--
Organics - PCBs											
									ND	ND	ND
Organics - SVOCs (ug/kg)											
FLUORANTHENE	206-44-0	730,000	5,500	9.3E+09	4.6E+07	730,000	4.1E+09	1.3E+08	<3100 U	<2400 U	--
PHENANTHRENE	85-01-8	56,000	2,100	6.7E+06	1.6E+06	160,000	2.9E+06	5.2E+06	<3100 U	<2400 U	--
PYRENE	129-00-0	480,000	ID	6.7E+09	2.9E+07	480,000	2.9E+09	8.4E+07	<3100 U	<2400 U	--
Organics - VOCs (ug/kg)											
1,2,4-TRIMETHYLBENZENE (I)	95-63-6	2,100	570	8.2E+10	3.2E+07 (C)	2,100	3.6E+10	1E+08 (C)	<710 U	--	--
O-XYLENE	95-47-6	NA	NA	NA	NA	NA	NA	NA	<710 U	--	--
TOLUENE (I)	108-88-3	16,000	5,400	2.7E+10	5E+07 (C)	16,000	1.2E+10	1.6E+08 (C)	<710 U	--	--
XYLENE - TOTAL (I)	--	5,600	820	2.9E+11	4.1E+08 (C)	5600	1.3E+11	1E+09	ND	--	--
Asbestos (%)											
ASBESTOS	ASB	NLL	NLL	1.0 (BB)	ID	NLL	1.0 (BB)	ID	--	--	--

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

TABLE 7-2
Sample Analytical Summary - Soil
Tamarack 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 group 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
% = Percent

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.

(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 of drinking water can only be used at sites where groundwater is prevented from being used as a public water supply, currently and in the future, through an approved land or resource use restriction.

(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.

(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.

(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 7-3
Sample Analytical Summary - Groundwater
Tamarack 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	CHTC-GW11	CHTC-GW29	CHTC-GW30	CHTC-GW31		CHTC-GW32
Field Sample ID									CHTC-GW-11-10'-15'	CHTC-GW-29-10'-15'	CHTC - GW - 30 - 7'-12'	CHTC - GW - 31 - 10'-15'	CHTC - GW - 31 - 10'-15' DUP	CHTC - GW - 32 - 6'-10'
Sample Date									5/18/2015	5/18/2015	8/22/2015	8/22/2015	8/22/2015	8/22/2015
Sample Interval (bgs)									10 - 15 ft	10 - 15 ft	7 - 12 ft	10 - 15 ft	10 - 15 ft	6 - 10 ft
Sample Description									--	--	--	--	Field Duplicate	--
Inorganics - Metals (ug/l)														
ALUMINUM	7429-90-5	50 (V)	50 (V)	NA	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	--	--	--	--	--	--
CADMIUM	7440-43-9	5.0 (A)	5.0 (A)	1.3 (G,X)	NLV	NLV	NA	ID	--	--	--	--	--	--
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	--	--	--	--	--	--
LITHIUM	7439-93-2	170	350	440	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	--	--	--	--	--	--
SILVER	7440-22-4	34	98	0.2 (M)	NLV	NLV	NA	ID	--	--	--	--	--	--
ZINC	7440-66-6	2,400	5,000 (E)	63 (G)	NLV	NLV	NA	ID	--	--	--	--	--	--
Organics - PCBs														
									ND	ND	ND	ND	ND	ND
Organics - SVOCs														
									ND	ND	ND	ND	ND	ND
Organics - VOCs (ug/l)														
ISOPROPYLBENZENE	98-82-8	800	2,300	28	56,000 (S)	56,000 (S)	56,000	29,000	<1.0 U	<1.0 U	<1.0 UJ	<1.0 U	<1.0 UJ	<1.0 UJ
P-ISOPROPYL TOLUENE (p-CYMENE)	99-87-6	NA	NA	NA	NA	NA	NA	NA	<1.0 U	<1.0 U	<1.0 UJ	<1.0 U	<1.0 UJ	<1.0 UJ

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

TABLE 7-3
Sample Analytical Summary - Groundwater
Tamarack 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	CHTC-GW33	CHTC-GW34	CHTC-GW35	CHTC-GW36	CHTC-GW37	CHTC-GW38
Field Sample ID									CHTC - GW - 33 - 21'-25'	CHTC - GW - 34 - 6'-10'	CHTC - GW - 35 - 16'-21'	CHTC - GW - 36 - 20-25'	CHTC - GW - 37 - 9-13'	CHTC - GW - 38 - 6'-10'
Sample Date									8/22/2015	8/22/2015	8/22/2015	8/22/2015	8/21/2015	8/21/2015
Sample Interval (bgs)									21 - 25 ft	6 - 10 ft	16 - 21 ft	20 - 25 ft	9 - 13 ft	6 - 10 ft
Sample Description									--	--	--	--	--	--
Inorganics - Metals (ug/l)														
ALUMINUM	7429-90-5	50 (V)	50 (V)	NA	NLV	NLV	NA	ID	**16000**	--	--	--	--	--
ARSENIC	7440-38-2	10 (A)	10 (A)	10	NLV	NLV	NA	ID	**8.3**	--	--	--	--	--
BARIUM	7440-39-3	2,000 (A)	2,000 (A)	200 (G)	NLV	NLV	NA	ID	**65**	--	--	--	--	--
BERYLLIUM	7440-41-7	4.0 (A)	4.0 (A)	0.36 (G)	NLV	NLV	NA	ID	<1.0 U	--	--	--	--	--
CADMIUM	7440-43-9	5.0 (A)	5.0 (A)	1.3 (G,X)	NLV	NLV	NA	ID	<0.2 U	--	--	--	--	--
CHROMIUM	7440-47-3	100 (A,H)	100 (A,H)	40 (G,H,X)	NLV	NLV	NA	ID	**38**	--	--	--	--	--
COBALT	7440-48-4	40	100	100	NLV	NLV	NA	ID	**20**	--	--	--	--	--
COPPER	7440-50-8	1,000 (E)	1,000 (E)	4.7 (G)	NLV	NLV	NA	ID	**1000**	--	--	--	--	--
IRON	7439-89-6	300 (E)	300 (E)	NA	NLV	NLV	NA	ID	**14000**	--	--	--	--	--
LEAD	7439-92-1	4.0 (L)	4.0 (L)	11 (G,X)	NLV	NLV	NA	ID	**2.8**	--	--	--	--	--
LITHIUM	7439-93-2	170	350	440	NLV	NLV	NA	ID	<10 U	--	--	--	--	--
MAGNESIUM	7439-95-4	400,000	1,100,000	NA	NLV	NLV	NA	ID	**20000**	--	--	--	--	--
MANGANESE	7439-96-5	50 (E)	50 (E)	1,000 (G,X)	NLV	NLV	NA	ID	**420**	--	--	--	--	--
MERCURY	7439-97-6	2.0 (A)	2.0 (A)	0.0013	56 (S)	56 (S)	56	ID	<0.2 U	--	--	--	--	--
NICKEL	7440-02-0	100 (A)	100 (A)	28 (G)	NLV	NLV	NA	ID	**36**	--	--	--	--	--
SILVER	7440-22-4	34	98	0.2 (M)	NLV	NLV	NA	ID	**0.8**	--	--	--	--	--
ZINC	7440-66-6	2,400	5,000 (E)	63 (G)	NLV	NLV	NA	ID	**140**	--	--	--	--	--
Organics - PCBs														
									ND	ND	ND	ND	ND	ND
Organics - SVOCs														
									ND	--	--	--	--	--
Organics - VOCs (ug/l)														
ISOPROPYLBENZENE	98-82-8	800	2,300	28	56,000 (S)	56,000 (S)	56,000	29,000	<1.0 U	--	--	--	--	--
P-ISOPROPYL TOLUENE (p-CYMENE)	99-87-6	NA	NA	NA	NA	NA	NA	NA	<1.0 U	--	--	--	--	--

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

TABLE 7-3
Sample Analytical Summary - Groundwater
Tamarack 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	CHTC-GW40	CHTC-GW43	CHTC-GW44
Field Sample ID									CHTC - GW - 40 - 13'-17'	CHTC - GW - 43 - 10'-15'	CHTC - GW - 44 25-30'
Sample Date									8/22/2015	8/22/2015	8/21/2015
Sample Interval (bgs)									13 - 17 ft	10 - 15 ft	25 - 30 ft
Sample Description									--	--	--
Inorganics - Metals (ug/l)											
ALUMINUM	7429-90-5	50 (V)	50 (V)	NA	NLV	NLV	NA	ID	**91000**	**14000**	**92000**
ARSENIC	7440-38-2	10 (A)	10 (A)	10	NLV	NLV	NA	ID	**51**	**8.1**	**61**
BARIUM	7440-39-3	2,000 (A)	2,000 (A)	200 (G)	NLV	NLV	NA	ID	**530**	**190**	**320**
BERYLLIUM	7440-41-7	4.0 (A)	4.0 (A)	0.36 (G)	NLV	NLV	NA	ID	**13**	<1.0 U	**15**
CADMIUM	7440-43-9	5.0 (A)	5.0 (A)	1.3 (G,X)	NLV	NLV	NA	ID	<2.0 U	**0.2**	<2.0 U
CHROMIUM	7440-47-3	100 (A,H)	100 (A,H)	40 (G,H,X)	NLV	NLV	NA	ID	**320**	**47**	**420**
COBALT	7440-48-4	40	100	100	NLV	NLV	NA	ID	**150**	**13**	**150**
COPPER	7440-50-8	1,000 (E)	1,000 (E)	4.7 (G)	NLV	NLV	NA	ID	**330000**	**6500**	**420000**
IRON	7439-89-6	300 (E)	300 (E)	NA	NLV	NLV	NA	ID	**84000**	**42000**	**100000**
LEAD	7439-92-1	4.0 (L)	4.0 (L)	11 (G,X)	NLV	NLV	NA	ID	**50**	**53**	**45**
LITHIUM	7439-93-2	170	350	440	NLV	NLV	NA	ID	**83**	<10 U	**84**
MAGNESIUM	7439-95-4	400,000	1,100,000	NA	NLV	NLV	NA	ID	**140000**	**21000**	**130000**
MANGANESE	7439-96-5	50 (E)	50 (E)	1,000 (G,X)	NLV	NLV	NA	ID	**3900**	**690**	**4400**
MERCURY	7439-97-6	2.0 (A)	2.0 (A)	0.0013	56 (S)	56 (S)	56	ID	**1.3**	<0.2 U	**1.9**
NICKEL	7440-02-0	100 (A)	100 (A)	28 (G)	NLV	NLV	NA	ID	**310**	**34**	**320**
SILVER	7440-22-4	34	98	0.2 (M)	NLV	NLV	NA	ID	**62**	**1.8**	**94**
ZINC	7440-66-6	2,400	5,000 (E)	63 (G)	NLV	NLV	NA	ID	**1300**	**140**	**1400**
Organics - PCBs											
									ND	ND	ND
Organics - SVOCs											
									ND	ND	ND
Organics - VOCs (ug/l)											
ISOPROPYLBENZENE	98-82-8	800	2,300	28	56,000 (S)	56,000 (S)	56,000	29,000	<1.0 UJ	<1.0 UJ	**1.2**
P-ISOPROPYL TOLUENE (p-CYMENE)	99-87-6	NA	NA	NA	NA	NA	NA	NA	<1.0 UJ	<1.0 UJ	**17**

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

TABLE 7-3
Sample Analytical Summary - Groundwater
Tamarack 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 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 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
ft = Feet
PCBs = Polychlorinated biphenyls
SVOC = Semi-volatile organic compound
ug/l = Micrograms per liter
VOC = Volatile organic compound

Groundwater Table Footnotes:

ID = Insufficient data to develop criterion.
NA = A criterion or value is not available
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.

(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 criterion for protection of drinking water can only be used at sites where groundwater is prevented from being used as a public water supply, currently and in the future, through an approved land or resource use restriction.

(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.

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

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

Laboratory Footnotes:

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

TABLE 7-4
Sample Analytical Summary - Sediment
Tamarack 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)	CHTC-SD06			CHTC-SD07			
Field Sample ID					CHTC-SD-06-0-6''	CHTC-SD-06-1-3'	CHTC-SD-06-3-3.92'	CHTC-SD-07-0-6''	CHTC-SD-07-1-3'	CHTC-SD-07-1-3' dup	CHTC-SD-07-3-5'
Sample Date					7/11/2015	7/11/2015	7/11/2015	7/11/2015	7/11/2015	7/11/2015	7/11/2015
Sample Interval (bgs)					0 - 0.5 ft	1 - 3 ft	3 - 3.92 ft	0 - 0.5 ft	1 - 3 ft	1 - 3 ft	3 - 5 ft
Sample Description					SAND; Dark brown to black; wet; medium dense; fine angular sand	SAND; Dark brown to black; wet; medium dense; fine angular sand	SAND; Dark brown to black; wet; medium dense; fine angular sand	SILT; Dark brown; soft to firm; black staining visible at .5 ft	CLAY wth SAND; Dark brown; wet; soft; clay with fine sand to 1.3'; SILT with SAND; Dark brown; wet; soft to firm; silt with fine angular sand	Field Duplicate	SILT with SAND; Dark brown; wet; soft to firm; silt with fine angular sand
Inorganics - Metals (mg/kg)											
ANTIMONY	7440-36-0	NA	NA	NA	<0.3 U	--	--	--	--	--	--
ARSENIC	7440-38-2	9.79	9.79	33.0	**1.3**	--	--	--	--	--	--
BARIUM	7440-39-3	NA	NA	NA	**24**	--	--	--	--	--	--
BERYLLIUM	7440-41-7	NA	NA	NA	**0.5**	--	--	--	--	--	--
CHROMIUM	7440-47-3	43.4	43.4	111	**24**	--	--	--	--	--	--
COBALT	7440-48-4	50	NA	NA	**16**	--	--	--	--	--	--
COPPER	7440-50-8	31.6	31.6	149	**510**	--	--	--	--	--	--
IRON	7439-89-6	NA	NA	NA	**20000**	--	--	--	--	--	--
LEAD	7439-92-1	35.8	35.8	128	**2.4**	--	--	--	--	--	--
LITHIUM	7439-93-2	NA	NA	NA	**3.5**	--	--	--	--	--	--
MAGNESIUM	7439-95-4	NA	NA	NA	**9900**	--	--	--	--	--	--
MANGANESE	7439-96-5	NA	NA	NA	**250**	--	--	--	--	--	--
MERCURY	7439-97-6	0.174	0.18	1.06	<0.07 U	--	--	--	--	--	--
NICKEL	7440-02-0	22.7	22.7	48.6	**22**	--	--	--	--	--	--
SELENIUM	7782-49-2	NA	NA	NA	<0.2 U	--	--	--	--	--	--
SILVER	7440-22-4	0.5	NA	NA	**0.7**	--	--	--	--	--	--
TITANIUM METAL POWDER	7440-32-6	NA	NA	NA	--	--	--	--	--	--	--
ZINC	7440-66-6	121	121	459	**54**	--	--	--	--	--	--
Inorganics - Cyanide (mg/kg)											
CYANIDE	57-12-5	0.0001	NA	NA	<0.13 U	--	--	--	--	--	--
Organics - PCBs											
					ND	ND	ND	ND	ND	ND	ND
Organics - SVOCs											
					--	ND	--	--	--	--	--

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

TABLE 7-4
Sample Analytical Summary - Sediment
Tamarack 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)	CHTC-SD09			CHTC-SD10			
Field Sample ID					CHTC - SD - 09 - 0''-6''	CHTC - SD - 09 - 1'-3'	CHTC - SD - 09 - 3'-5'	CHTC-SD-10-0-6''	CHTC-SD-10-1-3'	CHTC-SD-10-3'-4.75'	CHTC-SD-10-3-4.75 dup
Sample Date					7/8/2015	7/8/2015	7/8/2015	7/10/2015	7/10/2015	7/10/2015	7/10/2015
Sample Interval (bgs)					0 - 0.5 ft	1 - 3 ft	3 - 5 ft	0 - 0.5 ft	1 - 3 ft	3 - 4.75 ft	3 - 4.75 ft
Sample Description					SAND, Dark brown to red, Loose, Fine grained	SAND, Dark brown to red, Loose, Fine grained to 1 ft; SAND, Dark brown to purple brown, Soft, With clay to 2 ft, SAND, Dark brown to red brown, Loose, Fine grained, With silt	SAND, Dark brown to red brown, Loose, Fine grained, With silt	SAND, Dark brown, red, and green, Loose, Coarse to fine grained	SAND, Dark brown, red, and green, Loose, Coarse to fine grained to 2.5 ft; SILT, dark brown, Soft to firm	SILT, Dark brown, Soft to firm to 4.25 ft; SILT, Dark brown, Soft, Fine grained, Metallic streaking from 4.7 to 4.75 ft	Field Duplicate
Inorganics - Metals (mg/kg)											
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**	--	**3.0**	--
BARIUM	7440-39-3	NA	NA	NA	--	--	--	**18**	--	**33**	--
BERYLLIUM	7440-41-7	NA	NA	NA	--	--	--	**0.4**	--	**0.5**	--
CHROMIUM	7440-47-3	43.4	43.4	111	--	--	--	**18**	--	**34**	--
COBALT	7440-48-4	50	NA	NA	--	--	--	**9.7**	--	**19**	--
COPPER	7440-50-8	31.6	31.6	149	--	--	--	**200**	--	**960**	--
IRON	7439-89-6	NA	NA	NA	--	--	--	**17000**	--	**27000**	--
LEAD	7439-92-1	35.8	35.8	128	--	--	--	**4.3**	--	**3.0**	--
LITHIUM	7439-93-2	NA	NA	NA	--	--	--	**7.0**	--	**4.6**	--
MAGNESIUM	7439-95-4	NA	NA	NA	--	--	--	**6900**	--	**14000**	--
MANGANESE	7439-96-5	NA	NA	NA	--	--	--	**210**	--	**340**	--
MERCURY	7439-97-6	0.174	0.18	1.06	--	--	--	<0.07 U	--	<0.07 U	--
NICKEL	7440-02-0	22.7	22.7	48.6	--	--	--	**18**	--	**34**	--
SELENIUM	7782-49-2	NA	NA	NA	--	--	--	<0.2 U	--	<0.2 U	--
SILVER	7440-22-4	0.5	NA	NA	--	--	--	**0.4**	--	**1.2**	--
TITANIUM METAL POWDER	7440-32-6	NA	NA	NA	--	--	--	**1600**	--	**3700**	--
ZINC	7440-66-6	121	121	459	--	--	--	**40**	--	**68**	--
Inorganics - Cyanide (mg/kg)											
CYANIDE	57-12-5	0.0001	NA	NA	--	--	--	**0.14**	--	<0.14 U	--
Organics - PCBs											
					ND	ND	ND	ND	ND	ND	ND
Organics - SVOCs											
					--	--	--	--	ND	--	--

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

TABLE 7-4
Sample Analytical Summary - Sediment
Tamarack 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)	CHTC-SD11			CHTC-SD13			CHTC-SD14		
Field Sample ID					CHTC-SD-11-0-6''	CHTC-SD-11-1-3'	CHTC-SD-11-3-5'	CHTC-SD-13-0-6''	CHTC-SD-13-1-3'	CHTC-SD-13-3-5'	CHTC-SD-14-0-6''	CHTC-SD-14-1-2.75'	CHTC-SD-14-1-2.75' dup
Sample Date					7/10/2015	7/10/2015	7/10/2015	7/11/2015	7/11/2015	7/11/2015	7/11/2015	7/11/2015	7/11/2015
Sample Interval (bgs)					0 - 0.5 ft	1 - 3 ft	3 - 5 ft	0 - 0.5 ft	1 - 3 ft	3 - 5 ft	0 - 0.5 ft	1 - 2.75 ft	1 - 2.75 ft
Sample Description					SILT, Dark brown to black, Soft, With organics	SILT, Dark brown to black, Soft, With organics to 0.75 ft; CLAY, dark brown with purple hue, Soft, With silt	CLAY, dark brown with purple hue, Soft, With silt	CLAY with Trace SAND; Dark brown to black; wet; soft; clay with trace fine sand	SAND with SILT; Dark brown; wet; loose to medium dense; fine angular sand with silt	SAND; Dark brown; wet; loose to medium dense; fine to medium angular sand	CLAY; Dark brown to black; wet; soft; clay with organics	SAND with Some SILT; Dark brown to black; wet; loose; fine angular sand with some silt to 1.5'; SAND, Dark brown to black; wet; loose; coarse angular	Field Duplicate
Inorganics - Metals (mg/kg)													
ANTIMONY	7440-36-0	NA	NA	NA	--	--	--	--	--	--	<0.3 U	--	--
ARSENIC	7440-38-2	9.79	9.79	33.0	--	--	--	--	--	--	**3.6**	--	--
BARIUM	7440-39-3	NA	NA	NA	--	--	--	--	--	--	**25**	--	--
BERYLLIUM	7440-41-7	NA	NA	NA	--	--	--	--	--	--	**0.5**	--	--
CHROMIUM	7440-47-3	43.4	43.4	111	--	--	--	--	--	--	**34**	--	--
COBALT	7440-48-4	50	NA	NA	--	--	--	--	--	--	**19**	--	--
COPPER	7440-50-8	31.6	31.6	149	--	--	--	--	--	--	**830**	--	--
IRON	7439-89-6	NA	NA	NA	--	--	--	--	--	--	**27000**	--	--
LEAD	7439-92-1	35.8	35.8	128	--	--	--	--	--	--	**11**	--	--
LITHIUM	7439-93-2	NA	NA	NA	--	--	--	--	--	--	**6.2**	--	--
MAGNESIUM	7439-95-4	NA	NA	NA	--	--	--	--	--	--	**15000**	--	--
MANGANESE	7439-96-5	NA	NA	NA	--	--	--	--	--	--	**350**	--	--
MERCURY	7439-97-6	0.174	0.18	1.06	--	--	--	--	--	--	<0.08 U	--	--
NICKEL	7440-02-0	22.7	22.7	48.6	--	--	--	--	--	--	**31**	--	--
SELENIUM	7782-49-2	NA	NA	NA	--	--	--	--	--	--	<0.2 U	--	--
SILVER	7440-22-4	0.5	NA	NA	--	--	--	--	--	--	**1.4**	--	--
TITANIUM METAL POWDER	7440-32-6	NA	NA	NA	--	--	--	--	--	--	**3800**	--	--
ZINC	7440-66-6	121	121	459	--	--	--	--	--	--	**84**	--	--
Inorganics - Cyanide (mg/kg)													
CYANIDE	57-12-5	0.0001	NA	NA	--	--	--	--	--	--	<0.16 U	--	--
Organics - PCBs													
					ND	ND	ND	ND	ND	ND	ND	ND	ND
Organics - SVOCs													
					--	--	--	--	--	--	--	ND	ND

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

TABLE 7-4
Sample Analytical Summary - Sediment
Tamarack 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)	CHTC-SD15			CHTC-SD17			CHTC-SD18		
Field Sample ID					CHTC-SD-15-0-6''	CHTC-SD-15-1-3'	CHTC-SD-15-3-4.33	CHTC-SD-17-0-6''	CHTC-SD-17-1-3'	CHTC-SD-17-3-5'	CHTC-SD-18-0-6''	CHTC-SD-18-1-3'	CHTC-SD-18-3-5'
Sample Date					7/10/2015	7/10/2015	7/10/2015	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 - 4.33 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 with purple hue, Very soft, Black streaking in upper 2 ft	SILT, Dark brown with purple hue, Very soft, Black streaking in upper 2 ft	SILT, Dark brown with purple hue, Very soft	SAND; Dark brown to red-brown; wet; loose to medium dense; fine to medium angular sand	SAND; Dark brown to red-brown; wet; loose to medium dense; fine to medium angular sand; Metallic streaking visible at 2.75'	SAND; Dark brown to red-brown; wet; loose to medium dense; fine to medium angular sand	CLAY; Dark brown to black; wet; very soft; clay with organics and root matter	SAND; Dark red-brown; wet; loose to medium dense; fine to medium angular sand	SAND; Dark red-brown; wet; loose to medium dense; fine to medium angular sand
Inorganics - Metals (mg/kg)													
ANTIMONY	7440-36-0	NA	NA	NA	--	--	--	--	--	--	**0.09**	--	--
ARSENIC	7440-38-2	9.79	9.79	33.0	--	--	--	--	--	--	**4.2**	--	--
BARIUM	7440-39-3	NA	NA	NA	--	--	--	--	--	--	**3.1**	--	--
BERYLLIUM	7440-41-7	NA	NA	NA	--	--	--	--	--	--	**0.6**	--	--
CHROMIUM	7440-47-3	43.4	43.4	111	--	--	--	--	--	--	**26**	--	--
COBALT	7440-48-4	50	NA	NA	--	--	--	--	--	--	**14**	--	--
COPPER	7440-50-8	31.6	31.6	149	--	--	--	--	--	--	**810**	--	--
IRON	7439-89-6	NA	NA	NA	--	--	--	--	--	--	**16000**	--	--
LEAD	7439-92-1	35.8	35.8	128	--	--	--	--	--	--	<1.0 U	--	--
LITHIUM	7439-93-2	NA	NA	NA	--	--	--	--	--	--	**5.4**	--	--
MAGNESIUM	7439-95-4	NA	NA	NA	--	--	--	--	--	--	**11000**	--	--
MANGANESE	7439-96-5	NA	NA	NA	--	--	--	--	--	--	**360**	--	--
MERCURY	7439-97-6	0.174	0.18	1.06	--	--	--	--	--	--	<0.1 U	--	--
NICKEL	7440-02-0	22.7	22.7	48.6	--	--	--	--	--	--	**30**	--	--
SELENIUM	7782-49-2	NA	NA	NA	--	--	--	--	--	--	**0.3**	--	--
SILVER	7440-22-4	0.5	NA	NA	--	--	--	--	--	--	**0.1**	--	--
TITANIUM METAL POWDER	7440-32-6	NA	NA	NA	--	--	--	--	--	--	--	--	--
ZINC	7440-66-6	121	121	459	--	--	--	--	--	--	**67**	--	--
Inorganics - Cyanide (mg/kg)													
CYANIDE	57-12-5	0.0001	NA	NA	--	--	--	--	--	--	<0.27 U	--	--
Organics - PCBs													
					ND	ND	ND	ND	ND	ND	ND	ND	ND
Organics - SVOCs													
					--	--	--	--	--	--	--	ND	--

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

TABLE 7-4
Sample Analytical Summary - Sediment
Tamarack 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)	CHTC-SD19			TL08-015	TL08-030	TL08-066	TL08-067	TL08-068
Field Sample ID					CHTC-SD-19-0-6''	CHTC-SD-19-1-3'	CHTC-SD-19-3-4.75'	TL08-015	TL08-030	TL08-066	TL08-067	TL08-068
Sample Date					7/10/2015	7/10/2015	7/10/2015	8/27/2008	8/27/2008	8/28/2008	8/28/2008	8/28/2008
Sample Interval (bgs)					0 - 0.5 ft	1 - 3 ft	3 - 4.75 ft	0 - 0 ft	0 - 0 ft	0 - 0 ft	0 - 0 ft	0 - 0 ft
Sample Description					SILT; dark brown, wet, soft, organic silt	SILT, dark brown, Soft, Organic to 1 ft; CLAY, Dark brown to purple brown, Soft, No cohesion	SILT, dark brown, Soft, Organic to 1 ft; CLAY, Dark brown to purple brown, Soft, No cohesion to 3.25 ft; SAND, Dark brown, Loose, Fine grained	--	--	--	--	--
Inorganics - Metals (mg/kg)												
ANTIMONY	7440-36-0	NA	NA	NA	<0.3 U	--	--	--	--	--	--	--
ARSENIC	7440-38-2	9.79	9.79	33.0	**4.6**	--	--	--	--	--	--	--
BARIUM	7440-39-3	NA	NA	NA	**32**	--	--	--	--	--	--	--
BERYLLIUM	7440-41-7	NA	NA	NA	**0.5**	--	--	--	--	--	--	--
CHROMIUM	7440-47-3	43.4	43.4	111	**42**	--	--	--	--	--	--	--
COBALT	7440-48-4	50	NA	NA	**25**	--	--	--	--	--	--	--
COPPER	7440-50-8	31.6	31.6	149	**570**	--	--	--	--	--	--	--
IRON	7439-89-6	NA	NA	NA	**36000**	--	--	--	--	--	--	--
LEAD	7439-92-1	35.8	35.8	128	**13**	--	--	--	--	--	--	--
LITHIUM	7439-93-2	NA	NA	NA	**7.6**	--	--	--	--	--	--	--
MAGNESIUM	7439-95-4	NA	NA	NA	**19000**	--	--	--	--	--	--	--
MANGANESE	7439-96-5	NA	NA	NA	**440**	--	--	--	--	--	--	--
MERCURY	7439-97-6	0.174	0.18	1.06	**0.1**	--	--	--	--	--	--	--
NICKEL	7440-02-0	22.7	22.7	48.6	**44**	--	--	--	--	--	--	--
SELENIUM	7782-49-2	NA	NA	NA	<0.2 U	--	--	--	--	--	--	--
SILVER	7440-22-4	0.5	NA	NA	**1.1**	--	--	--	--	--	--	--
TITANIUM METAL POWDER	7440-32-6	NA	NA	NA	**4600**	--	--	--	--	--	--	--
ZINC	7440-66-6	121	121	459	**96**	--	--	--	--	--	--	--
Inorganics - Cyanide (mg/kg)												
CYANIDE	57-12-5	0.0001	NA	NA	<0.16 U	--	--	--	--	--	--	--
Organics - PCBs												
					ND	ND	ND	ND	ND	ND	ND	ND
Organics - SVOCs												
					--	--	--	--	--	--	--	--

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

TABLE 7-4
Sample Analytical Summary - Sediment
Tamarack 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 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 *et al.* 2000

PECs from MacDonald *et al.* 2000

-- = Not analyzed/Not Reported

bgs = Below ground surface

ESL = Ecological Screening Level

ft = Feet

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

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.

SECTION 7

DETAILED FINDINGS REPORT – TAMARACK SANDS AREA FIGURES

Image Source: MIS - Public Imagery

CHTC-ASBBLK11A
CHTC-ASBBLK10B
CHTC-ASBBLK10C
CHTC-ASBBLK10A
CHTC-ASBBLK09B
CHTC-ASBBLK09A
CHTC-ASBBLK09C
CHTC-SB15
CHTC-GW11
CHTC-SB34
CHTC-GW29
Hub-S1-12
CHTC-SB35
CHTC-GW30
CHTC-SS11
CHTC-SB47
CHTC-GW43
CHTC-SS01
CHTC-SB45
CHTC-GW40
CHTC-SB48
CHTC-GW44
CHTC-SB37
CHTC-GW32
CHTC-SB39
CHTC-GW34
CHTC-SD06
CHTC-SD07
CHTC-SB36
CHTC-GW31
CHTC-SD10
CHTC-SB40
CHTC-GW35
CHTC-SD09
CHTC-SD11
CHTC-SB41
CHTC-GW36
CHTC-SB42
CHTC-GW37
CHTC-SB38
CHTC-GW33
Upland Waste Deposits
CHTC-SD14
CHTC-SD13
TL08-068
TL08-015
CHTC-SB43
CHTC-GW38
CHTC-SD19
CHTC-SD15
TL08-067
CHTC-SD18
CHTC-SD17
TL08-066
TL08-030
Tamarack Hill Rd
Oneco Rd
Conglomerate St
N Amygdaloid St
S Amygdaloid Rd
Junction Rd
M-26
Red Metal
Red Barn Rd
20
26

Map Extent
Lake Linden
Schoolcraft Twp
Hubbell
Houghton County Memorial Airport
Osceola Twp
Dollar Bay

Sampling Location Type

- Bulk Asbestos
- Soil
- Groundwater
- Sediment

Conceptual Site and Geographic Area Boundaries

N

0 600 Ft

Coordinate System: MIGeoRef(m)

Prepared for:
Michigan Department of Environmental Quality

Prepared By:
WESTON SOLUTIONS of MICHIGAN, INC
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Houghton, MI 49931

Figure 7-1
Sampling Location Map
Tamarack Sands Area
Tamarack City, Houghton County, Michigan

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Image Source: ESRI World Imagery (NAIP 2014)

CHTC-ASBBLK09A 06/29/15

Parameter	Result	Units	[Criteria]
ASBESTOS-CHRYSOTILE	60	%	[1%]

CHTC-ASBBLK09B 06/29/15

Parameter	Result	Units	[Criteria]
ASBESTOS-CHRYSOTILE	70	%	[1%]

CHTC-ASBBLK09C 06/29/15

Parameter	Result	Units	[Criteria]
ASBESTOS-CHRYSOTILE	70	%	[1%]

Map Extent

Sampling locations with at least one exceedance

Sampling locations with no exceedances

Conceptual Site and Geographic Area Boundaries

N

0 100 Ft

Coordinate System: MIGeoRef(m)

Prepared for:
Michigan Department of Environmental Quality

Prepared By:
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Figure 7-2

Sample Analytical Result Map - Bulk Asbestos
Tamarack Sands Area - Historical Municipal Dump (Trail Asbestos)
Tamarack City, Houghton County, Michigan

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Image Source: MIS - Public Imagery

Hub-S1-12
HUB-S1-10
HUB-S1-14
HUB-S1-17
HUB-S1-15
HUB-S1-09
HUB-S1-16
HUB-S1-07
HUB-S1-08
HUB-S1-02
HUB-S1-01
Upland Waste Deposits
HUB-S1-03
HUB-S1-06
HUB-S1-04
HUB-S1-05

Tamarack Hill Rd
Oneco Rd
Conglomerate St
N Amygdaloid St
S Amygdaloid Rd
Junction Rd
Maple St
2nd St
Seneca Cir
M-26
26
Red Barn Rd

Locations Screened for Metals - At least one exceedance of:

- Residential Direct Contact Criteria
- Residential Particulate Soil Inhalation Criteria
- Non Residential Direct Contact Criteria
- Non Residential Particulate Soil Inhalation Criteria
- Screening locations with no exceedances
- Locations are included within a different geographical area boundary
- Conceptual Site and Geographic Area Boundaries

Xray Fluorescence screening results are from surface soils unless otherwise specified.

N

0 600 Ft

Coordinate System: MIGeoRef(m)

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Michigan Department of Environmental Quality

Prepared By:
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Figure 7-3
Soil Screening Results Map - Soil
Tamarack Sands Area
Tamarack City, Houghton County, Michigan

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Image Source: MIS - Public Imagery

CHTC-SS01 08/20/15

Depth	Parameter	Result	Units	[Criteria]
0.25-0.75	ARSENIC	16	mg/kg	[10]
0.25-0.75	CYANIDE	0.69	mg/kg	[2]

CHTC-SS11 08/21/15

Depth	Parameter	Result	Units	[Criteria]
0-0.5	CYANIDE	0.17	mg/kg	[2]

CHTC-SB48 08/21/15

Depth	Parameter	Result	Units	[Criteria]
1-1.5	CYANIDE	0.16	mg/kg	[2]

Upland Waste Deposits

Map Extent

Lake Linden
Schoolcraft Twp
Hubbell
Houghton County Memorial Airport
Osceola Twp
Dollar Bay

- 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

Notes:
MG/KG = milligrams per kilogram
UG/KG = micrograms per kilogram
Sample depths shown in feet below ground surface.

N

0 500 Ft

Coordinate System: MIGeoRef(m)

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

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Figure 7-4
Sample Analytical Result Map - Soil
Tamarack Sands Area
Tamarack City, Houghton County, Michigan

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Image Source: MIS - Public Imagery

Upland Waste Deposits

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

N

0 500 Ft

Coordinate System: MIGeoRef(m)

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

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Figure 7-5

Sample Analytical Result Map - Groundwater
Tamarack Sands Area
Tamarack City, Houghton County, Michigan

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Image Source: MIS - Public Imagery

CHTC-SD06 07/11/15

Depth	Parameter	Result	Units	[Criteria]
0-0.5	COPPER	510	mg/kg	[1,2,3]
0-0.5	SILVER	0.7	mg/kg	[1]

CHTC-SD10 07/10/15

Depth	Parameter	Result	Units	[Criteria]
0-0.5	CYANIDE	0.14	mg/kg	[1]
0-0.5	COPPER	200	mg/kg	[1,2,3]
3-4.75	COPPER	960	mg/kg	[1,2,3]
3-4.75	NICKEL	34	mg/kg	[1,2]
3-4.75	SILVER	1.2	mg/kg	[1]

CHTC-SD14 07/11/15

Depth	Parameter	Result	Units	[Criteria]
0-0.5	COPPER	830	mg/kg	[1,2,3]
0-0.5	NICKEL	31	mg/kg	[1,2]
0-0.5	SILVER	1.4	mg/kg	[1]

CHTC-SD19 07/10/15

Depth	Parameter	Result	Units	[Criteria]
0-0.5	COPPER	570	mg/kg	[1,2,3]
0-0.5	NICKEL	44	mg/kg	[1,2]
0-0.5	SILVER	1.1	mg/kg	[1]

CHTC-SD18 07/12/15

Depth	Parameter	Result	Units	[Criteria]
0-0.5	COPPER	810	mg/kg	[1,2,3]
0-0.5	NICKEL	30	mg/kg	[1,2]

Upland Waste Deposits

Map Extent

Lake Linden
Schoolcraft Twp
Hubbell
Houghton County Memorial Airport
Osceola Twp
Dollar Bay

MDEQ Part 201 Cleanup Criteria for Response Action
1=Sediment Ecological Screening Levels
2=Threshold Effect Concentration (TEC)
3=Probable Effect Concentration (PEC)

- 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

Notes:
mg/kg = milligrams per kilogram
Sample depths shown in feet below lake bed surface

N

0 550 Ft

Coordinate System: MIGeoRef(m)

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Figure 7-6
Sample Analytical Result Map - Sediment
Tamarack Sands Area
Tamarack City, Houghton County, Michigan

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8. DETAILED FINDINGS REPORT – TORCH LAKE

This Section summarizes the findings derived from implementation of the offshore sampling components of the sampling and analysis plan (SAP) in the Calumet and Hecla (C&H) Tamarack City Operations Area (CHTC). Although critical to the understanding of contaminant migration within Torch Lake, the terrestrial portion of the investigation is emphasized in the preceding detailed findings reports for each study area. This Section provides a comprehensive assessment of Torch Lake using analytical results derived from the Site Investigation (SI) as well as historical investigations, most of which encompass all of Torch Lake versus the geographic area evaluated in the SI. The narrative follows the offshore investigative approach outlined in **Section 3**, while providing specific details about the potential human health and ecological risks associated with mining era operations as they relate to Torch Lake as a whole.

8.1 OFFSHORE INVESTIGATION RESULTS

The SI at the CHTC Operations Area was developed based on a variety of data and information as outlined in **Section 3**. The offshore investigation activities were guided by several factors. First, historical analytical data was evaluated to determine if adequate characterization data was available in each study area to assess the overall sediment and surface water quality in Torch Lake.

Historical and SI sediment and surface water sampling locations are presented on **Figure 8-1.** Fish tissue and semi-permeable membrane device (SPMD) sample locations collected from Torch Lake and connecting waters to Lake Superior are presented on **Figure 8-2**, along with the location of samples analyzed for polychlorinated biphenyl (PCB) congeners as part of the SI.

In addition to historical analytical results, 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. Sediment sampling completed as part of the SI was conducted in accordance with the sampling methods described in **Section 3**. Surface water sampling was not completed in the CHTC study area.

The following subsections present the outcomes of offshore investigative activities completed in each study area by summarizing the laboratory analytical results and characterizing their impacts on the environmental media in which they were detected.

8.1.1 Ahmeek Mill Processing Area

The findings derived from side-scan sonar and visual inspection using underwater surveillance conducted along the shoreline in the Ahmeek Mill Processing Area, as well as historical documentation, guided the selection of offshore sampling locations. Offshore sediment samples were collected from the Ahmeek Mill Processing Area and the following subsections present the results.

8.1.1.1 Sediment Sampling Results

Offshore investigation activities were completed in the Ahmeek Mill Processing Area between 7 and 12 July 2015. A total of 15 sediment samples including one duplicate sediment sample were collected from five sampling locations. Sediment sampling locations included five surficial sediment samples, ranging from 0 to 6 inches (in.) in depth. The investigation also included the collection of nine deeper sediment samples ranging from 1 foot (ft) to 4.66 ft in depth. All samples were analyzed for PCBs. A subset of sediment samples were selected for inorganic, semi-volatile organic compounds (SVOCs), and cyanide analyses.

The analytical results for sediment samples collected during the SI indicated multiple inorganic contaminants of concern (COCs) at concentrations that exceeded applicable regulatory criteria. Total PCBs were not detected in any of the sediment samples collected from the Ahmeek Mill Processing Area. Tabulated summaries and graphical depictions of the sediment analytical results from the Ahmeek Mill Processing Area are presented in **Section 5**.

8.1.2 Tamarack Sands Area

The findings derived from side-scan sonar and visual inspection using underwater surveillance conducted along the shoreline in the Tamarack Sands Area, as well as historical documentation guided the selection of offshore sampling locations. Offshore sediment samples were collected from the Tamarack Sands Area and the following subsections present the results.

8.1.2.1 Sediment Sampling Results

Offshore investigation activities were completed in the Tamarack Sands Area between 8 and 12 July 2015. A total of 35 sediment samples including three duplicate sediment samples were collected from 11 sampling locations. Sediment sampling locations included 11 surficial sediment samples, ranging from 0 to 6 in. in depth. The investigation also included the collection of 21 deeper sediment samples ranging from 1 ft to 4.75 ft in depth. All samples were analyzed for PCBs. A subset of sediment samples were selected for inorganic, SVOCs, and cyanide analyses.

The analytical results for sediment samples collected during the SI indicated multiple inorganic COCs and cyanide at concentrations that exceeded applicable regulatory criteria. Total PCBs were detected in any of the sediment samples collected from the Tamarack Sands Area. Tabulated summaries and graphical depictions of the sediment analytical results from the Tamarack Sands Area are presented in **Section 7**.

8.2 NATURE AND EXTENT OF CONTAMINATION

Utilizing the established regulatory criteria presented in **Section 4**, the laboratory analytical results summarized in the preceding section for the CHTC Operations Area were reviewed and compared to the following criteria as applicable for the sampled environmental media:

- Michigan Department of Environmental Quality (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.

8.2.1 Comprehensive Exposure Assessment

The comparison was completed to determine which ecological and human exposure pathways, risks, and conditions are relevant in Torch Lake. Although not inclusive of relevant pathways where criteria were not exceeded, the following exposure pathways were determined to be relevant in Torch Lake as it pertains to the offshore investigative activities completed during the CHTC SI:

- Risks due to hazardous substances in sediments.

8.2.1.1 Ahmeek Mill Processing Area - Exposure Pathway Assessment

Sediment analytical results from the Ahmeek Mill Processing 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 Ahmeek Mill Processing 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	92	19	**6**	**6**	**6**
Cyanide	6	0	0	0	0	0
VOCs	0	0	0	0	0	0
SVOCs	6	0	0	0	0	0
Total PCBs	23	0	0	0	0	0
COCs exceeding applicable regulatory criteria in one or more sample				Chromium, Copper, Nickel, Silver		

8.2.1.2 Tamarack Sands Area - Exposure Pathway Assessment

Sediment analytical results from the Tamarack Sands 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 Tamarack 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	6	96	14	**6**	**6**	**6**
Cyanide	6	1	1	**1**	0	0
VOCs	0	0	0	0	0	0
SVOCs	5	0	0	0	0	0
Total PCBs	40	0	0	0	0	0
COCs exceeding applicable regulatory criteria in one or more sample				Copper, Cyanide, Nickel, Silver		

8.2.2 CHTC - Extent of Contamination

The comparison of analytical results to applicable regulatory criteria indicates that potential human health and ecological risks are present in sediment in the CHTC Operations Area. The following subsections describe the extent of contamination in sediment within the CHTC Operations Area.

8.2.2.1 Sediment - Extent of Contamination

Analytical results from sediment samples collected from the various study areas within the CHTC Operations Area included inorganic COCs and cyanide in both surficial and deep sediment samples. These results varied between study areas likely due to the varying operational and remedial history within each area. The following provides a summary of the analytical results and their relevance to potential exposure risks for human and ecological receptors:

- Inorganic COCs – Inorganic COCs and cyanide were detected at or in excess of applicable regulatory criteria in the following study areas:

  - Ahmeek Mill Processing Area (inorganics only); and,
  - Tamarack Sands Area.

  As indicated by the number of locations summarized above, inorganic COCs are prevalent in the region and the related exceedances, although potentially detrimental to aquatic biota, remain a consistent finding in sediment samples collected from Torch Lake. Nevertheless, exceedances of inorganic COCs in sediment should be considered when evaluating the extent of contamination in the CHTC Operations Area.

Sediment sampling locations in the CHTC Operations Area and Torch Lake are presented on **Figure 8-3**.

8.2.3 Torch Lake – Extent of Contamination

The analytical results and interpretation summarized in the preceding subsections document potential human health and ecological risks that are present in the sediment in the CHTC Operations Area. The following subsections provide a correlation of these results to sediment and surface water analytical results throughout Torch Lake.

8.2.3.1 Sediment – Extent of Contamination

Although PCBs were not detected in sediment samples collected from the CHTC, sediment samples collected from locations in Torch Lake outside of the conceptual boundaries of the CHTC Operations Area in the Calumet and Hecla Lake Linden Operations Area (CHLL) did contain detections of PCBs. The majority of these PCB detections were found in sediment samples that were collected from the shallow or surface interval of sediment. Although not specific to the CHTC, these sample analytical results provide a broad view of sediment quality, as it relates to PCB contamination, across Torch Lake as well as the CHTC. The Torch Lake sediment sampling locations are depicted on **Figure 8-3**.

The CHLL SI and historical Torch Lake sediment samples combined with the CHTC sediment sample results provide a profile of PCB contaminant distribution within the sediments of Torch Lake. Although PCBs were not detected in the CHTC, the interpreted results clearly show two distinct groupings of Total PCB concentrations in the CHLL that exceed applicable regulatory

criteria: The first grouping is located offshore in the Lake Linden Recreation Area and the second is located offshore in the Hubbell Processing Area. These study areas are shown relative to the CHTC and Torch Lake on **Figure 8-3**. Sediment sampling locations that exceeded applicable regulatory criteria for Total PCBs in the Lake Linden Recreation Area are depicted on **Figure 8-4**. Sediment sampling locations that exceeded applicable regulatory criteria for Total PCBs in the Hubbell Processing Area are depicted on **Figure 8-5**.

8.2.3.2 Surface Water and Fish Tissue – Extent of Contamination

A limited number of surface water samples were collected from Torch Lake from outside of the CHTC Operations Area and only one of the samples contained Total PCB concentrations at or above ESLs and Rule 57 criteria. The surface water sample was collected from the CHLL in the Hubbell Processing Area. This surface water sample was collected at the time of the sampling of the co-located, deteriorated drum whose contents are also subject to disturbance from wave action. Surface water sampling locations are depicted **Figure 8-1**. Historical Semi-permeable Membrane Device (SPMD) analytical results also indicated the presence of PCBs in the CHLL and Torch Lake. 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 Torch Lake and CHLL SPMD samples outside of the CHTC Operations Area. The SPMD results provide a qualitative comparison of PCB concentrations in Torch Lake to concentrations in connecting waters to Lake Superior. The results obtained from an SPMD are often higher than the actual concentrations found in a water sample. These results are for a relative comparison between in-lake locations and should not be considered to be the concentrations of PCBs in the lake water itself. SPMD sampling locations are presented on **Figure 8-2**. As reported by the Great Lakes Environmental Center in a document entitled *Final Report, PCB Study Using Semipermeable Membrane Devices in Torch Lake, Houghton County* (March 2006), analytical results from the SPMD samples confirmed the presence of PCBs in surface waters of Torch Lake. The SPMD sampling results were inconclusive in identifying a specific PCB source within Torch Lake. In addition, the SPMD sample results demonstrated that

concentrations of PCB congeners in Torch Lake SPMD samples were significantly higher than the SPMD results collected from the connecting waters to Lake Superior.

The SPMD analytical results were later corroborated in a fish tissue study completed by the MDEQ Water Bureau in 2008. The study was documented in a report prepared by the MDEQ Water Bureau entitled *PCB Concentrations in Walleye Collected from Torch Lake (Houghton County) and Lake Superior* (June 2008). The study documented that "PCB concentrations in fish collected from Torch Lake have been consistently higher than in fish found in nearby surface water bodies. A fish consumption advisory due to elevated levels of PCBs was first issued for Torch Lake fish by the Michigan Department of Community Health (MDCH) in 1998.

Fish in Torch Lake were known to contain elevated levels of PCBs, but it was previously unclear whether the cause of elevated PCB concentrations in fish was from sources within Torch Lake watershed, from air deposition or from fish exposure at other locations. It had been postulated that the elevated concentrations of PCBs in fish caught in Torch Lake may actually represent exposure to the contaminant in Lake Superior waters since PCBs are known to be elevated in several species in Lake Superior, and there are no barriers to fish movement between the two water bodies. The elevated PCB concentration in Lake Superior fish is believed to be due primarily to atmospheric deposition.

The report concluded that "higher Total PCB concentrations and different congener compositions were found in walleye collected from Torch Lake versus walleye caught in Huron Bay indicating that there is a source of PCBs in the Torch Lake watershed" (MDEQ, 2008).

The MDEQ Water Resources Division (WRD) and Michigan Department of Health and Human Services (MDHHS) continue to monitor fish contaminant levels in Torch Lake and from two Lake Superior reference sites to allow comparisons of key contaminant concentrations between sites as well as temporal trend evaluations. An update of the status of contaminant concentrations using fish samples collected in 2013 was documented in a report prepared by the MDEQ Water Resources Division entitled *Status of fish Contaminant Levels in the Torch Lake Area of Concern 2013* (January 2016). This report provides an update on the status of contaminant concentrations using fish samples collected in 2013 from Torch Lake and from two Lake Superior reference sites.

The study concluded that "Overall, the evidence indicates that total PCB concentrations in Torch Lake fish remain elevated compared to other water bodies in northern Michigan, even though levels have declined since monitoring began in 1988. Mercury concentrations in Torch Lake fish have not declined since monitoring began in 1988 and may have increased over that time; however, mercury levels are lower than in fish from other Upper Peninsula inland lakes." The report also anticipated continued fish consumption advisories for Total PCBs and mercury.

PCBs were manufactured as blends based on the overall percent chlorine present in the blend. Different chlorine content dictated the physical and chemical properties of the blend, each of which had different commercial/industrial applications. The commercial name for PCB blends was "Aroclor". The Aroclor number generally indicated the percent chlorine present; Aroclor 1242 contains 42% chlorine, Aroclor 1254 contains 54% chlorine, etc. The manufacture and use of the various Aroclors is well documented (Frame, 1996). Analysis of PCBs as Aroclors (EPA Method 8082) is the most common approach to measuring PCB concentration, and is the basis for most regulatory standards. PCBs can be analyzed by "homolog", the composition by percent chlorine (EPA Method 680). Results are expressed as either parts per million (ppm) or percent of total PCB by chlorine grouping, such as monochlorobiphenyl, dichlorobiphenyls, etc., on up to decachlorobiphenyl. PCBs can also be analyzed by "congener". There are 209 possible PCB compounds, or congeners. Like homolog analysis, the results of congener analysis are expressed as either ppm or percent of total PCB by each individual congener. The composition of Aroclors by congener had been studied extensively (Frame, 1996). Most Aroclors have unique, or "marker" congeners that can help identify the source Aroclor in a degraded sample.

Comparison of Aroclors in source material and environmental media is commonly used to determine contamination pathways. While higher concentration PCBs such as in source material can be readily identified by Aroclor analysis, low concentration PCBs in the environment are sometimes degraded (through evaporation or biodegradation of the lighter congeners); homolog and congener analysis can be a useful tool when trying to identify the source of PCB contamination in degraded samples, such as in sediment and tissue.

As part of the CHLL SI, a subset of known PCB containing environmental and waste samples were selected for PCB congener analysis. The purpose of the analysis was to compare the observed congener/homolog/Aroclor patterns in soil, sediment, residual process materials, and groundwater from the Hubbell Processing Area and Lake Linden Recreation Area which are located in the CHLL with the observed congener/homolog/Aroclor patterns in Torch Lake fish tissue data and contrasting with congener/homolog/Aroclor patterns in waters believed to be contaminated with PCBs via only air deposition to confirm or refute the hypothesis that identified upland and in-lake PCB sources are continuing to contribute to the PCBs in the fish tissue.

The SI congener analytical results are presented in **Table 8-1**. **Figure 8-2** depicts the PCB congener, SPMD, and generalized fish tissue sampling locations.

Maximum Total PCB concentrations in the Hubbell Processing Area were:

- Residual Process Materials (wire wrap/sheathing) = 860 milligrams/kilogram (mg/kg)
- Waste Piles = 72.2 mg/kg
- Surficial soils = 9.1 mg/kg
- Sediments = 3.35 mg/kg
- Groundwater = 0.73 microgram/liter (µg/L)

The samples from this area contained the full range of Aroclors, including Aroclors 1242, 1254, 1260, 1262, and 1268. Aroclors 1262 and 1268 had limited commercial use and are therefore particularly notable when identified in environmental or fish tissue samples; both are solids at room temperature, and contain the heaviest (most chlorinated) PCB congeners.

Maximum Total PCB concentrations in the Lake Linden recreational area, where sediments are the primary issue, were:

- Sediment = 8.9 mg/kg

The Lake Linden Aroclors were limited to Aroclors 1242 and 1254, both of which were commonly used in electrical equipment.

The following initial observations were made, comparing the observed congener/homolog/Aroclor patterns in soil, sediment, residual process materials and groundwater from the Hubbell Processing

Area and Lake Linden Recreation Area with the observed congener/homolog/Aroclor patterns in Torch Lake fish tissue data:

Aroclor 1242

- No Aroclor 1242 was detected in upland soil or waste.
- Aroclor 1242 was detected primarily in sediments in Lake Linden Recreation Area.
- No Aroclor 1242 was detected in the 1988 fish tissue (without congener data, and assuming analysis is correct).
- Little or no Aroclor 1242 seems to be present in the 2013 fish tissue based on the congener comparison with the Aroclor 1242 standard.
- Aroclor 1242 may have entered the water at some time in the past but does not appear to be entering the water and impacting fish now.

Aroclor 1254

- Aroclor 1254 was present in every PCB containing soil, sediment and groundwater sample.
- Aroclor 1254 was present in the 1988 fish tissue.
- Aroclor 1254 is probably present in the 2013 fish tissue based on congener analysis, given that the pentachlorobiphenyl homolog common to Aroclor 1254 is significant (16%). Pentachlorobiphenyl is barely present in heavier Aroclors. Pentachlorobiphenyl is present in Aroclor 1242 (in lower proportions than in Aroclor 1254), but because Aroclor 1242 is not present in the upland areas it is not likely to still be impacting fish.
- Aroclor 1254 from sediment and upland soils could therefore still be impacting fish tissue. Airborne deposition of Aroclor 1254 (presenting as pentachlorobiphenyl vapors) could be occurring and cannot be ruled out based on the available data, but the airborne contribution relative to other pathways would be extremely small given its low vapor pressure. Ambient air monitoring would be needed to confirm whether the Aroclor homologs are detectable in the local air, and even then it would be difficult to assess their relative contribution to the water column.

Aroclor 1260 and Higher

- Aroclors 1260, 1262 and 1268 were detected in upland soil and groundwater, but not in sediment.
- These three Aroclors were not detected in the 1988 Torch Lake fish tissue samples.

- One or more of these heavier Aroclors is present in the 2013 Torch Lake fish tissue based on the congener test results. A number of the heavier homologs (hexa through octa in particular) are present in the 2013 fish tissue samples and could not have come from Aroclor 1254.

- Either Aroclor 1262 and/or 1268 are present in the 26 of 33 2013 Torch Lake fish tissue samples, based on the presence of the octa homolog. Octachlorobiphenyl is also present in Aroclor 1260 but not at levels that could explain the results shown.

- Note also that octa congeners were detected in the groundwater samples, which could explain the fish exposure pathway. SPMD test results did not show Octachlorobiphenyl, but the method only measures soluble PCBs (solids are cleaned off) and Octachlorobiphenyl is a solid (non-soluble) at room temperature.

The following initial observations were made, comparing the observed congener/homolog/Aroclor patterns in Torch Lake fish tissue data with congener/homolog/Aroclor patterns from fish tissue in waters believed to be contaminated with PCBs via only air deposition.

The Torch Lake 2013 fish tissue results were then compared with fish tissue test data from other water bodies (Huron and Keweenaw bays) where there was no identified PCB source. The congener makeup in the control sample fish (particularly in the Huron Bay samples) looks most like Aroclor 1260. The homolog percentages in some cases are higher than in the commercial mixture, but probably due to loss of the lower chlorinated congeners. There is little if any evidence of Aroclors 1262 or 1268 in the control fish tissue, unlike those of the Torch Lake samples. Only 1 out of 38 samples from Huron Bay contained any Octa, a marker for the Aroclors 1262/1268.

Based on these results, it appears that the source of some of the PCBs in the Torch Lake fish tissue is different than in the control samples from other areas with no known PCB source. In summary:

- It is apparent based on the above analysis that fish in Torch Lake are being exposed to PCB contamination from the upland areas that perhaps wasn't occurring in the past. Since Aroclor 1260 and up were not in 1988 fish samples but were in 2013 samples, and are present in upland soil and groundwater, it is apparent that Aroclor 1260 and up have made their way into fish tissue after 1988.

- Because these heavier congeners are present in groundwater and may be present in the water column, it is possible that the exposure is ongoing, but the pathway is unclear.

- Because Aroclor 1242 (i.e. the lighter congeners) have a relatively short half-life in animals and the environment, it is possible that 1242 was present in some of the 1988 fish tissue but is now undetectable. If true, this would impact the relative percentage of the various homologs present, but not enough to impact the conclusions above nor does it explain the shift to the presence of the heavier congeners.

8.3 CONCLUSIONS AND RECOMMENDATIONS

The analytical results and interpretation summarized in the preceding subsections document potential human health and ecological risks that are present in sediment in the CHTC Operations Area, but also expand on the implications of those findings on environmental conditions throughout Torch Lake. The following subsections provide a synopsis of these findings and a recommended path forward for mitigating these risks in the CHTC Area and subsequently, Torch Lake.

8.3.1 Conclusions

Environmental impacts in the CHTC Operations Area are generally characterized by detections of inorganic contaminants and cyanide in 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/scrapping of mining company operations provided substantive evidence for assessing specific operational areas and selecting target analytes anticipated to be present in environmental media throughout the area. The findings of these investigative activities, specifically as it relates to concentrations of contaminants in CHTC Operations Area sediment are summarized as follows:

Sediment

- Inorganic COCs – Inorganic COCs and cyanide were detected at or in excess of applicable regulatory criteria in the following study areas:

  - Ahmeek Mill Processing Area (inorganics only); and,
  - Tamarack Sands Area.

Sediment samples collected during prior studies from the CHLL and Torch Lake outside of the conceptual boundaries of the CHTC Operations Area did contain Total PCBs that exceeded applicable regulatory criteria. Moreover, interpretation of these results clearly demonstrates that

there are two distinct groupings of elevated Total PCB concentrations in sediment: The first located offshore in the Lake Linden Recreation Area and the second located offshore in the Hubbell Processing Area.

A limited number of surface water samples were collected from Torch Lake and only one of the samples contained Total PCB concentrations at or above applicable regulatory criteria in the CHLL Hubbell Processing Area. Analytical results from the SPMD samples confirmed the presence of PCBs in surface waters of Torch Lake. The SPMD sampling results were inconclusive in identifying a specific PCB source within Torch Lake, but noted that the concentrations of PCBs measured in the SPMD samples were consistent with historical analytical results. In addition, the SPMD sample results demonstrated that relative concentrations of PCB congeners in Torch Lake were significantly higher than the results collected from the connecting waters to Lake Superior.

The SPMD analytical results were later corroborated in a fish tissue study completed by the MDEQ. The study documented that PCB concentrations in fish collected from Torch Lake were consistently higher than in fish found in nearby surface water bodies. Torch Lake was known to contain elevated levels of PCBs, but it was unclear whether the cause of elevated PCB concentrations in fish was caused by sources within Torch Lake. The report concluded that higher Total PCB concentrations and different congener compositions were found in walleye collected from Torch Lake versus walleye caught in Huron Bay indicating that there was a source of PCBs in the Torch Lake watershed.

The investigative results from the SI have identified two offshore sources of PCBs. These source areas, as confirmed by the results of the historical SPMD and fish tissue studies, are ongoing sources of PCBs that pose both ecological and potential human health risks and continued degradation of the benthos in Torch Lake.

8.3.2 Recommendations

SI and past investigative results derived from multiple sources have confirmed that ongoing sources of contamination are present in CHTC, CHLL, and Torch Lake. Of these contaminants, PCBs, although not detected in samples from the CHTC, present a unique hazard in the CHLL and

Torch Lake due to their chemical properties that allow the chemical to migrate and bioaccumulate, such as in fish tissue where concentrations of the contaminant can exceed measured concentrations in environmental samples. Although measures such as beneficial use impairments (BUIs), including "Restrictions on fish and wildlife consumption" and "Degradation of benthos" are in place, there is potential for increased risks to human health due to the presence of PCBs in the food chain, in terrestrial areas, and on-going potential for upland sources of PCBs to enter Torch Lake.

For the Tamarack Sands Area where no potential upland sources of PCBs have been identified, no further measures to address PCBs are apparently required at this time.

MDEQ should continue to provide new study data to the RRD Superfund Section (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 MDHHS where evaluation of specific potential public health risks is warranted.

SECTION 8

DETAILED FINDINGS REPORT – TORCH LAKE TABLES

TABLE 8-1
Sample Analytical Summary - PCB Congeners
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Station Name	CHLL-GW23	CHLL-RPM-02		CHLL-SB90		CHLL-SD17		CHLL-SD52		CHLL-SS01		CHLL-WP01	
FieldSampleID	CHLL-GW 23 10-15'	CHLL-RPM02-101514	CHLL-RPM02-101514	CHLL-SB90-0-6"	CHLL-SB90-0-6"	CHLL-SD17-0"-6"	CHLL-SD17-0"-6"	CHLL-SD52-0"-6"	CHLL-SD52-0"-6"	CHLL-SS01-101514	CHLL-SS01-101514	CHLL-WP01-101514	CHLL-WP01-101514
Sample Date	6/11/2014	10/15/2014	10/15/2014	8/20/2014	8/20/2014	7/12/2014	7/12/2014	7/9/2014	7/9/2014	10/15/2014	10/15/2014	10/15/2014	10/15/2014
Sample Interval (bgs)	10 - 15 ft	0 - 0 ft	0 - 0 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	0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft
Sample Type	Groundwater	Residual Process Material	Residual Process Material	Soil	Soil	Sediment	Sediment	Sediment	Sediment	Soil	Soil	Waste Pile	Waste Pile
Units	ug/L	ug/kg (wet wt)	ug/kg (dry wt)	ug/kg (wet wt)	ug/kg (dry wt)	ug/kg (wet wt)	ug/kg (dry wt)	ug/kg (wet wt)	ug/kg (dry wt)	ug/kg (wet wt)	ug/kg (dry wt)	ug/kg (wet wt)	ug/kg (dry wt)
Organics - PCB Congeners													
PCB 001	I	<5.0 U	--	<5.0 U	<6.4 U	<5.0 U	<10.4 U	<5.0 U	<10.7 U	<5.0 U	<6.3 U	<5.0 U	<5.5 U
PCB 003	I	<5.0 U	--	I	I	<5.0 U	<10.4 U	<5.0 U	<10.7 U	<5.0 U	<6.3 U	<5.0 U	<5.5 U
PCB 008	0.0029	I	I	I	I	I	I	I	I	I	I	I	I
PCB 011	<0.005 U	<5.0 U	--	<5.0 U	<6.4 U	<5.0 U	<10.4 U	<5.0 U	<10.7 U	<5.0 U	<6.3 U	<5.0 U	<5.5 U
PCB 016-032	--	<2.0 U	--	<2.0 U	<2.5 U	<2.0 U	<4.1 U	31.7	68.0	<2.0 U	<2.5 U	2.1	2.4
PCB 016	0.0028	--	--	--	--	--	--	--	--	--	--	--	--
PCB 017	I	<1.0 U	--	1.6	2.1	<1.0 U	<2.0 U	20.9	44.9	3.0	3.8	2.7	3.0
PCB 018	I	3.4	--	<1.0 U	<1.2 U	0.9	1.8	51.8	111.2	0.8	1.0	6.9	7.7
PCB 022	0.0055	<0.5 U	--	0.7	0.9	0.5	1.1	15.1	32.6	0.4	0.5	1.1	1.2
PCB 025	0.0046	<1.0 U	--	0.7	0.9	<1.0 U	<2.0 U	3.5	7.6	<1.0 U	<1.2 U	1.4	1.5
PCB 026	<0.001 U	<1.0 U	--	<1.0 U	<1.2 U	<1.0 U	<2.0 U	7.9	17.0	<1.0 U	<1.2 U	9.3	10.3
PCB 027	0.02	<1.0 U	--	10.5	13.6	<1.0 U	<2.0 U	3.9	8.5	<1.0 U	<1.2 U	<1.0 U	<1.1 U
PCB 028	0.0709	4.2	--	1.6	2.1	1.5	3.1	37.4	80.2	1.6	2.1	5.6	6.2
PCB 031	0.0058	11.5	--	2.8	3.7	1.3	2.8	37.2	79.9	2.8	3.6	8.6	9.5
PCB 032	<0.001 U	--	--	--	--	--	--	--	--	--	--	--	--
PCB 033	<0.001 U	<1.0 U	--	<1.0 U	<1.2 U	0.6	1.2	30.6	65.8	<1.0 U	<1.2 U	I	I
PCB 037-042	--	<2.0 U	--	2.6	3.3	<2.0 U	<4.1 U	15.7	33.8	2.1	2.7	39.7	44.1
PCB 037	<0.001 U	--	--	--	--	--	--	--	--	--	--	--	--
PCB 040	0.006	90.3	--	4.0	5.2	1.9	4.0	7.0	15.1	1.5	1.9	122.9	136.4
PCB 042	0.0053	--	--	--	--	--	--	--	--	--	--	--	--
PCB 044	0.033	38.3	--	10.1	13.1	1.7	3.5	22.6	48.5	12.7	16.1	196.3	217.8
PCB 045	<0.001 U	5.4	--	3.4	4.4	1.8	3.8	7.2	15.6	2.5	3.2	12.1	13.5
PCB 047	0.004	<1.0 U	--	<1.0 U	<1.2 U	<1.0 U	<2.0 U	5.2	11.2	<1.0 U	<1.2 U	34.8	38.7
PCB 048	0.0043	<0.5 U	--	<0.5 U	<0.6 U	0.2	0.5	7.3	15.8	<0.5 U	<0.6 U	9.4	10.5
PCB 049	0.0218	15.0	--	5.1	6.7	1.2	2.6	16.3	35.1	3.6	4.6	154.4	171.4
PCB 052	0.0729	78.3	--	12.4	16.0	2.2	4.6	26.0	55.8	9.9	12.6	722.3	801.7
PCB 056-060	--	<1.0 U	--	11.3	14.6	1.9	3.9	15.1	32.6	13.9	17.6	56.8	63.0
PCB 056	0.008	--	--	--	--	--	--	--	--	--	--	--	--
PCB 060	0.0018	--	--	--	--	--	--	--	--	--	--	--	--
PCB 063	<0.0005 U	<0.5 U	--	<0.5 U	<0.6 U	<0.5 U	<1.0 U	0.6	1.4	<0.5 U	<0.6 U	<0.5 U	<0.5 U
PCB 064	0.0122	9.5	--	3.4	4.4	0.9	2.0	14.6	31.3	2.8	3.6	66.9	74.3
PCB 066-095	--	1094.0	--	24.5	31.7	4.1	8.7	31.7	68.0	20.9	26.6	1277.4	1417.7
PCB 066	0.0747	--	--	--	--	--	--	--	--	--	--	--	--
PCB 070	0.0477	7.4	--	3.7	4.8	0.9	1.8	8.7	18.8	4.2	5.4	48.7	54.1
PCB 071	0.0055	<1.0 U	--	<1.0 U	<1.2 U	<1.0 U	<2.0 U	4.9	10.5	<1.0 U	<1.2 U	26.4	29.3
PCB 074	0.0214	28.3	--	13.5	17.4	2.4	5.1	23.7	50.8	14.5	18.4	366.6	406.8
PCB 077-110	--	713.5	--	61.8	79.9	6.8	14.1	32.0	68.6	62.5	79.2	3814.3	4233.4
PCB 077	0.028	--	--	--	--	--	--	--	--	--	--	--	--
PCB 081-087	--	303.6	--	35.0	45.2	2.2	4.6	11.7	25.2	54.1	68.6	1337.3	1484.3
PCB 081	0.0097	--	--	--	--	--	--	--	--	--	--	--	--
PCB 082	0.0132	<0.5 U	--	3.0	4.0	0.4	1.0	2.8	6.0	3.4	4.3	141.9	157.5

TABLE 8-1
Sample Analytical Summary - PCB Congeners
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Station Name	CHLL-GW23	CHLL-RPM-02		CHLL-SB90		CHLL-SD17		CHLL-SD52		CHLL-SS01		CHLL-WP01	
FieldSampleID	CHLL-GW 23 10-15'	CHLL-RPM02-101514	CHLL-RPM02-101514	CHLL-SB90-0-6"	CHLL-SB90-0-6"	CHLL-SD17-0"-6"	CHLL-SD17-0"-6"	CHLL-SD52-0"-6"	CHLL-SD52-0"-6"	CHLL-SS01-101514	CHLL-SS01-101514	CHLL-WP01-101514	CHLL-WP01-101514
Sample Date	6/11/2014	10/15/2014	10/15/2014	8/20/2014	8/20/2014	7/12/2014	7/12/2014	7/9/2014	7/9/2014	10/15/2014	10/15/2014	10/15/2014	10/15/2014
Sample Interval (bgs)	10 - 15 ft	0 - 0 ft	0 - 0 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	0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft
Sample Type	Groundwater	Residual Process Material	Residual Process Material	Soil	Soil	Sediment	Sediment	Sediment	Sediment	Soil	Soil	Waste Pile	Waste Pile
Units	ug/L	ug/kg (wet wt)	ug/kg (dry wt)	ug/kg (wet wt)	ug/kg (dry wt)	ug/kg (wet wt)	ug/kg (dry wt)	ug/kg (wet wt)	ug/kg (dry wt)	ug/kg (wet wt)	ug/kg (dry wt)	ug/kg (wet wt)	ug/kg (dry wt)
PCB 083	0.0099	<0.5 U	--	3.4	4.5	<0.5 U	<1.0 U	1.5	3.4	3.0	3.8	93.7	103.9
PCB 084	0.0432	19.7	--	4.9	6.3	0.7	1.6	4.7	10.2	3.7	4.8	276.0	306.3
PCB 087	0.0797	--	--	--	--	--	--	--	--	--	--	--	--
PCB 090-101	--	1789.5	--	42.3	54.7	3.2	6.6	15.4	33.1	51.8	65.7	1921.2	2132.3
PCB 090	0.0039	--	--	--	--	--	--	--	--	--	--	--	--
PCB 091	0.0234	309.9	--	49.5	64.0	I	I	2.6	5.6	47.9	60.7	181.7	201.7
PCB 092	0.0165	120.2	--	7.0	9.0	<1.0 U	<2.0 U	2.5	5.3	6.8	8.6	208.6	231.6
PCB 095	0.0747	--	--	--	--	--	--	--	--	--	--	--	--
PCB 097	0.0448	209.9	--	32.8	42.4	1.0	2.1	6.4	13.8	52.6	66.7	666.1	739.3
PCB 099	0.0708	63.7	--	22.9	29.6	1.8	3.9	8.0	17.2	21.1	26.8	841.2	933.7
PCB 100	I	<1.0 U	--	<1.0 U	<1.2 U	<1.0 U	<2.0 U	I	I	<1.0 U	<1.2 U	11.4	12.6
PCB 101	0.1527	--	--	--	--	--	--	--	--	--	--	--	--
PCB 105	0.05	<0.5 U	--	9.9	12.8	1.2	2.7	6.7	14.4	11.6	14.8	683.2	758.3
PCB 110	0.2641	--	--	--	--	--	--	--	--	--	--	--	--
PCB 114	0.0042	43.2	--	<0.5 U	<0.6 U	<0.5 U	<1.0 U	0.4	0.9	0.5	0.6	32.4	36.0
PCB 118	0.1356	110.6	--	21.0	27.2	2.9	6.0	12.8	27.6	26.7	33.8	1813.3	2012.6
PCB 123-149	--	12825.3	--	34.2	44.3	1.6	3.4	7.1	15.4	46.3	58.7	1021.9	1134.2
PCB 123	<0.0005 U	--	--	--	--	--	--	--	--	--	--	--	--
PCB 126-178	--	2983.6	--	9.5	12.3	<2.5 U	<5.2 U	<2.5 U	<5.3 U	15.4	19.5	28.9	32.1
PCB 126	<0.001 U	--	--	--	--	--	--	--	--	--	--	--	--
PCB 128	0.0471	136.9	--	6.7	8.7	0.6	1.2	2.6	5.5	8.1	10.3	444.1	492.9
PCB 130	0.0115	<0.5 U	--	1.8	2.3	<0.5 U	<1.0 U	1.1	2.4	<0.5 U	<0.6 U	109.7	121.7
PCB 132	0.0743	1263.2	--	11.7	15.2	1.0	2.0	3.8	8.1	13.1	16.6	664.5	737.6
PCB 134	0.0081	179.9	--	1.5	2.0	<0.5 U	<1.0 U	0.7	1.5	1.3	1.7	77.5	86.0
PCB 135-144	--	1825.8	--	10.6	13.7	0.8	1.6	2.5	5.4	12.8	16.2	199.0	220.9
PCB 135	<0.0005 U	--	--	--	--	--	--	--	--	--	--	--	--
PCB 136	0.0195	1412.9	--	5.1	6.6	<1.0 U	<2.0 U	1.4	3.1	5.5	7.0	140.4	155.9
PCB 136-163	--	9200.5	--	39.4	50.9	3.1	6.5	12.1	26.1	50.6	64.1	1974.9	2191.9
PCB 137	0.0102	53.8	--	34.0	44.0	1.3	2.7	5.0	10.7	73.6	93.3	89.7	99.5
PCB 138	0.08585	--	--	--	--	--	--	--	--	--	--	--	--
PCB 141	0.0246	3607.4	--	9.5	12.3	0.5	1.0	1.9	4.2	13.6	17.3	190.3	211.2
PCB 144	0.0084	--	--	--	--	--	--	--	--	--	--	--	--
PCB 146	0.0186	887.4	--	6.0	7.8	0.2	0.6	1.3	2.8	7.5	9.5	152.9	169.7
PCB 149	0.1205	--	--	--	--	--	--	--	--	--	--	--	--
PCB 151	0.0145	6953.4	--	9.8	12.7	0.3	0.7	1.6	3.4	15.9	20.1	125.5	139.3
PCB 153	0.1356	18708.7	--	46.9	60.7	2.7	5.8	9.4	20.3	72.4	91.8	1234.7	1370.4
PCB 156	0.0155	I	I	4.6	5.9	0.4	0.8	1.4	3.1	5.1	6.4	265.4	294.5
PCB 157-201	--	1391.5	--	15.0	19.4	0.7	1.6	2.8	6.0	17.5	22.2	63.5	70.5
PCB 157	0.0051	--	--	--	--	--	--	--	--	--	--	--	--
PCB 158-160	--	591.6	--	27.7	35.8	0.3	0.7	1.5	3.3	82.1	104.1	238.1	264.3
PCB 158	0.0351	--	--	--	--	--	--	--	--	--	--	--	--
PCB 160	<0.0005 U	--	--	--	--	--	--	--	--	--	--	--	--

TABLE 8-1
Sample Analytical Summary - PCB Congeners
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Station Name	CHLL-GW23	CHLL-RPM-02		CHLL-SB90		CHLL-SD17		CHLL-SD52		CHLL-SS01		CHLL-WP01	
FieldSampleID	CHLL-GW 23 10-15'	CHLL-RPM02-101514	CHLL-RPM02-101514	CHLL-SB90-0-6"	CHLL-SB90-0-6"	CHLL-SD17-0"-6"	CHLL-SD17-0"-6"	CHLL-SD52-0"-6"	CHLL-SD52-0"-6"	CHLL-SS01-101514	CHLL-SS01-101514	CHLL-WP01-101514	CHLL-WP01-101514
Sample Date	6/11/2014	10/15/2014	10/15/2014	8/20/2014	8/20/2014	7/12/2014	7/12/2014	7/9/2014	7/9/2014	10/15/2014	10/15/2014	10/15/2014	10/15/2014
Sample Interval (bgs)	10 - 15 ft	0 - 0 ft	0 - 0 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	0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft	0 - 0.5 ft
Sample Type	Groundwater	Residual Process Material	Residual Process Material	Soil	Soil	Sediment	Sediment	Sediment	Sediment	Soil	Soil	Waste Pile	Waste Pile
Units	ug/L	ug/kg (wet wt)	ug/kg (dry wt)	ug/kg (wet wt)	ug/kg (dry wt)	ug/kg (wet wt)	ug/kg (dry wt)	ug/kg (wet wt)	ug/kg (dry wt)	ug/kg (wet wt)	ug/kg (dry wt)	ug/kg (wet wt)	ug/kg (dry wt)
PCB 163	0.08585	--	--	--	--	--	--	--	--	--	--	--	--
PCB 167	0.0063	57.6	--	2.0	2.6	<0.5 U	<1.0 U	0.3	0.7	<0.5 U	<0.6 U	85.8	95.2
PCB 169	--	<0.5 U	--	I	I	<0.5 U	<1.0 U	<0.5 U	<1.0 U	<0.5 U	<0.6 U	<0.5 U	<0.5 U
PCB 170-190	--	9408.9	--	43.5	56.2	1.5	3.2	4.0	8.6	57.1	72.3	141.7	157.3
PCB 170	0.018	--	--	--	--	--	--	--	--	--	--	--	--
PCB 171	0.0048	I	I	I	I	<0.5 U	<1.0 U	0.8	1.8	20.6	26.2	33.9	37.6
PCB 172	0.0023	1273.8	--	2.8	3.7	<0.2 U	<0.5 U	0.2	0.5	6.1	7.7	28.3	31.4
PCB 174	0.0103	13006.8	--	17.4	22.5	0.3	0.6	1.2	2.7	37.2	47.2	90.8	100.8
PCB 175	0.0004	396.8	--	1.7	2.3	<0.2 U	<0.5 U	<0.2 U	<0.5 U	2.5	3.2	<0.2 U	<0.2 U
PCB 177	0.0085	6377.1	--	13.8	17.9	0.3	0.7	1.7	3.6	25.3	32.1	63.8	70.8
PCB 178	I	--	--	--	--	--	--	--	--	--	--	--	--
PCB 179	0.0039	8660.5	--	11.6	15.0	<0.2 U	<0.5 U	0.5	1.2	23.6	29.9	32.2	35.8
PCB 180	0.0373	39698.2	--	46.3	59.8	0.7	1.5	3.2	7.0	140.8	178.5	343.7	381.4
PCB 182-187	--	21298.1	--	38.9	50.2	<0.7 U	<1.5 U	2.3	5.0	71.1	90.2	122.3	135.8
PCB 182	<0.0005 U	--	--	--	--	--	--	--	--	--	--	--	--
PCB 183	0.0084	11881.8	--	18.3	23.6	0.1	0.3	1.2	2.6	33.0	41.8	74.0	82.1
PCB 185	<0.0003 U	2531.7	--	2.8	3.6	<0.2 U	<0.5 U	0.1	0.3	6.7	8.5	11.7	13.0
PCB 187	0.015	--	--	--	--	--	--	--	--	--	--	--	--
PCB 189	0.0006	133.5	--	4.1	5.3	<0.2 U	<0.5 U	<0.2 U	<0.5 U	2.1	2.7	15.1	16.8
PCB 190	0.0019	--	--	--	--	--	--	--	--	--	--	--	--
PCB 193	0.0013	1406.6	--	1.4	1.9	<0.2 U	<0.5 U	<0.2 U	<0.5 U	3.4	4.3	12.0	13.3
PCB 194	0.007	16515.5	--	28.1	36.3	0.2	0.5	1.0	2.2	72.2	91.5	67.8	75.2
PCB 195	0.0033	5353.2	--	5.9	7.6	<0.2 U	<0.5 U	I	I	13.2	16.8	20.0	22.2
PCB 196-203	--	26036.5	--	27.9	36.0	<0.5 U	<1.0 U	1.1	2.5	76.1	96.4	82.0	91.0
PCB 196	0.0028	--	--	--	--	--	--	--	--	--	--	--	--
PCB 198	0.0065	1124.6	--	I	I	<0.2 U	<0.5 U	I	I	2.6	3.3	6.0	6.7
PCB 199 (201)	0.0081	--	--	--	--	--	--	--	--	--	--	--	--
PCB 199	--	20118.1	--	31.5	40.7	0.1	0.4	1.2	2.6	98.7	125.1	70.5	78.2
PCB 200 (199)	<0.00025 U	--	--	--	--	--	--	--	--	--	--	--	--
PCB 200	--	2762.3	--	4.4	5.8	<0.2 U	<0.5 U	<0.2 U	<0.5 U	8.4	10.7	13.0	14.4
PCB 201 (200)	I	--	--	--	--	--	--	--	--	--	--	--	--
PCB 203	0.0028	--	--	--	--	--	--	--	--	--	--	--	--
PCB 205	I	644.2	--	I	I	<0.2 U	<0.5 U	<0.2 U	<0.5 U	2.0	2.5	10.2	11.4
PCB 206	0.002	12824.1	--	22.5	29.0	<0.2 U	<0.5 U	0.9	2.0	69.3	87.9	75.0	83.3
PCB 207	<0.0003 U	946.6	--	<0.2 U	<0.3 U	<0.2 U	<0.5 U	<0.2 U	<0.5 U	7.5	9.5	12.0	13.3
Total PCB Congeners	2.3273	269550.6	--	1007.6	1301.9	63.1	131.4	633.2	1359.0	1666.5	2112.2	23631.3	26227.9

PCB Congener Table Footnotes:

bgs = Below ground surface

ft = Feet

PCBs = Polychlorinated biphenyls

ug/kg = Micrograms per kilogram

ug/L = Micrograms per liter

Laboratory Footnotes:

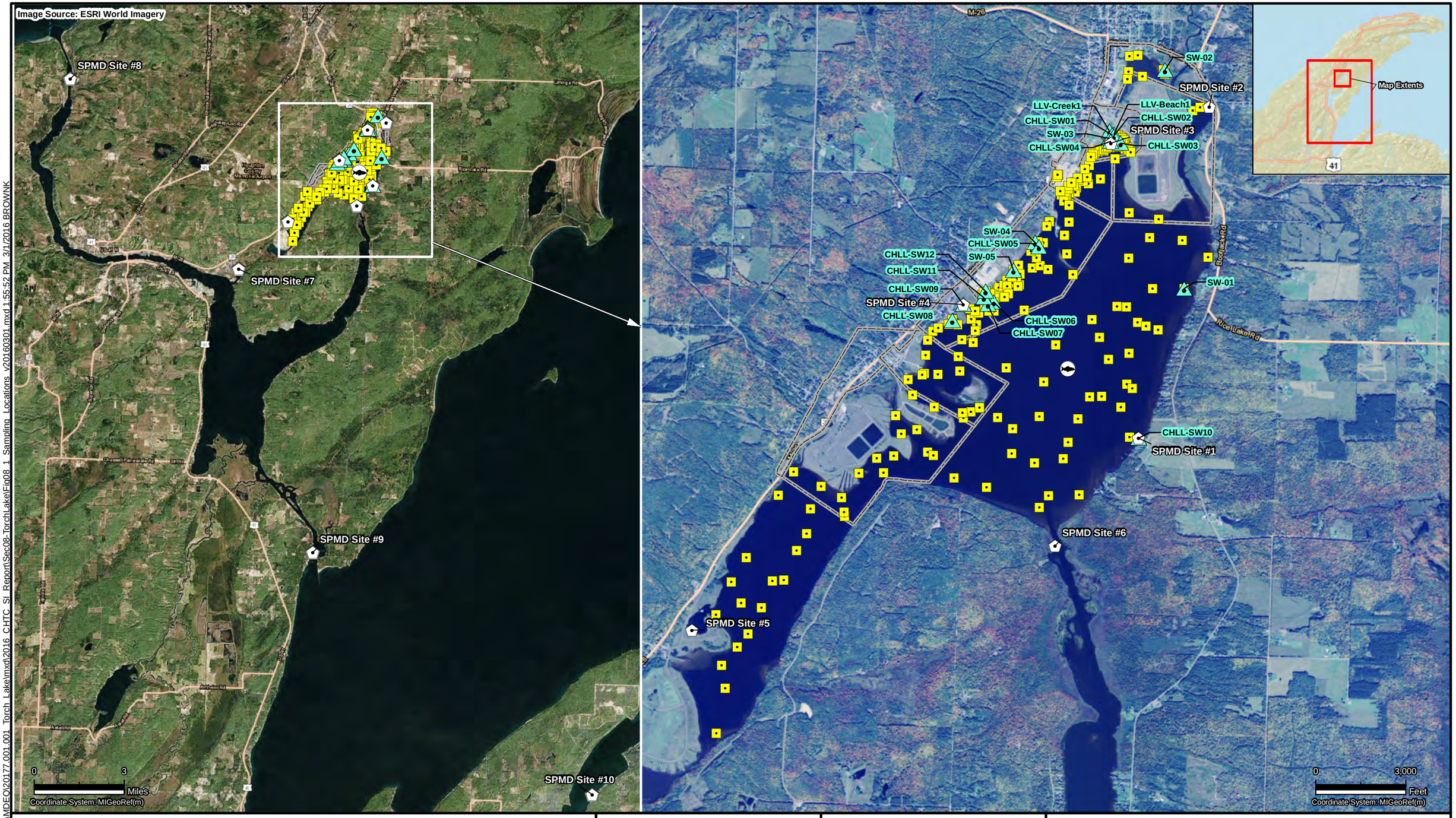
-- = Not analyzed/Not reported

I = Analytical Interference; quantification was not possible

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

SECTION 8

DETAILED FINDINGS REPORT – TORCH LAKE FIGURES



Sampling Location Type

- Semi-Permeable Membrane Device
- Surface Water
- Fish
- Sediment
- Conceptual Site and Geographic Area Boundaries

Notes:
Fish sample location shown is a generalization

N

Prepared for:
Michigan Department of Environmental Quality

Prepared By:
WESTON SOLUTIONS of MICHIGAN, INC
P.O. Box 577
Houghton, MI 49931

Figure 8-1
Sampling Location Map
Torch Lake
Tamarack City, Houghton County, Michigan

FILE: J:\GIS_Projects\MDEQ\20177.001.001_Torch_Lake\mxd\2016_CHTC_SI_Report\Sec08-TorchLakeFin08_1_Sampling_Locations_v20160301.mxd 1:55:52 PM 3/1/2016 BROWNK

Image Source: ESRI World Imagery

SPMD Site #8
SPMD Site #1
SPMD Site #6
SPMD Site #5
SPMD Site #7
SPMD Site #2
CHLL-SD17
SPMD Site #3
SPMD Site #9
SPMD Site #10
CHLL-RPM-02
CHLL-SB90
CHLL-WP01
CHLL-SS01
CHLL-GW23
SPMD Site #4
CHLL-SD52

Keweenaw Bay
Huron Bay

Houghton County Memorial Airport

0 3,500 Feet
Coordinate System: MIGeoRef(m)

Map Extents

Sampling Location Type

- Groundwater
- Soil
- Residual Process Material
- Waste Pile
- Sediment
- Semi-Permeable Membrane Device
- Fish (Generalized Location)
- Conceptual Site and Geographic Area Boundaries

N
0 3 Miles
Coordinate System: MIGeoRef(m)

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Prepared By:
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Houghton, MI 49931

Figure 8-2
PCB Congeners Sampling Location Map
Torch Lake
Tamarack City, Houghton County, Michigan

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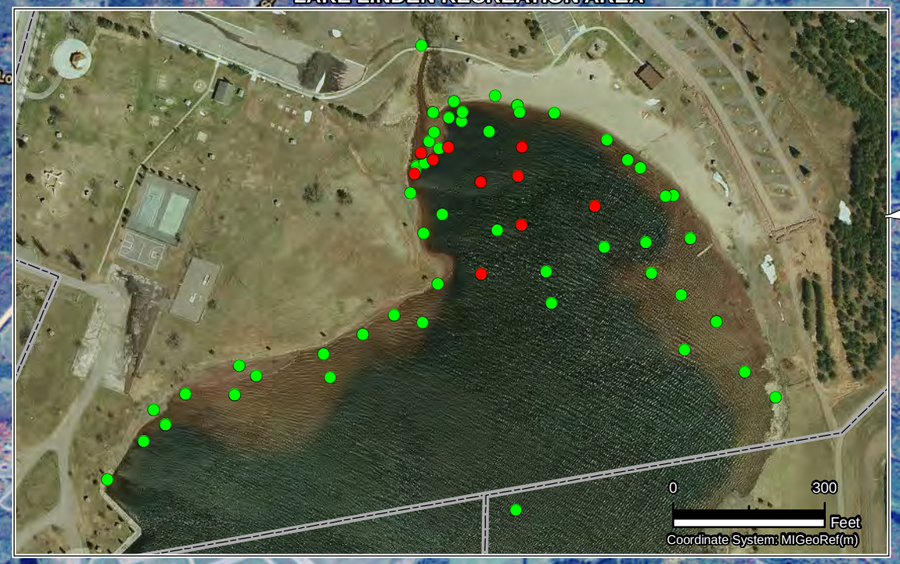
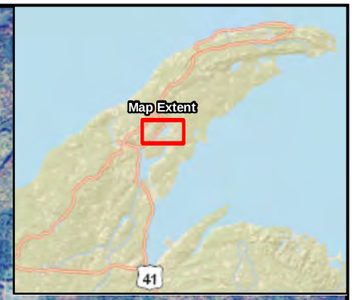
Image Sources: ESRI World Imagery (NAIP 2014) and MIS - Public Imagery

LAKE LINDEN RECREATION AREA





HUBBELL PROCESSING AREA

Houghton County Memorial Airport

M-26

M-26

M-26

Booljack Rd

Rice Lake Rd

Rice Lake Rd

- Sampling locations with PCB detected greater than criteria
- Sampling locations with PCB detected below criteria
- Sampling locations with no PCB detections
- Conceptual Site and Geographic Area Boundaries

N

0 ½ Miles

Coordinate System: MIGeoRef(m)

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Michigan Department of Environmental Quality

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Houghton, MI 49931

Figure 8-3
PCB Analytical Results Map
Torch Lake Sediment and Surface Water
Tamarack City, Houghton County, Michigan

FILE: J:\GIS_Projects\MDEQ\20177.001.001_Torch_Lake\mxd\2016_CHTC_SI_Report\Sec08-TorchLakeFig08_3_PCB_Analytical_Results_TL_SW_SED_v20160301.mxd 1:56:07 PM, 3/1/2016 BROWNK

Image Source: ESRI World Imagery (NAIP 2014)

TL07-03 08/07/07

Depth	Parameter	Result	[Criteria]
1.75-3.42	TOTAL PCBS	6100	[1,2,3]

TL07-02 08/07/07

Depth	Parameter	Result	[Criteria]
2.33-4	TOTAL PCBS	5800	[1,2,3]
4-5.33	TOTAL PCBS	280	[1,2]

TL07-01 08/07/07

Depth	Parameter	Result	[Criteria]
3.58-5.33	TOTAL PCBS	8900	[1,2,3]

CHLL-SD18 07/12/14

Depth	Parameter	Result	[Criteria]
1-2.7	TOTAL PCBS	720	[1,2,3]

CHLL-SD102 07/12/15

Depth	Parameter	Result	[Criteria]
1-3	TOTAL PCBS	920	[1,2,3]

TL07-04 08/07/07

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	910	[1,2,3]
0.5-2.17	TOTAL PCBS	180	[1,2]
5-7.92	TOTAL PCBS	50	[--]

CHLL-SD15 06/16/14

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	500	[1,2]
1-2.7	TOTAL PCBS	290	[1,2]

CHLL-SD17 07/12/14

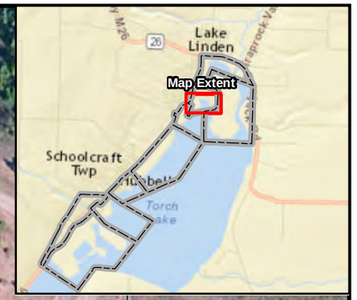
Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	1650	[1,2,3]

CHLL-SD14 07/11/14

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	730	[1,2,3]

CHLL-SD16 07/11/14

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	560	[1,2]



MDEQ Part 201 Cleanup Criteria for Response Action
1=Sediment Ecological Screening Levels
2=Threshold Effect Concentration (TEC)
3=Probable Effect Concentration (PEC)
4=Surface Water Ecological Screening Levels
5=Surface Water Rule 57 HNV Drink
6=Surface Water Rule 57 HCV Drink
7=Surface Water Rule 57 WV

- Sampling locations with PCB detected greater than criteria
- Sampling locations with PCB detected below criteria
- Sampling locations with no PCB detections
- Excavation Extent (2007)
- Conceptual Site and Geographic Area Boundaries

Notes:
Sediment results = micrograms per kilogram
Surface water results = micrograms per liter
Sample depths shown in feet below surface

N
0 150 Feet
Coordinate System: MIGeoRef(m)

Prepared for:
Michigan Department of Environmental Quality

Prepared By:
WESTON SOLUTIONS of MICHIGAN, INC
P.O. Box 577
Houghton, MI 49931

Figure 8-4
PCB Analytical Results Map
Lake Linden Recreation Area Sediment and Surface Water
Tamarack City, Houghton County, Michigan

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Image Source: MIS - Public Imagery

SD-04 10/12/11

Depth	Parameter	Result	[Criteria]
0-0.25	TOTAL PCBS	92	[1,2]

TL08-076 08/28/08

Depth	Parameter	Result	[Criteria]
0-0	TOTAL PCBS	26	[--]

CHLL-SD45 07/11/14

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	440	[1,2]

SD-05 10/12/11

Depth	Parameter	Result	[Criteria]
0-0.25	TOTAL PCBS	890	[1,2,3]

TL07-17 08/09/07

Depth	Parameter	Result	[Criteria]
0-0.17	TOTAL PCBS	1100	[1,2,3]
0-0.5	TOTAL PCBS	160	[1,2]

TL07-08 08/07/07

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	320	[1,2]

TL07-07 08/07/07

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	320	[1,2]

TL07-12 08/08/07

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	510	[1,2]

CHLL-SW12 08/20/15

Depth	Parameter	Result	[Criteria]
--	TOTAL PCBS	2.3 J	[4,6,7]

TL08-075 08/28/08

Depth	Parameter	Result	[Criteria]
0-0	TOTAL PCBS	90	[1,2]

CHLL-SD103 08/20/15

Depth	Parameter	Result	[Criteria]
0-0.167	TOTAL PCBS	1600	[1,2,3]

TL07-05 08/07/07

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	290	[1,2]
0-0.5	TOTAL PCBS	230	[1,2]

TL07-23 08/09/07

Depth	Parameter	Result	[Criteria]
0-0.17	TOTAL PCBS	620	[1,2]
0-0.17	TOTAL PCBS	730	[1,2,3]

CHLL-SD52 07/09/14

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	3350	[1,2,3]

CHLL-SD99 07/09/15

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	63	[1,2]

CHLL-SD63 07/15/14

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	1430	[1,2,3]

TL07-06 08/07/07

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	130	[1,2]

TL07-22 08/09/07

Depth	Parameter	Result	[Criteria]
0-0.17	TOTAL PCBS	450	[1,2]

CHLL-SD64 07/15/14

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	680	[1,2,3]

TL07-05 08/07/07

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	290	[1,2]
0-0.5	TOTAL PCBS	230	[1,2]

TL07-21 08/09/07

Depth	Parameter	Result	[Criteria]
0-0.17	TOTAL PCBS	340	[1,2]

Map Extent

Lake Linden

Torch Lake

MDEQ Part 201 Cleanup Criteria for Response Action
1=Sediment Ecological Screening Levels
2=Threshold Effect Concentration (TEC)
3=Probable Effect Concentration (PEC)
4=Surface Water Ecological Screening Levels
5=Surface Water Rule 57 HNV Drink
6=Surface Water Rule 57 HCV Drink
7=Surface Water Rule 57 WV

- Sampling locations with PCB detected greater than criteria
- Sampling locations with PCB detected below criteria
- Sampling locations with no PCB detections

Conceptual Site and Geographic Area Boundaries

Notes:
Sediment results = micrograms per kilogram
Surface water results = micrograms per liter
Sample depths shown in feet below surface

N

0 325 Feet

Coordinate System: MIGeoRef(m)

Prepared for:
Michigan Department of Environmental Quality

Prepared By:
WESTON SOLUTIONS of MICHIGAN, INC
P.O. Box 577
Houghton, MI 49931

Figure 8-5

PCB Analytical Results Map
Hubbell Processing Area Sediment and Surface Water
Tamarack City, Houghton County, Michigan

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9. CONCLUSIONS AND RECOMMENDATIONS

The analytical results and interpretation summarized in the detailed finding reports presented in **Section 5** through **Section 8** document potential human health and ecological risks that are present in the CHTC along with the implications of these findings on environmental conditions throughout Torch Lake. The following subsections provide a synopsis of these findings and a recommended path forward for mitigating the identified risks in the CHTC and subsequently, Torch Lake.

9.1 CONCLUSIONS

Environmental impacts in the CHTC are generally characterized by detections of organic and inorganic contaminants in soil 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/scrapping of mining company operations provided substantive evidence for assessing specific operational areas and selecting target analytes anticipated to be present in environmental media throughout the area. The findings of these investigative activities in each of the study areas are presented in the following subsections.

9.1.1 Ahmeek Mill Processing Area

The analytical results and interpretation summarized **Section 5** document potential risks that are present in the Ahmeek Mill Processing Area. The findings of these investigative activities are summarized as follows:

- Asbestos analytical results for various building materials, including but, not limited to transite, sheeting, and rope gasket material indicate ACM are present in the Ahmeek Mill Processing Area. These materials are in a debris pile within the brush across the street from the Osceola Township Park and are subject to migration via wind and water erosion. Asbestos concentrations in five bulk material samples contained asbestos fibers at concentrations greater than 1 %. The damaged and friable nature of these materials poses a potential risk to human health as it relates to the inhalation pathway. Although, asbestos fibers were not detected in a limited number of soil samples collected from the study area, the exposed nature of these material, makes them subject to further degradation that could potentially impact surface soils in the Ahmeek Mill Processing Area.
- The shallow and subsurface soil analytical results for the Ahmeek Mill Processing Area SI did not contain any COCs at concentrations at or above applicable regulatory criteria.

- Historic soil analytical and X-ray fluorescence (XRF) soil screening results for samples from the Osceola Township Park and ruins of the former Ahmeek Stamp Mill Complex did indicate the presence of COCs at concentrations at or above applicable regulatory criteria including Particulate Soil Inhalation Criteria (PSIC) and Direct Contact Criteria (DCC) in both of the residential and nonresidential exposure scenarios for inorganic and SVOC contaminants, and Groundwater/Surface Water Interface Protection Criteria (GSIPC) for cyanide and SVOCs. Those areas have reportedly been addressed under previous cleanup and removal actions undertaken in the area and provided the remedies are maintained properly risk to these contaminants apparently would be minimized.

- Sediment analytical results exceeded ESLs, TECs, and PECs 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 Ahmeek Mill Processing Area.

Ahmeek Mill Processing Area – Media, Criteria, Potential Receptor Summary

Media	Soil			Groundwater			Air		Sediment	Surface Water		Building Materials, Asbestos, and Abandoned Containers			
Criteria / Potential Receptor	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
Residential Human		✓	✓					✓				✓			✓
Nonresidential Human		✓	✓					✓				✓			✓
Water Column Organism									✓						
Benthic Organism									✓						
COCs exceeding applicable regulatory criteria in one or more sample	Arsenic, Chromium, Copper, Cyanide, Lead, Nickel, Silver, Naphthalene, Fluoranthene, Phenanthrene, Asbestos, Benzo(a)pyrene, Carbazole														

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 Ahmeek Mill Processing 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 COCs, cyanide, SVOCs, and asbestos in the study area. With the exception of the ACM in a debris pile within the brush across the street from the Osceola Township Park, the terrestrial COCs have reportedly been addressed under previous cleanup and removal actions undertaken in the area and provided the remedies are maintained properly risk to these contaminants apparently would be minimized;

- No in-lake or terrestrial uncharacterized waste deposits were identified in the study area; and,

- Industrial ruins, including buildings, foundations, and building floors associated with the mill ruins are present. Voids noted where it appears soil has settled into the subsurface near the mill ruins pose a potential physical hazard due to slip, trip, and fall concerns. Mining era ACM in building debris were observed in the study area. Small mounds and rubble piles where debris including cable, piping, asphalt, and concrete; and partially buried concrete piping were also observed in the area.

9.1.2 Tamarack Processing Area

The analytical results and interpretation summarized **Section 6** document potential risks that are present in the Tamarack Processing Area. The findings of these investigative activities are summarized as follows:

- Asbestos analytical results for various building materials including, but not limited to asphaltic roofing material and transite are present in the study area. These materials are widely distributed in the area of the Tamarack Reclamation Plant and are subject to migration via wind and water erosion. Asbestos concentrations in seven bulk material samples contained asbestos fibers at concentrations greater than 1 %. The damaged and friable nature of these materials poses a potential risk to human health as it relates to the inhalation pathway. Although, asbestos fibers were not detected in a limited number of soil samples collected from the study area, the exposed nature of these material, makes them subject to further degradation that could potentially impact surface soils in the Tamarack Processing Area.

- The contents of three dilapidated drums contained inorganic contaminants that exceeded PSIC for the non-residential scenario, and DCC in both of the residential and nonresidential exposure scenarios. One sample contained cyanide that exceeded the GSIPC.

- Historically sampled waste piles contained concentrations of inorganic contaminants that exceeded PSIC and DCC in both of the residential and nonresidential exposure scenarios.

- A shallow soil sample contained a detectable concentration of oil and grease while other shallow and subsurface soil analytical results did not contain any COCs at concentrations at or above applicable regulatory criteria. Historic soil analytical results did indicate the presence of COCs at concentrations at or above applicable regulatory criteria including

PSIC and DCC in both of the residential and nonresidential exposure scenarios for inorganic contaminants; and GSIPC and nonresidential DCC for SVOCs. Total PCB concentrations in one historic surface soil sample collected from the Tamarack Processing Area exceed DCC for both residential and nonresidential exposure scenarios.

- Surface soil samples collected near dilapidated drums and an area of oil staining exceeded PSIC for the non-residential scenario, and DCC in both of the residential and nonresidential exposure scenarios for inorganic contaminants. Surface soil samples contained contaminants that exceeded the GSIPC, and Drinking Water Criteria (DWC) in both of the residential and nonresidential exposure scenarios for cyanide.

- Historic surface soil XRF screening results included measured inorganic contaminant concentrations that exceeded DCC and PSIC in both residential and non-residential exposure scenarios.

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 Tamarack Processing Area.

Tamarack Processing Area – Media, Criteria, Potential Receptor Summary

Media	Soil			Groundwater			Air		Sediment	Surface Water		Building Materials, Asbestos, and Abandoned Containers			
Criteria / Potential Receptor	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
Residential Human	✓	✓	✓					✓				✓		✓	✓
Nonresidential Human	✓	✓	✓					✓				✓		✓	✓
Water Column Organism															
Benthic Organism															
COCs exceeding applicable regulatory criteria in one or more sample	Arsenic, Copper, Cyanide, Iron, Lead, Manganese, Naphthalene, Fluoranthene, Phenanthrene, Total PCBs, Benzo(a)pyrene, Dibenzo(a,h)anthracene, Carbazole, Asbestos														

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 Tamarack Processing Area with respect to the goals and objectives for the Project:

- Significant terrestrial sources of contamination are present in the form of inorganic COCs, cyanide, SVOCs, PCBs, and asbestos in the study area. Reconnaissance documented that the contents of abandoned containers and debris and waste piles are prevalent in the study area and contain multiple COCs that exceed applicable regulatory criteria; and,

- Industrial ruins, including buildings, foundations, and building floors are present. Mining era ACM, containers, and building materials were all observed in the study area. Multiple pieces of SACM commingled with building debris in various sizes and quantities were also noted. Several locations in the study area feature structural voids in foundations and floors at or above grade in mining era building footprints and steep hill side locations that may pose physical hazards.

9.1.3 Tamarack Sands Area

The analytical results and interpretation summarized **Section 7** document human health and ecological risks that are present in the Tamarack Sands Area. The findings of these investigative activities are summarized as follows:

- Asbestos analytical results for a white to whitish gray fibrous material that was damaged, weathered, and friable, (CHTC-ASBBLK09) confirmed that ACM is present on and adjacent to a trail in the Tamarack Sands Area. This material is located on and adjacent to a trail, adjacent to a residential area, and was subject to migration via wind and water erosion. Asbestos concentrations in the bulk material samples contained asbestos fibers at concentrations greater than 1 %. The damaged and friable nature of these materials posed a potential risk to human health as it relates to the inhalation pathway. Although, asbestos fibers were not detected in a limited number of soil samples collected from the study area, the exposed nature of these material, makes them subject to further degradation that could potentially impact surface soils in the Tamarack Sands Area. During the fall of 2015, MDEQ undertook an emergency interim response to cap the area of observed ACM on and adjacent to the trail in the Tamarack Sands Area. Provided the remedial measures are maintained properly, the risk from the observed ACM on and adjacent to the trail would be minimized.

- Soil analytical results for a single soil sample exceeded the GSIPC for cyanide. Other shallow and subsurface soil analytical results for the Tamarack Sands Area SI did not contain any COCs at concentrations at or above applicable regulatory criteria.

- Analytical results for a single SI surface soil sample collected near an abandoned container exceeded DCC in the residential exposure scenario for arsenic and GSIPC for cyanide. Analytical results for one other surface soil sample collected near an abandoned container also exceeded GSIPC for cyanide.

- Historical surface soil XRF screening results also included measured inorganic contaminant concentrations that exceeded DCC in the residential exposure scenarios in two study area sampling locations.

- Sediment analytical results exceeded ESLs, TECs, and PECs 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 Tamarack Sands Area.

Tamarack Sands Area – Media, Criteria, Potential Receptor Summary

Media	Soil			Groundwater			Air		Sediment	Surface Water		Building Materials, Asbestos, and Abandoned Containers			
Criteria / Potential Receptor	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
Residential Human		✓	✓									✓		✓	
Nonresidential Human		✓										✓		✓	
Water Column Organism									✓						
Benthic Organism									✓						
COCs exceeding applicable regulatory criteria in one or more sample	Arsenic, Copper, Cyanide, Nickel, Silver, Asbestos														

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 Tamarack Sands 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 COCs, cyanide, and asbestos in the study area. During the fall of 2015, MDEQ undertook an emergency interim response to cap the area of observed ACM on and adjacent to the trail in the Tamarack Sands Area. Provided the remedial measures are maintained properly, the risk from the observed ACM would be minimized;

- No in-lake or terrestrial uncharacterized waste deposits were identified in the study area; and,

- Industrial ruins, including piping and other structures are present. Numerous debris mounds, some constructed of mine rock or concrete debris, partially buried pipe segments, stormwater outfalls, concrete piping, metal debris, ACM, abandoned containers, and building debris were also observed in the area.

9.1.4 Torch Lake

The analytical results and interpretation summarized **Section 8** document the potential human health and ecological risks that are present in the CHTC, CHLL, and Torch Lake. The findings of these investigative activities, specifically as it relates to concentrations of contaminants in sediment and surface water are summarized as follows:

Sediment

- Inorganic COCs – Inorganic COCs and cyanide were detected at or in excess of applicable regulatory criteria in the following study areas:
  - Ahmeek Mill Processing Area (inorganics only); and,
  - Tamarack Sands Area.

Sediment samples collected during prior studies from the CHLL and Torch Lake outside of the conceptual boundaries of the CHTC Operations Area did contain Total PCBs that exceeded applicable regulatory criteria. Moreover, interpretation of these results clearly demonstrates that there are two distinct groupings of elevated Total PCB concentrations in sediment: The first located offshore in the Lake Linden Recreation Area and the second located offshore in the Hubbell Processing Area.

A limited number of surface water samples were collected from Torch Lake and only one of the samples contained Total PCB concentrations at or above applicable regulatory criteria in the CHLL Hubbell Processing Area. Analytical results from the SPMD samples confirmed the presence of PCBs in surface waters of Torch Lake. The SPMD sampling results were inconclusive in identifying a specific PCB source within Torch Lake, but noted that the concentrations of PCBs measured in the SPMD samples were consistent with historical analytical results. In addition, the SPMD sample results demonstrated that relative concentrations of PCB congeners in Torch Lake were significantly higher than the results collected from the connecting waters to Lake Superior.

The SPMD analytical results were later corroborated in a fish tissue study completed by the MDEQ. The study documented that PCB concentrations in fish collected from Torch Lake were consistently higher than in fish found in nearby surface water bodies. Torch Lake was known to contain elevated levels of PCBs, but it was unclear whether the cause of elevated PCB concentrations in fish was caused by sources within Torch Lake. The report concluded that higher

Total PCB concentrations and different congener compositions were found in walleye collected from Torch Lake versus walleye caught in Huron Bay indicating that there was a source of PCBs in the Torch Lake watershed.

The investigative results from the SI have identified two offshore sources of PCBs. These source areas, as confirmed by the results of the historical SPMD and fish tissue studies, are ongoing sources of PCBs that pose both ecological and potential human health risks and continued degradation of the benthos in Torch Lake.

9.2 RECOMMENDATIONS

The conclusions outlined in the preceding subsection establish that the study areas in the CHTC Operations Area are Facilities. The following subsections outline recommended path forward for managing the identified potential exposure risks in the CHTC and Torch Lake.

9.2.1 CHTC

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.

Various actions have been taken through the implementation of remedial measures, such as the placement of a soil and vegetative caps on bulk waste deposits, to address these environmental issues. 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 will continue to provide new study data to the 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 MDHHS where evaluation of specific potential public health risks is warranted.

Once property-specific exposure risks have been evaluated, remedial objectives can be established with appropriate land use restrictions that minimize or eliminate potential exposure risks. These land-use restrictions, or administrative controls, should be employed to ensure that exposures are reliably restricted by a restrictive covenant, institutional control, or other mechanism allowed for under Part 201.

By copy of this SI Report, the Project findings were provided RRD SFS which is responsible for monitoring EPA's remedy for the Torch Lake Superfund Site. RRD SFS should evaluate whether 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 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.

In addition to the overarching recommendations presented above, the following provides additional considerations specific to individual study areas:

- **Ahmeek Mill Processing Area -** EPA actions and actions by others have been taken through the implementation of remedial measures, such as the placement of a partial soil and vegetative cap and removal activities in the Ahmeek Stamp Mill ruins. Given current land use consideration, the uncontrolled nature of the identified ACM across the street from the Osceola Township Park merits immediate response actions to control potential exposure to contaminants. Once these uncontrolled conditions have been stabilized and exposure risks have been evaluated, long-term remedial objectives can be evaluated. To ensure compliance with regulatory statutes, 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.

- **Tamarack Processing Area –** To date, no documented remedial actions are known to have been completed in the study area. The identified contaminants and their uncontrolled nature merit immediate response actions to control and prevent continued migration of contaminants from the terrestrial portions of the study area. Once these uncontrolled conditions have been stabilized and exposure risks have been evaluated, long-term remedial objectives can be evaluated. To ensure compliance with regulatory statutes, 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.
- **Tamarack Sands Area –** It is recommended that additional characterization of the seeps associated with potential upland waste deposits observed by MDEQ GSU staff be conducted.
- A summary of the remedial measures undertaken by MDEQ to cap the area of observed ACM should be provided to the property owner.

9.2.2 Torch Lake

Identified terrestrial and in-lake contamination in the CHTC and Torch Lake may require that additional steps be taken to remove, reduce or treat the contamination to concentrations that are below applicable cleanup standards. Of these contaminants, PCBs, although not detected in samples from the CHTC, present a unique hazard in the CHLL and Torch Lake due to their chemical properties that allow the chemical to migrate and bioaccumulate, such as in fish tissue where concentrations of the contaminant can exceed measured concentrations in environmental samples. Although measures such as BUIs, including "Restrictions on fish and wildlife consumption" and "Degradation of benthos" are in place, risks to human health are significant due to the presence of PCBs in the food chain in terrestrial areas, and on-going potential for upland sources of PCBs to enter Torch Lake.

MDEQ should continue to provide new study data to the RRD SFS which is responsible for monitoring EPA's remedy for the terrestrial and lake portion of the Torch Lake Superfund Site so they can determine if any remedy modifications are necessary in light of the additional information provided by the Project. 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 EPA's 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 MDHHS where evaluation of specific potential public health risks is warranted.

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TABLES

TABLE 3-1
Summary of Historical Operations - C&H Tamarack City Operations Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Historical Building	Study Area	Mining Era Operation	Potential Contaminant Sources	Operational Practices
Ahmeek Stamp Mill	Ahmeek Mill Processing Area	The mill was constructed in 1909 by the Ahmeek Mining Company. The mill processed ore from the company's mines and smaller mines that did not have their own stamping facilities. In 1923 the mill was incorporated into C&H Consolidated Mining Company. The mill did not operate between 1934 and 1936, and in 1947 two new ball mills and flotation units were installed. The mill operation was supported by an adjacent power house and boiler house. By 1938 the Ahmeek Stamp Mill housed eight stamps that could process 900 tons of material per day. The mill discontinued operation in 1969.	Potential for the use of oils and lubricants for maintenance of equipment. Potential for subsurface conduits and utility corridors creating preferential pathways to Torch Lake. Metals-laden stamp sand discharged to Torch Lake. Stamp sand waste stream was commingled with waste streams generated by other facilities including the power house, boiler house, and reclamation facilities.	The Ahmeek Mill began depositing stamp sands into Torch Lake in 1910 and did so continuously until 1968. The mill processed materials from a variety of regional mining companies housing equipment suitable for processing both amygdaloid and conglomerate rock.
Ahmeek Pump House	Ahmeek Mill Processing Area	The pump house was constructed prior to 1921 to support the operations of the Ahmeek Stamp Mill. The pump house was established to extract water from Torch Lake to be used as process water in the mill.	Potential for the use of oils and lubricants for maintenance of equipment. Potential for subsurface conduits and utility corridors creating preferential pathways to Torch Lake. Potential asbestos containing material used for insulation of equipment and fire retardant.	Chemical storage and disposal practices are not well understood.

TABLE 3-1
Summary of Historical Operations - C&H Tamarack City Operations Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Historical Building	Study Area	Mining Era Operation	Potential Contaminant Sources	Operational Practices
Ahmeek Power House	Ahmeek Mill Processing Area	The original power house was constructed prior to 1930 to support operations of the stamp mill. The power house incorporated a transformer house that housed transformers that supported the electrical operations of the stamp mill prior to 1931. In 1930 the power house was demolished and a new facility was constructed and brought on line in 1931. By 1947 the Ahmeek Power House had become a central component in C&H's power generation in the region.	Potential for the use of polychlorinated biphenyl-containing oils and lubricants for maintenance of equipment. ACM used for insulation of equipment and fire retardant building materials. Potential for subsurface conduits and utility corridors creating preferential pathways to Torch Lake.	The storage of coal and other materials typically associated with power generation are not well understood. Use and discharge of cooling water, condensate, and possible treatment chemicals are not well understood. The generation of fly-ash and similar byproducts of power generation is not well understood.
Ahmeek Boiler House	Ahmeek Mill Processing Area	The original boiler house was constructed prior to 1930 to support operations of the stamp mill. In 1930 the boiler house was demolished and a new facility was constructed and brought on line in 1931. By 1941 the Ahmeek Boiler House was providing steam to the Tamarack Reclamation Complex.	Potential for the use of PCB-containing oils and lubricants for maintenance of equipment. Potential for subsurface conduits and utility corridors creating preferential pathways to Torch Lake ACM used for insulation of equipment and fire retardant building materials. Boiler "clinkers" and similar waste streams likely added to the stamp sand waste stream and discharged to Torch Lake	The generation of fly-ash and similar byproducts of power generation is not well understood. Particulate distribution from power generation resulting in potential distribution of mercury and other impurities.

TABLE 3-1
Summary of Historical Operations - C&H Tamarack City Operations Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Historical Building	Study Area	Mining Era Operation	Potential Contaminant Sources	Operational Practices
Tamarack Regrinding Plant	Tamarack Processing Area	The Tamarack Regrinding Plant reground the tailings previously deposited by the Ahmeek, Tamarack, Lake Milling, Smelting & Refining, and the Osceola stamp mills that operated in the Tamarack and Ahmeek Mill Processing Areas. The regrinding plant was operational in 1925, remodeled in 1936, and 1943-44. In 1945 space in the regrinding plant was modified and leased to a subsidiary of C&H, Lake Chemical for the production of copper chemicals. The regrinding plant operated until it's closure in 1956.	Potential for the use of oils and lubricants for maintenance of equipment. Potential for subsurface conduits and utility corridors creating preferential pathways to Torch Lake. Metals-laden stamp sand discharged to Torch Lake. Stamp sand waste stream was commingled with waste streams generated by other facilities.	Original stamp sand deposit was reclaimed and reclamation wastes were deposited in the Tamarack Sands Area.
Tamarack Electrical Substation	Tamarack Processing Area	The electrical substation, was constructed with the other reclamation plant facilities to support electrical operations. The substation was utilized in operations until 1941.	Potential ACM used for insulation of equipment and fire retardant. Potential for the use of PCB-containing oils and lubricants for maintenance of equipment.	The operation and maintenance of the electrical substation is not well documented.

TABLE 3-1
Summary of Historical Operations - C&H Tamarack City Operations Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Historical Building	Study Area	Mining Era Operation	Potential Contaminant Sources	Operational Practices
Tamarack Floatation Plant	Tamarack Processing Area	The Flotation Plant was constructed to treat slimes from stamp sand reclamation operations. The Flotation Plant was operational in 1925. The plant was remodeled in 1936 and 1943-44 and closed in 1956. Flotation is a process which uses a surfactant (pine oil, Dow Froth, xanthates) to get particular mineral particles, in this case copper, to adhere and float to the top of large vats in the form of foam and froth, which is then skimmed off and separated from the other materials and collected. The copper-bearing froth was skimmed and collected for further processing. The sludges/gangue remaining in the tank, having no monetary value, were discharged to the tailings piles in Torch Lake.	Potential for the use of PCB-containing oils and lubricants for maintenance of equipment. Storage and disposal practices for xanthate, pine oil, Dow Froth, and other chemicals. Potential for subsurface conduits and utility corridors creating preferential pathways to Torch Lake.	Chemical storage and disposal practices are not well understood. The sludges/gangue generated by the floatation plant operations were presumably discharged to the tailings piles in Torch Lake.
Tamarack Leaching Plant	Tamarack Processing Area	The Leaching Plant was operational in 1925. It was remodeled in 1936 and 1943-44. The leaching plant discontinued operation in 1956. Leaching is a process where an ammonia solution is mixed with copper bearing sands and put into large holding tanks where the ammonia dissolves the copper. This ammonia and copper solution is then separated from the rest of the material and heated. The ammonia is evaporated and recycled, whereas the copper is precipitated into copper oxide, which was then sent to the smelter to be processed into pure copper.	Potential for the use of oils and lubricants for maintenance of equipment. Storage and disposal practices for leaching solutions, ammonium carbonate, and other chemicals. The final disposition of scrap (post leaching) and any contents of scrapped items is unknown.	Consistent with similar operations in the region, the leaching process is assumed to have taken approximately 72 hours. Chemical storage and disposal practices are not well understood. The interior layout and operational practices of the leach plant are not well understood.

TABLE 3-1
Summary of Historical Operations - C&H Tamarack City Operations Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Historical Building	Study Area	Mining Era Operation	Potential Contaminant Sources	Operational Practices
Tamarack Classifying Plant	Tamarack Processing Area	The Classifying Plant processed the material that came from the regrinding plant to eliminate undesirable material. It was operational by 1925 and was remodeled in 1936 and 1943-44. The classifying plant discontinued operation in 1956. Classifiers in the facility separated out waste material and undesirable grades of material recovered from the stamp sand deposits "reclaimed" from Torch Lake, in this case primarily those originally deposited by the Ahmeek, Tamarack, Lake Milling, Smelting & Refining, and the Osceola stamp mills.	Potential for the use of PCB-containing oils and lubricants for maintenance of equipment. Potential for subsurface conduits and utility corridors creating preferential pathways to Torch Lake. Metals-laden stamp sand discharged to Torch Lake.	Chemical storage and disposal practices are not well understood. The interior layout and operational practices of the leach plant are not well understood. The sludges and wastes generated by the classifying plant operations were presumably discharged to the tailings piles in Torch Lake.
Tamarack Stamp Mill No. 1	Tamarack Processing Area	The Tamarack Stamp Mill was originally owned by the Tamarack Mining Co. The stamp mill was constructed in 1887. C&H purchased the majority of shares in 1910 and the stamp mill was remodeled between 1910 and 1914 and operated until 1917. The stamp mill was demolished and scrapped in 1920.	Potential for the use of oils and lubricants for maintenance of equipment. Potential for subsurface conduits and utility corridors creating preferential pathways to Torch Lake. Metals-laden stamp sand discharged to Torch Lake. Stamp sand waste stream was commingled with waste streams generated by other facilities including the power plant and reclamation facilities.	The mill processed materials and discharged wastes to Torch Lake. The deposited stamp sands were later recovered, reclaimed, and re-deposited in Torch Lake.

TABLE 3-1
Summary of Historical Operations - C&H Tamarack City Operations Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Historical Building	Study Area	Mining Era Operation	Potential Contaminant Sources	Operational Practices
Lake Stamp Mill No. 2 (Tamarack Stamp Mill No. 2)	Tamarack Processing Area	The Lake Milling, Smelting & Refining Company Mill was constructed and operated by the Lake Milling, Smelting & Refining Company in 1898. In 1917 the stamp mill was incorporated into the neighboring Tamarack Operations and renamed Tamarack Stamp Mill No.2. It was closed between 1927 and 1929, but in 1930 it finally closed and remained closed until it was liquidated in 1945. The upper elevations of the stamp mill were demolished and interior equipment scrapped. The lower elevation of the stamp mill was remodeled and was used as a warehouse served as a storage facility for Lake Chemical's chemical production operations.	Potential for the use of oils and lubricants for maintenance of equipment. Potential for subsurface conduits and utility corridors creating preferential pathways to Torch Lake. Metals-laden stamp sand discharged to Torch Lake.	The mill processed materials and discharged wastes to Torch Lake. The deposited stamp sands were later recovered, reclaimed, and re-deposited in Torch Lake.
Osceola Stamp Mill	Tamarack Processing Area	The Osceola Stamp Mill was owned and operated by the Osceola Mining Company before C&H bought a controlling interest in 1906 and merged it with C&H in 1911. The Osceola Mill began depositing stamp sands into Torch Lake around 1900 and did so continuously until approximately 1920. In 1941 the mill and boiler house were scrapped.	Potential for the use of oils and lubricants for maintenance of equipment. Potential for subsurface conduits and utility corridors creating preferential pathways to Torch Lake. Metals-laden stamp sand discharged to Torch Lake.	The mill processed materials and discharged wastes to Torch Lake. The deposited stamp sands were later recovered, reclaimed, and re-deposited in Torch Lake.

TABLE 3-1
Summary of Historical Operations - C&H Tamarack City Operations Area
Abandoned Mining Wastes - Torch Lake Non-Superfund Site

Historical Building	Study Area	Mining Era Operation	Potential Contaminant Sources	Operational Practices
Lake Chemical Production Facility	Tamarack Processing Area	C&H and Harshaw Chemical Company of Cleveland, established a corporate subsidiary, the Lake Chemical Company in 1945. The company's operations were located in a remodeled portion of the Tamarack Reclamation Plant. The chemical manufacturing company utilized six lead-lined reaction tanks, 7 feet in diameter by 12 feet high, in the production of chemical additives and pesticides. The chemicals were produced by chemically reacting scrap copper with chlorides and sulfates to form products such as copper hydrate, copper oxychloride sulfate, and copper oxide. The chemicals were generally sold for agricultural purposes; however, the C&H sought to have the copper oxides used in a number of other industries during the 1930s and 1940s. The mixed copper oxides were used as dyes for ceramics, paints, and synthetic materials like rayon. From 1934 to 1944, Lake Chemical shipped over 50 million pounds of cupric and mixed oxides to industries throughout the United States. Due to waning sales and the decreasing quality of their product, Lake Chemical was dissolved in 1965.	Potential for the use of PCB-containing oils and lubricants for maintenance of equipment. Potential for spills and subsequent leaching of chemicals produced and stored at the facility. Potential for subsurface conduits and utility corridors creating preferential pathways to Torch Lake. The final disposition of scrap (post chemical reaction) and any contents of scrapped items is unknown. Potential for sewage to have been discharged to Torch Lake during operations.	Use of chlorides, sulfates, and other chemicals in the production of copper-based chemicals. Chemical storage and disposal practices are not well understood. The interior layout and operational practices of Lake Chemical are not well understood.

Table 3-2
Sampling and Analysis Summary
Ahmeek Mill Processing Area
C&H Tamarack City Operations
Houghton County, Michigan

Proposed Sampling Location	Sample Date	Field Sample Identification	Laboratory Work Order Number	Longitude	Latitude	Sample Interval/Screen Interval (feet)	Sampling Rationale	Sample Description	Sample Notes	Sampling Method	Sample Type/Matrix						Requested Laboratory Analyses								Water Quality Parameters			
											Surface Soil	Subsurface Soil	Groundwater	Surface Water	Sediment	Drums, Containers, and Building Materials/SACM	VOCs	PNAs	Metals	PCBs	Cyanide	Asbestos	Chloride/Sulfate	Oil and Grease	Temperature (°C)	Conductivity (mS/cm)	Dissolved Oxygen (%)	pH
Soil Borings																												
CHTC-SB01-0-6"	5/16/2015	CHTC-SB01-0-6"	1505188	47.17055328	-88.43158343	0 - 0.5	Data Gap - Lack of historical data	TOPSOIL	Grab Sample	Direct Push Boring	X									X								
CHTC-SB01-X-Y'	5/16/2015	CHTC-SB01-6"-7'	1505188	47.17055328	-88.43158343	0.5 - 7	Data Gap - Lack of historical data	SAND, Medium grained, Light Brown to 1.75 ft; SILTY SAND, Fine grained, Reddish brown to 7 ft; SAND, Fine grained, Reddish brown to 8 ft	Composite Sample	Direct Push Boring		X								X								
CHTC-SB02-0-6"	5/16/2015	CHTC-SB02-0-6"	1505188	47.1701299	-88.43206494	0 - 0.5	Data Gap - Lack of historical data	TOPSOIL	Grab Sample	Direct Push Boring	X									X								
CHTC-SB02-X-Y'	5/16/2015	CHTC-SB02-6"-10'	1505188	47.1701299	-88.43206494	0.5 - 10	Data Gap - Lack of historical data	SAND, Fine to medium grained, Brown to 9 ft; SAND, Fine grained, Brown to 11 ft; SAND, Fine to medium grained, Brown to 12 ft	Composite Sample	Direct Push Boring		X					X	X		X								
CHTC-SB03-0-6"	5/17/2015	CHTC-SB03-0-6"	1505190 240-51101-1	47.16927136	-88.43293383	0 - 0.5	Data Gap - Lack of historical data	TOPSOIL	Grab Sample	Direct Push Boring	X									X		X						
CHTC-SB03-X-Y'	5/17/2015	CHTC-SB03-6"-7'	1505190	47.16927136	-88.43293383	0.5 - 7	Data Gap - Lack of historical data	SAND AND GRAVEL, Medium grained, Brown to 2 ft; SAND, Medium grained, Light brown to 6 ft; SAND, Coarse to medium grained, Brown to 8 ft	Composite Sample	Direct Push Boring		X								X								
CHTC-SB04-0-6"	5/17/2015	CHTC-SB04-6"-12"	1505192	47.16890037	-88.43213188	0.5 - 1	Data Gap - Lack of historical data	CLAY cap to 1.5 ft	Grab Sample	Direct Push Boring	X									X								
CHTC-SB04-X-Y'	5/17/2015	CHTC-SB04-12"-5'	1505192	47.16890037	-88.43213188	1 - 5	Data Gap - Lack of historical data	SAND, Stamp sand, Medium grained, Gray	Composite Sample	Direct Push Boring		X					X	X		X								
CHTC-SB05-0-6"	5/17/2015	CHTC-SB05-3"-9"	1505190 240-51101-1	47.16813001	-88.43247236	0.25 - 0.75	Data Gap - Lack of historical data	CLAY cap to 0.25 ft; SAND, Stamp sand, Medium grained, Gray to 0.75 ft	Grab Sample	Direct Push Boring	X									X		X						
CHTC-SB05-X-Y'	5/17/2015	CHTC-SB05-9"-5'	1505190	47.16813001	-88.43247236	0.75 - 5	Data Gap - Lack of historical data	SAND, Stamp sand, Medium grained, Gray	Composite Sample	Direct Push Boring		X								X								
--	5/17/2015	CHTC-SB05-9"-5'-DUP	1505190	47.16813001	-88.43247236	0.75 - 5	QA/QC Duplicate Sample	SAND, Stamp sand, Medium grained, Gray	QA/QC Duplicate Sample	Direct Push Boring		X								X								
CHTC-SB06-0-6"	5/17/2015	CHTC-SB06-0-6"	1505190	47.16717678	-88.43288733	0 - 0.5	Data Gap - Lack of historical data	TOPSOIL	Grab Sample	Direct Push Boring	X									X								
CHTC-SB06-X-Y'	5/17/2015	CHTC-SB06-6"-4'	1505190	47.16717678	-88.43288733	0.5 - 4	Data Gap - Lack of historical data	SAND, Fine grained, Brown to 0.75 ft; SAND, Stamp sand, Medium grained, Gray	Composite Sample	Direct Push Boring		X								X								
CHTC-SB07-0-6"	5/18/2015	CHTC-SB07-0-6"	1505192 240-51101-1	47.16683151	-88.43312468	0 - 0.5	Data Gap - Lack of historical data	TOPSOIL	Grab Sample	Direct Push Boring	X									X		X						
CHTC-SB07-X-Y'	5/18/2015	CHTC-SB07-6"-4'	1505192	47.16683151	-88.43312468	0.5 - 4	Data Gap - Lack of historical data	FILL, Sand and gravel and debris	Composite Sample	Direct Push Boring		X								X								
CHTC-SB08-0-6"	5/18/2015	CHTC-SB08-0-6"	1505192 240-51101-1	47.16745791	-88.43361549	0 - 0.5	Data Gap - Lack of historical data	TOPSOIL	Grab Sample	Direct Push Boring	X									X		X						
CHTC-SB08-X-Y'	5/18/2015	CHTC-SB08-6"-4'	1505192	47.16745791	-88.43361549	0.5 - 4	Data Gap - Lack of historical data	SAND, Fine grained, Brown to 3 ft; SAND, Fine grained, Gray to 5 ft	Composite Sample	Direct Push Boring		X								X								
CHTC-SB09-0-6"	5/18/2015	CHTC-SB09-0-6"	1505192 240-51101-1	47.16643487	-88.43393609	0 - 0.5	Data Gap - Lack of historical data	SAND with GRAVEL, Medium grained, Reddish Brown to 4 ft	Grab Sample	Direct Push Boring	X									X		X						
CHTC-SB09-X-Y'	5/18/2015	CHTC-SB09-6"-4'	1505192	47.16643487	-88.43393609	0.5 - 4	Data Gap - Lack of historical data	SILTY SAND, Fine grained, Brown to 4.75 ft; SAND, Coarse to medium grained, Brown to 5 ft	Composite Sample	Direct Push Boring		X								X								
CHTC-SB10-0-6"	5/18/2015	CHTC-SB10-0-6"	1505192 240-51101-1	47.16704548	-88.43437576	0 - 0.5	Data Gap - Lack of historical data	TOPSOIL	Grab Sample	Direct Push Boring	X									X		X						
CHTC-SB10-X-Y'	5/18/2015	CHTC-SB10-6"-4'	1505192	47.16704548	-88.43437576	0.5 - 4	Data Gap - Lack of historical data	SAND, Fine to medium grained, Brown to 3 ft; SAND with GRAVEL, Fine grained, Reddish Brown to 5 ft	Composite Sample	Direct Push Boring		X								X								
--	5/18/2015	CHTC-SB10-6"-4'-DUP	1505192	47.16704548	-88.43437576	0.5 - 4	QA/QC Duplicate Sample	SAND, Fine to medium grained, Brown to 3 ft; SAND with GRAVEL, Fine grained, Reddish Brown to 5 ft	QA/QC Duplicate Sample	Direct Push Boring		X								X								
CHTC-SB11-0-6"	5/17/2015	CHTC-SB11-0-6"	1505190 240-51104-1	47.1687339	-88.43358273	0 - 0.5	Data Gap - Lack of historical data	TOPSOIL	Grab Sample	Direct Push Boring	X									X		X						
CHTC-SB11-X-Y'	5/17/2015	CHTC-SB11-6"-7'	1505190	47.1687339	-88.43358273	0.5 - 7	Data Gap - Lack of historical data	SAND AND GRAVEL, Medium grained, Dark gray to 1 ft; SAND, Fine grained, Brown to 5 ft; SAND, Medium grained, Brown to 9 ft	Composite Sample	Direct Push Boring		X					X	X		X								
CHTC-SB12-0-6"	5/17/2015	CHTC-SB12-0-6"	1505190	47.16844064	-88.43556556	0 - 0.5	Data Gap - Lack of historical data	FILL, Sand and gravel, Gray to 7 ft	Grab Sample	Direct Push Boring	X									X								
CHTC-SB12-X-Y'	5/17/2015	CHTC-SB12-6"-11'	1505190	47.16844064	-88.43556556	0.5 - 11	Data Gap - Lack of historical data	SAND, Fine grained, Brown to 9 ft; SILTY SAND, Fine grained, Brown to 11 ft; SAND, Medium to fine grained, Brown to 13 ft	Composite Sample	Direct Push Boring		X					X	X		X								
CHTC-SB13-0-6"	5/17/2015	CHTC-SB13-0-6"	1505190	47.16817832	-88.43566862	0 - 0.5	Proximity to a historical power house.	SAND, Fine grained, Light brown to 1 ft	Grab Sample	Direct Push Boring	X									X								
CHTC-SB13-X-Y'	5/17/2015	CHTC-SB13-6"-9'	1505190	47.16817832	-88.43566862	0.5 - 9	Proximity to a historical power house.	SAND, Fine grained, Gray to 5 ft; SAND, Medium grained, Brown to 12 ft	Composite Sample	Direct Push Boring		X					X	X		X								
CHTC-SB14-0-6"	5/18/2015	CHTC-SB14-0-6"	1505192 240-51101-1	47.16715347	-88.43508774	0 - 0.5	Proximity to observed suspect asbestos panel	TOPSOIL	Grab Sample	Direct Push Boring	X									X		X						
CHTC-SB14-X-Y'	5/18/2015	CHTC-SB14-6"-7'	1505192	47.16715347	-88.43508774	0.5 - 7	Proximity to observed suspect asbestos panel	SAND, Medium to fine grained, Brown to 3 ft; SILTY SAND, Fine grained, Brown to 5 ft; SAND, Medium grained, brown to 7 ft	Composite Sample	Direct Push Boring		X								X								
CHTC-SB44-0-6"	5/17/2015	CHTC-SB44-0-6"	1505190	47.16668919	-88.43221635	0 - 0.5	Reported disposal area	TOPSOIL	Grab Sample	Direct Push Boring	X									X								
CHTC-SB44-X-Y'	5/17/2015	CHTC-SB44-6"-4'	1505190	47.16668919	-88.43221635	0.5 - 4	Reported disposal area	SAND, Fine grained, Brown to 0.75 ft; SAND, Stamp sand, Medium grained, Gray to 4 ft	Composite Sample	Direct Push Boring		X					X	X		X								
Groundwater																												
CHTC-GW01-X-Y'	5/16/2015	CHTC-GW01-15'-20'	1505187	47.1701299	-88.43206494	15 - 20	Data Gap - Lack of historical data	Temporary Screen Interval: 15 ft - 20 ft	Grab Sample	Peristaltic Pump			X				X	X		X					14.8	0.775	--	6.79
CHTC-GW02-X-Y'	5/17/2015	CHTC-GW02-12'-17'	1505191	47.16890037	-88.43213188	12 - 17	Data Gap - Lack of historical data	Temporary Screen Interval: 12 ft - 17 ft	Grab Sample	Peristaltic Pump			X				X	X		X					14.0	0.388	--	7.63
CHTC-GW03-X-Y'	5/18/2015	CHTC-GW03-10'-15'	1505191	47.16683151	-88.43312468	10 - 15	Data Gap - Lack of historical data	Temporary Screen Interval: 10 ft - 15 ft	Grab Sample	Peristaltic Pump			X				X	X		X					8.6	0.378	--	7.12
CHTC-GW04-X-Y'	8/23/2015	CHTC-GW-04-11'-15'	1508219	47.16745791	-88.43361549	11 - 15	Data Gap - Lack of historical data	Temporary Screen Interval: 11 ft - 15 ft	Grab Sample	Peristaltic Pump			X				X	X		X					--	--	--	--
CHTC-GW05-X-Y'	8/23/2015	CHTC-GW-05-11'-15'	1508219	47.16643487	-88.43393609	11 - 15	Data Gap - Lack of historical data	Temporary Screen Interval: 11 ft - 15 ft	Grab Sample	Peristaltic Pump			X				X	X		X					--	--	--	--
CHTC-GW06-X-Y'	5/18/2015	CHTC-GW06-10'-15'	1505191	47.16704548	-88.43437576	10 - 15	Data Gap - Lack of historical data	Temporary Screen Interval: 10 ft - 15 ft	Grab Sample	Peristaltic Pump			X				X	X		X					8.9	0.175	--	8.54
CHTC-GW07-X-Y'	5/17/2015	CHTC-GW07-12'-17'	1505189	47.1687339	-88.43358273	12 - 17	Proximity to a historical power house.	Temporary Screen Interval: 12 ft - 17 ft	Grab Sample	Peristaltic Pump			X				X	X		X					11.7	0.204	--	7.11
CHTC-GW08-X-Y'	5/17/2015	CHTC-GW08-15'-20'	1505189	47.16844064	-88.43556556	15 - 20	Proximity to a historical power house.	Temporary Screen Interval: 15 ft - 20 ft	Grab Sample	Peristaltic Pump			X				X	X		X					--	--	--	--
CHTC-GW09-X-Y'	8/23/2015	CHTC-GW-09-13'-17'	1508219	47.16817832	-88.43566862	13 - 17	Data Gap - Lack of historical data	Temporary Screen Interval: 13 ft - 17 ft	Grab Sample	Peristaltic Pump			X				X	X		X					--	--	--	--
CHTC-GW10-X-Y'	5/18/2015	CHTC-GW10-11'-16'	1505191	47.16715347	-88.43508774	11 - 16	Data Gap - Lack of historical data	Temporary Screen Interval: 11 ft - 16 ft	Grab Sample	Peristaltic Pump			X				X	X		X					--	--	--	--
CHTC-GW39-X-Y'	5/17/2015	CHTC-GW39-6'-11'	1505189	47.16668919	-88.43221635	6 - 11	Reported disposal area	Temporary Screen Interval: 6 ft - 11 ft	Grab Sample	Peristaltic Pump			X				X	X	X	X					10.9	0.397	--	6.8
--	5/17/2015	CHTC-GW39-6'-11'-DUP	1505189	47.16668919	-88.43221635	6 - 11	QA/QC Duplicate Sample	Temporary Screen Interval: 6 ft - 11 ft	Grab Sample	Peristaltic Pump			X				X	X		X					10.9	0.397	--	6.8

Table 3-2
Sampling and Analysis Summary
Ahmeek Mill Processing Area
C&H Tamarack City Operations
Houghton County, Michigan

Proposed Sampling Location	Sample Date	Field Sample Identification	Laboratory Work Order Number	Longitude	Latitude	Sample Interval/Screen Interval (feet)	Sampling Rationale	Sample Description	Sample Notes	Sampling Method	Sample Type/Matrix						Sample Analyses								Water Quality Parameters			
											Surface Soil	Subsurface Soil	Groundwater	Surface Water	Sediment	Drums, Containers, and Building Materials/SACM	VOCs	PNAs	Metals	PCBs	Cyanide	Asbestos	Chloride/Sulfate	Oil and Grease	Temperature (°C)	Conductivity (mS/cm)	Dissolved Oxygen (%)	pH
Sediment																												
CHTC-SD01-0-6"	7/7/2015	CHTC-SD01-0-6"	1507117	47.16984577	-88.43039219	0 - 0.5	Data Gap - Lack of historical data.	SAND with SILT, Dark brown; wet; soft	Grab Sample	Vibracore					X				X	X	X							
CHTC-SD01-1-3'	7/7/2015	CHTC-SD01-1-2.66'	1507117	47.16984577	-88.43039219	1 - 2.66	Data Gap - Lack of historical data	SILT with Trace SAND, Dark brown; very wet; very soft	Composite Sample	Vibracore					X			X		X								
CHTC-SD01-3-5'	--	--	--	--	--	--	Data Gap - Lack of historical data	SAND, Dark brown; wet; firm; fine to medium sand	Composite Sample	Vibracore					X					X								
CHTC-SD02-0-6"	7/7/2015	CHTC-SD02-0-6"	1507117	47.16844627	-88.43061019	0 - 0.5	Data Gap - Lack of historical data	SAND, Dark brown, red and black; loose; wet; fine to medium sand	Grab Sample	Vibracore					X					X								
CHTC-SD02-1-3'	7/7/2015	CHTC-SD02-1-3'	1507117	47.16844627	-88.43061019	1 - 3	Data Gap - Lack of historical data	SAND Dark brown, red and black; firm; wet; fine to medium sand with some silt; staining visible in discrete streaks from 2-2.75'; no odor	Composite Sample	Vibracore					X					X								
CHTC-SD02-3-5'	7/7/2015	CHTC-SD02-3-3.33'	1507117	47.16844627	-88.43061019	3 - 3.33	Data Gap - Lack of historical data	SAND Dark brown, red and black; firm; wet; fine to medium sand with some silt; no odor	Composite Sample	Vibracore					X					X								
CHTC-SD03-0-6"	7/7/2015	CHTC-SD03-0-6"	1507117	47.16677327	-88.43072424	0 - 0.5	Data Gap - Lack of historical data.	SILT with ORGANICS; Dark brown; soft; wet; silt with organics	Grab Sample	Vibracore					X				X	X	X							
CHTC-SD03-1-3'	7/7/2015	CHTC-SD03-1-3'	1507117	47.16677327	-88.43072424	1 - 3	Data Gap - Lack of historical data	SILT with SAND; Dark red to brown; firm; moist; silt with sand	Composite Sample	Vibracore					X			X		X								
CHTC-SD03-3-6'	7/7/2015	CHTC-SD03-3-4.66'	1507117	47.16677327	-88.43072424	3 - 4.66	Data Gap - Lack of historical data	SAND with Trace GRAVELS; Dark red to brown; soft to firm; wet; fine to medium sand with trace angular gravels	Composite Sample	Vibracore					X					X								
CHTC-SD04-0-6"	7/8/2015	CHTC-SD04-0-6"	1507117	47.16619997	-88.43283846	0 - 0.5	Data Gap - Lack of historical data	SILT with Some SAND; Dark brown; wet; very soft; silt with some fine sand and organics	Grab Sample	Vibracore					X			X	X	X	X							
CHTC-SD04-1-3'	7/8/2015	CHTC-SD04-1-3'	1507117	47.16619997	-88.43283846	1 - 3	Data Gap - Lack of historical data	SAND with SILT; Dark red-brown; wet; loose; fine to medium sand with silt	Composite Sample	Vibracore					X			X	X	X	X							
--	7/8/2015	CHTC-SD04-1-3'-DUP	1507117	47.16619997	-88.43283846	1 - 3	QA/QC Duplicate Sample	SAND with SILT; Dark red-brown; wet; loose; fine to medium sand with silt	Composite Sample	Vibracore					X			X										
CHTC-SD04-3-5'	7/8/2015	CHTC-SD04-3-4.25'	1507117	47.16619997	-88.43283846	3 - 4.25	Data Gap - Lack of historical data	SILTY CLAY; Dark brown to purple-brown; wet; soft; silty clay.	Composite Sample	Vibracore					X			X	X	X	X							
CHTC-SD20-0-6"	7/12/2015	CHTC-SD20-0-6"	1507171	47.166673	-88.431007	0 - 0.5	Data Gap - Lack of historical data.	CLAY with SAND; Dark brown to black; wet; very soft; clay with fine sand.	Grab Sample	Vibracore					X				X	X	X							
CHTC-SD20-1-3'	7/12/2015	CHTC-SD20-1-3'	1507171	47.166673	-88.431007	1 - 3	Data Gap - Lack of historical data	SAND with SILT and Trace GRAVEL; Red-brown; wet; loose to medium dense; fine angular sand with silt and trace angular gravels	Composite Sample	Vibracore					X					X								
CHTC-SD20-3-5'	7/12/2015	CHTC-SD20-3-4.25'	1507171	47.166673	-88.431007	3 - 4.25	Data Gap - Lack of historical data	SAND; Dark red-brown; wet; loose to medium dense; fine angular sand	Composite Sample	Vibracore					X					X								
Bulk Asbestos																												
CHTC-ASBBLK12A	6/29/2015	CHTC-ASBBLK12A-062915	240-52869-1	47.16734403	-88.4349888	--	Suspect Asbestos Containing Material	"JM" Asbestos Sheeting	Bulk Material Sample	Grab						X						X							
CHTC-ASBBLK13A	6/29/2015	CHTC-ASBBLK13A-062915	240-52869-1	47.16732473	-88.43499012	--	Suspect Asbestos Containing Material	Grayish-white transite board	Bulk Material Sample	Grab						X						X							
CHTC-ASBBLK13B	6/29/2015	CHTC-ASBBLK13B-062915	240-52869-1	47.16731882	-88.43501023	--	Suspect Asbestos Containing Material	Grayish-white transite board	Bulk Material Sample	Grab						X						X							
CHTC-ASBBLK13C	6/29/2015	CHTC-ASBBLK13C-062915	240-52869-1	47.16730875	-88.43501598	--	Suspect Asbestos Containing Material	Grayish-white transite board	Bulk Material Sample	Grab						X						X							
CHTC-ASBBLK14A	6/29/2015	CHTC-ASBBLK14A-062915	240-52869-1	47.16733057	-88.43501667	--	Suspect Asbestos Containing Material	Brownish-yellow, weathered rope gasket material	Bulk Material Sample	Grab						X						X							

Notes:
% = Percent
°C = Degrees Celsius
CHTC = C&H Tamarack City Operations
ft = Feet
GW = Groundwater
mS/cm = Millisiemens per Centimeter
MW = Mointoring Well
NM = Not Measured
PNAs = Polynuclear Aromatic Hydrocarbons
PCBs = Polychlorinated Biphenyls
SB = Soil Boring
SD = Sediment
VOCs = Volatile Organic Compounds
X = Analyte selected for laboratory analysis

For the purposes of this investigation, sediments include residues and waste material associated with chemical containers and deposits on the lake bottom historically discarded in Torch Lake.

Table 3-2
Sampling and Analysis Summary
Tamarack Processing Area
C&H Tamarack City Operations
Houghton County, Michigan

Proposed Sampling Location	Sample Date	Field Sample Identification	Laboratory Work Order Number	Longitude	Latitude	Sample Interval/Screen Interval (feet)	Sampling Rationale	Sample Description	Sample Notes	Sampling Method	Sample Type/Matrix						Sample Analyses								Water Quality Parameters			
											Surface Soil	Subsurface Soil	Groundwater	Surface Water	Sediment	Drums, Containers, and Building Materials/SACM	VOCs	PNAs	Metals	PCBs	Cyanide	Asbestos	Chloride/Sulfate	Oil and Grease	Temperature (°C)	Conductivity (mS/cm)	Dissolved Oxygen (%)	pH
Soil Borings																												
CHTC-SB16-0-6"	5/14/2015	CHTC-SB16-0-6"	1505184	47.16537967	-88.44281344	0 - 0.5	Proximity to a historical electrical substation	TOPSOIL	Grab Sample	Direct Push Boring	X									X								
CHTC-SB16-X-Y'	5/14/2015	CHTC-SB16-6"-13'	1505184 240-51108	47.16537967	-88.44281344	0.5 - 13	Proximity to a historical electrical substation	CLAY, Reddish brown to 1 ft; SAND, Medium grained, Reddish brown to 13.5 ft; BEDROCK	Composite Sample	Direct Push Boring		X					X	X		X				X				
CHTC-SB17-0-6"	5/14/2015	CHTC-SB17-0-6"	1505184 240-51101-1	47.16531132	-88.44263354	0 - 0.5	Proximity to a historical electrical substation	TOPSOIL	Grab Sample	Direct Push Boring	X									X		X						
CHTC-SB17-X-Y'	5/14/2015	CHTC-SB17-6"-8'	1505184 240-51108	47.16531132	-88.44263354	0.5 - 8	Proximity to a historical electrical substation	SAND, Medium grained, Brown to 5 ft; SAND, Medium grained, Reddish brown to 12 ft; SAND, Medium grained, Brown to 14 ft	Composite Sample	Direct Push Boring		X					X	X		X				X				
CHTC-SB18-0-6"	5/14/2015	CHTC-SB18-0-6"	1505184	47.1651913	-88.44262538	0 - 0.5	Proximity to a historical electrical substation	SAND, Medium grained, Brown	Grab Sample	Direct Push Boring	X									X								
CHTC-SB18-X-Y	5/14/2015	CHTC-SB18-6"-6'	1505184 240-51108	47.1651913	-88.44262538	0.5 - 6	Proximity to a historical electrical substation	SAND, Medium grained, Reddish brown to 4.5 ft; SILT, Medium grained, Reddish brown to 5 ft, SAND, Medium grained, Reddish brown to 9 ft	Composite Sample	Direct Push Boring		X					X	X		X				X				
CHTC-SB19-0-6"	5/14/2015	CHTC-SB19-0-6"	1505184 240-51101-1	47.16497625	-88.4430161	0 - 0.5	Data Gap - Lack of historical data	FILL, Sand, Fine grained, Brown	Grab Sample	Direct Push Boring	X									X		X						
CHTC-SB19-X-Y	5/14/2015	CHTC-SB19-6"-7'	1505184 240-51108	47.16497625	-88.4430161	0.5 - 7	Data Gap - Lack of historical data	FILL, Sand and gravel, Gray to 1.75 ft; SAND, Medium grained, Reddish brown, to 9 ft	Composite Sample	Direct Push Boring		X					X	X		X				X				
CHTC-SB20-0-6"	5/14/2015	CHTC-SB20-0-6"	1505184	47.1647135	-88.44318972	0 - 0.5	Data Gap - Lack of historical data	FILL, Sand and gravel to 4 ft	Grab Sample	Direct Push Boring	X									X								
CHTC-SB20-X-Y'	5/14/2015	CHTC-SB20-6"-9'	1505184 240-51108	47.1647135	-88.44318972	0.5 - 9	Data Gap - Lack of historical data	SAND, Medium to fine grained, reddish brown to 9 ft, BEDROCK	Composite Sample	Direct Push Boring		X								X				X				
CHTC-SB21-0-6"	5/15/2015	CHTC-SB21-0-6"	1505186 240-51101-1	47.16394039	-88.44259234	0 - 0.5	Data Gap - Lack of historical data	TOPSOIL	Grab Sample	Direct Push Boring	X									X		X						
CHTC-SB21-X-Y'	5/15/2015	CHTC-SB21-6"-12'	1505186	47.16394039	-88.44259234	0.5 - 12	Data Gap - Lack of historical data	SAND, Fine grained, Brown to 0.75 ft; FILL, Sand and gravel to 11 ft; SAND, Fine grained, Brown to 11 ft; SAND, Fine grained, Reddish brown to 16 ft	Composite Sample	Direct Push Boring		X								X								
CHTC-SB21-X-Y'	5/15/2015	CHTC-SB21-6"-12'-DUP	1505186	47.16394039	-88.44259234	0.5 - 12	QA/QC Duplicate Sample	SAND, Fine grained, Brown to 0.75 ft; FILL, Sand and gravel to 11 ft; SAND, Fine grained, Brown to 11 ft; SAND, Fine grained, Reddish brown to 16 ft	Composite Sample	Direct Push Boring		X								X								
CHTC-SB22-0-6"	5/15/2015	CHTC-SB22-0-6"	1505186	47.16331295	-88.44328494	0 - 0.5	Proximity to historical PCB detections	FILL, Sand and gravel to 13 ft	Grab Sample	Direct Push Boring	X									X								
CHTC-SB22-X-Y	5/15/2015	CHTC-SB22-6"-12'	1505186	47.16331295	-88.44328494	0.5 - 12	Proximity to historical PCB detections	SAND, Fine grained, Brown to 16 ft	Composite Sample	Direct Push Boring		X								X								
CHTC-SB23-0-6"	5/15/2015	CHTC-SB23-0-6"	1505186 240-51104-1	47.163706	-88.443441	0 - 0.5	Proximity to historical PCB detections	SAND, Fine grained, Dark gray to 2.5 ft	Grab Sample	Direct Push Boring	X									X		X						
CHTC-SB23-X-Y	5/15/2015	CHTC-SB23-6"-6'	1505186	47.163706	-88.443441	0.5 - 6	Proximity to historical PCB detections	SAND, Medium to fine grained, Reddish brown to 9 ft	Composite Sample	Direct Push Boring		X						X		X								
CHTC-SB24-0-6"	5/15/2015	CHTC-SB24-0-6"	1505186 240-51101-1	47.163962	-88.444002	0 - 0.5	Data Gap - Lack of historical data	FILL, Sand and gravel, Dark gray to 1 ft	Grab Sample	Direct Push Boring	X									X		X						
CHTC-SB24-X-Y'	5/15/2015	CHTC-SB24-6"-8'	1505186	47.163962	-88.444002	0.5 - 8	Data Gap - Lack of historical data	SAND, Medium to fine grained, Dark gray to 3 ft; SAND, Medium to fine grained, Reddish brown to 9 ft	Composite Sample	Direct Push Boring		X								X								
CHTC-SB25-0-6"	5/15/2015	CHTC-SB25-0-6"	1505186	47.163269	-88.444257	0 - 0.5	Data Gap - Lack of historical data	TOPSOIL to 1 ft	Grab Sample	Direct Push Boring	X									X								
CHTC-SB25-X-Y'	5/15/2015	CHTC-SB25-6"-8'	1505186	47.163269	-88.444257	0.5 - 8	Data Gap - Lack of historical data	SAND, Fine grained, Brown to 2 ft; SAND, Fine grained, Reddish brown to 8 ft; SAND, Coarse to medium grained, Brown to 9 ft	Composite Sample	Direct Push Boring		X						X		X								
CHTC-SB26-0-6"	5/15/2015	CHTC-SB26-0-6"	1505186	47.1625873	-88.44389207	0 - 0.5	Data Gap - Lack of historical data	FILL, Sand and gravel to 10 ft	Grab Sample	Direct Push Boring	X									X								
CHTC-SB26-X-Y'	5/15/2015	CHTC-SB26-6"-11'	1505186	47.1625873	-88.44389207	0.5 - 11	Data Gap - Lack of historical data	SAND, Medium to fine grained, Brown to 12 ft	Composite Sample	Direct Push Boring		X								X								
--	5/15/2015	CHTC-SB26-6"-11'-DUP	1505186	47.1625873	-88.44389207	0.5 - 11	Data Gap - Lack of historical data	SAND, Medium to fine grained, Brown to 12 ft	Composite Sample	Direct Push Boring		X								X								
CHTC-SB27-0-6"	5/15/2015	CHTC-SB27-0-6"	1505186	47.16338029	-88.44491497	0 - 0.5	Data Gap - Lack of historical data	TOPSOIL	Grab Sample	Direct Push Boring	X									X								
CHTC-SB27-X-Y'	5/15/2015	CHTC-SB27-6"-8'	1505186	47.16338029	-88.44491497	0.5 - 8	Data Gap - Lack of historical data	SAND, Medium to fine grained, Gray to 1 ft; SAND, Fine grained, Reddish brown to 4 ft; SAND, Medium to fine grained, Brown to 8 ft; BEDROCK	Composite Sample	Direct Push Boring		X								X								
CHTC-SB28-0-6"	5/16/2015	CHTC-SB28-0-6"	1505188	47.16210889	-88.44457414	0 - 0.5	Data Gap - Lack of historical data	TOPSOIL	Grab Sample	Direct Push Boring	X									X								
CHTC-SB28-X-Y	5/16/2015	CHTC-SB28-6"-12'	1505188	47.16210889	-88.44457414	0.5 - 12	Data Gap - Lack of historical data	SAND, Stamp sand, Medium to fine grained, Gray to 11 ft; SAND, Medium to fine grained, Reddish brown to 16 ft	Composite Sample	Direct Push Boring		X						X		X								
CHTC-SB30-0-6"	5/16/2015	CHTC-SB30-0-6"	1505188	47.16148863	-88.44472524	0 - 0.5	Data Gap - Lack of historical data	TOPSOIL	Grab Sample	Direct Push Boring	X									X								
CHTC-SB30-X-Y'	5/16/2015	CHTC-SB30-6"-17'	1505188	47.16148863	-88.44472524	0.5 - 17	Data Gap - Lack of historical data	SAND, Stamp sand, Medium to fine grained, Gray to 20 ft	Composite Sample	Direct Push Boring		X						X		X								
CHTC-SB31-0-6"	5/16/2015	CHTC-SB31-0-6"	1505188	47.16139934	-88.44576882	0 - 0.5	Data Gap - Lack of historical data	FILL, Sand and gravel to 6.5 ft	Grab Sample	Direct Push Boring	X									X								
CHTC-SB31-X-Y'	5/16/2015	CHTC-SB31-6"-6'	1505188	47.16139934	-88.44576882	0.5 - 6	Data Gap - Lack of historical data	FILL, Sand and gravel to 6.5 ft; BEDROCK, Sandstone, Reddish brown	Composite Sample	Direct Push Boring		X						X		X								
--	5/16/2015	CHTC-SB31-6"-6'-DUP	1505188	47.16139934	-88.44576882	0.5 - 6	Data Gap - Lack of historical data	FILL, Sand and gravel to 6.5 ft; BEDROCK, Sandstone, Reddish brown	Composite Sample	Direct Push Boring		X						X		X								
CHTC-SB32-0-6"	5/16/2015	CHTC-SB32-0-6"	1505188	47.16181792	-88.44603616	0 - 0.5	Data Gap - Lack of historical data	FILL, Sand and gravel	Grab Sample	Direct Push Boring	X									X								
CHTC-SB32-X-Y'	5/16/2015	CHTC-SB32-6"-3'	1505188	47.16181792	-88.44603616	0.5 - 3	Data Gap - Lack of historical data	SAND, Medium to fine grained, Reddish brown to 7 ft, BEDROCK	Composite Sample	Direct Push Boring		X								X								

Table 3-2
Sampling and Analysis Summary
Tamarack Processing Area
C&H Tamarack City Operations
Houghton County, Michigan

Proposed Sampling Location	Sample Date	Field Sample Identification	Laboratory Work Order Number	Longitude	Latitude	Sample Interval/Screen Interval (feet)	Sampling Rationale	Sample Description	Sample Notes	Sampling Method	Sample Type/Matrix						Sample Analyses								Water Quality Parameters			
											Surface Soil	Subsurface Soil	Groundwater	Surface Water	Sediment	Drums, Containers, and Building Materials/SACM	VOCs	PNAs	Metals	PCBs	Cyanide	Asbestos	Chloride/Sulfate	Oil and Grease	Temperature (°C)	Conductivity (mS/cm)	Dissolved Oxygen (%)	pH
Surface Soil																												
CHTC-SS02	8/20/2015	CHTC - SS02 - 3"-9"	1508214	47.16461058	-88.44479509	0.25 - 0.75	Surface Soil	--	Grab Sample	Hand Tools	X						X	X	X	X	X							
CHTC-SS03	8/20/2015	CHTC - SS03 - 3"-9"	1508214	47.16536894	-88.44214394	0.25 - 0.75	Surface Soil	--	Grab Sample	Hand Tools	X						X	X	X	X	X							
CHTC-SS04	8/20/2015	CHTC - SS04 - 3"-9"	1508214	47.16554466	-88.44212933	0.25 - 0.75	Surface Soil	--	Grab Sample	Hand Tools	X						X	X	X	X	X							
CHTC-SS05	8/20/2015	CHTC - SS05 - 3"-9"	1508214	47.16557754	-88.44235173	0.25 - 0.75	Surface Soil	--	Grab Sample	Hand Tools	X						X	X	X	X	X							
CHTC-SS06	8/20/2015	CHTC - SS06 - 3"-9"	1508214	47.16520798	-88.44273906	0.25 - 0.75	Surface Soil	--	Grab Sample	Hand Tools	X						X	X	X	X	X							
CHTC-SS07	8/20/2015	CHTC - SS07 - 3"-9"	1508214	47.16499586	-88.4433568	0.25 - 0.75	Surface Soil	--	Grab Sample	Hand Tools	X						X	X	X	X	X							
CHTC-SS08	8/20/2015	CHTC - SS08 - 3"-9"	1508214	47.16418831	-88.44353962	0.25 - 0.75	Surface Soil	--	Grab Sample	Hand Tools	X						X	X	X	X	X							
CHTC-SS09	8/20/2015	CHTC - SS09 - 0-6"	1508214	47.16393299	-88.44458524	0 - 0.5	Surface Soil	--	Grab Sample	Hand Tools	X						X	X	X	X	X							
CHTC-SS10	8/20/2015	CHTC - SS-10 - 0-6"	1508214	47.16386034	-88.44463512	0 - 0.5	Surface Soil	--	Grab Sample	Hand Tools	X						X	X	X	X	X							
CHTC-SS12	8/20/2015	CHTC - SS-12 - 0-6"	1508214	47.16352913	-88.44431248	0 - 0.5	Surface Soil	--	Grab Sample	Hand Tools	X						X	X	X	X	X							
Groundwater																												
CHTC-GW13-X-Y'	5/14/2015	CHTC-GW13-14'-19'	1505183	47.16531132	-88.44263354	14 - 19	Proximity to a historical electrical substation	Temporary Screen Interval: 14 ft - 19 ft	Grab Sample	Peristaltic Pump			X				X	X		X			X		9.4	0.163	--	7.86
CHTC-GW14-X-Y'	5/14/2015	CHTC-GW14-8'-13'	1505183	47.1651913	-88.44262538	8 - 13	Data Gap - Lack of historical data	Temporary Screen Interval: 8 ft - 13 ft	Grab Sample	Peristaltic Pump			X				X	X		X			X		10.6	0.152	--	9.89
CHTC-GW17-X-Y'	5/15/2015	CHTC-GW17-16'-21'	1505185	47.16331295	-88.44328494	16 - 21	Proximity to historical PCB detections	Temporary Screen Interval: 16 ft - 21 ft	Grab Sample	Peristaltic Pump			X				X	X		X					--	--	--	--
CHTC-GW20-X-Y'	5/15/2015	CHTC-GW20-8'-13'	1505185	47.163269	-88.444257	8 - 13	Data Gap - Lack of historical data	Temporary Screen Interval: 8 ft - 13 ft	Grab Sample	Peristaltic Pump			X				X	X		X					--	--	--	--
CHTC-GW20-X-Y'	5/15/2015	CHTC-GW20-8'-13'-DUP	1505185	47.163269	-88.444257	8 - 13	QA/QC Duplicate Sample	Temporary Screen Interval: 8 ft - 13 ft	Grab Sample	Peristaltic Pump			X				X	X		X					--	--	--	--
CHTC-GW23-X-Y'	5/16/2015	CHTC-GW23-16'-21'	1505187	47.16210889	-88.44457414	16 - 21	Data Gap - Lack of historical data	Temporary Screen Interval: 16 ft - 21 ft	Grab Sample	Peristaltic Pump			X				X	X		X					--	--	--	--
CHTC-GW25-X-Y'	5/16/2015	CHTC-GW25-22'-27'	1505187	47.16148863	-88.44472524	22 - 27	Data Gap - Lack of historical data	Temporary Screen Interval: 22 ft - 27 ft	Grab Sample	Peristaltic Pump			X							X					--	--	--	--
Bulk Asbestos																												
CHTC-ASBBLK01A	6/29/2015	CHTC-ASBBLK01A-062915	240-52869-1	47.16557399	-88.44208572	--	Suspect Asbestos Containing Material	Black asphaltic roofing material	Grab Sample	Hand Tools						X						X						
CHTC-ASBBLK01B	6/29/2015	CHTC-ASBBLK01B-062915	240-52869-1	47.16557399	-88.44208572	--	Suspect Asbestos Containing Material	Black asphaltic roofing material	Grab Sample	Hand Tools						X						X						
CHTC-ASBBLK01C	6/29/2015	CHTC-ASBBLK01C-062915	240-52869-1	47.16557399	-88.44208572	--	Suspect Asbestos Containing Material	Black asphaltic roofing material	Grab Sample	Hand Tools						X						X						
CHTC-ASBBLK02A	6/29/2015	CHTC-ASBBLK02A-062915	240-52869-1	47.1654807	-88.44297468	--	Suspect Asbestos Containing Material	Light gray plaster-like veneer on concrete	Grab Sample	Hand Tools						X						X						
CHTC-ASBBLK02B	6/29/2015	CHTC-ASBBLK02B-062915	240-52869-1	47.16546292	-88.44301079	--	Suspect Asbestos Containing Material	Light gray plaster-like veneer on concrete	Grab Sample	Hand Tools						X						X						
CHTC-ASBBLK02C	6/29/2015	CHTC-ASBBLK02C-062915	240-52869-1	47.16549392	-88.44303564	--	Suspect Asbestos Containing Material	Light gray plaster-like veneer on concrete	Grab Sample	Hand Tools						X						X						
CHTC-ASBBLK03A	6/29/2015	CHTC-ASBBLK03A-062915	240-52869-1	47.16542452	-88.44301963	--	Suspect Asbestos Containing Material	Light gray plaster-like veneer on concrete	Grab Sample	Hand Tools						X						X						
CHTC-ASBBLK03B	6/29/2015	CHTC-ASBBLK03B-062915	240-52869-1	47.16538799	-88.44311401	--	Suspect Asbestos Containing Material	Light gray plaster-like veneer on concrete	Grab Sample	Hand Tools						X						X						
CHTC-ASBBLK03C	6/29/2015	CHTC-ASBBLK03C-062915	240-52869-1	47.16517736	-88.44319462	--	Suspect Asbestos Containing Material	Light gray plaster-like veneer on concrete	Grab Sample	Hand Tools						X						X						
CHTC-ASBBLK04A	6/29/2015	CHTC-ASBBLK04A-062915	240-52869-1	47.1651754	-88.44315241	--	Suspect Asbestos Containing Material	Light gray/white transite	Grab Sample	Hand Tools						X						X						
CHTC-ASBBLK04B	6/29/2015	CHTC-ASBBLK04B-062915	240-52869-1	47.16523659	-88.44309171	--	Suspect Asbestos Containing Material	Light gray/white transite	Grab Sample	Hand Tools						X						X						
CHTC-ASBBLK04C	6/29/2015	CHTC-ASBBLK04C-062915	240-52869-1	47.16538899	-88.44299321	--	Suspect Asbestos Containing Material	Light gray/white transite	Grab Sample	Hand Tools						X						X						
CHTC-ASBBLK05A	6/29/2015	CHTC-ASBBLK05A-062915	240-52869-1	47.16541396	-88.44284648	--	Suspect Asbestos Containing Material	Black asphaltic roofing material, weathered, friable	Grab Sample	Hand Tools						X						X						
CHTC-ASBBLK05B	6/29/2015	CHTC-ASBBLK05B-062915	240-52869-1	47.16529546	-88.44304757	--	Suspect Asbestos Containing Material	Black asphaltic roofing material, weathered, friable	Grab Sample	Hand Tools						X						X						
CHTC-ASBBLK05C	6/29/2015	CHTC-ASBBLK05C-062915	240-52869-1	47.16516056	-88.44312126	--	Suspect Asbestos Containing Material	Black asphaltic roofing material, weathered, friable	Grab Sample	Hand Tools						X						X						
CHTC-ASBBLK06A	6/29/2015	CHTC-ASBBLK06A-062915	240-52869-1	47.16533863	-88.44305423	--	Suspect Asbestos Containing Material	Grayish-tan, weathered, friable, woven fabric	Grab Sample	Hand Tools						X						X						
CHTC-ASBBLK07A	6/29/2015	CHTC-ASBBLK07A-062915	240-52869-1	47.16387407	-88.44399279	--	Suspect Asbestos Containing Material	Orange asphaltic roofing material	Grab Sample	Hand Tools						X						X						
CHTC-ASBBLK07B	6/29/2015	CHTC-ASBBLK07B-062915	240-52869-1	47.16353878	-88.44431834	--	Suspect Asbestos Containing Material	Orange asphaltic roofing material	Grab Sample	Hand Tools						X						X						
CHTC-ASBBLK07C	6/29/2015	CHTC-ASBBLK07C-062915	240-52869-1	47.16353669	-88.44429326	--	Suspect Asbestos Containing Material	Orange asphaltic roofing material	Grab Sample	Hand Tools						X						X						
CHTC-ASBBLK08A	6/29/2015	CHTC-ASBBLK08A-062915	240-52869-1	47.16380004	-88.44407863	--	Suspect Asbestos Containing Material	Bluish-black asphaltic roofing material	Grab Sample	Hand Tools						X						X						
CHTC-ASBBLK08B	6/29/2015	CHTC-ASBBLK08B-062915	240-52869-1	47.16378595	-88.4440375	--	Suspect Asbestos Containing Material	Bluish-black asphaltic roofing material	Grab Sample	Hand Tools						X						X						
CHTC-ASBBLK08C	6/29/2015	CHTC-ASBBLK08C-062915	240-52869-1	47.16352459	-88.4443057	--	Suspect Asbestos Containing Material	Bluish-black asphaltic roofing material	Grab Sample	Hand Tools						X						X						
Abandoned Containers																												
CHTC-DM01	8/20/2015	CHTC - DM01 - 0-6"	1508214	47.16499586	-88.4433568	0 - 0.5	Potential Wastes in Abandoned Container	Waste Sample from Degraded Abandoned Drum	Grab Sample	Hand Tools						X		X	X	X	X							
CHTC-DM02	8/20/2015	CHTC - DM02 - 0-6"	1508214	47.16474374	-88.44364344	0 - 0.5	Potential Wastes in Abandoned Container	Waste Sample from Degraded Abandoned Drum	Grab Sample	Hand Tools						X	X	X	X	X	X							
CHTC-DM03	8/20/2015	CHTC - DM03	1508214	47.16386653	-88.44465525	--	Potential Wastes in Abandoned Container	Waste Sample from Degraded Abandoned Drum	Grab Sample	Hand Tools						X	X	X	X	X	X							
CHTC-DM04	8/20/2015	CHTC - DM04	1508214	47.16394106	-88.44456902	--	Potential Wastes in Abandoned Container	Waste Sample from Degraded Abandoned Drum	Grab Sample	Hand Tools						X	X	X	X	X	X							

Notes:
% = Percent
°C = Degrees Celsius
CHTC = C&H Tamarack City Operations
ft = Feet
GW = Groundwater
mS/cm = Millisiemens per Centimeter
MW = Mointoring Well
NM = Not Measured
PNAs = Polynuclear Aromatic Hydrocarbons
PCBs = Polychlorinated Biphenyls
SB = Soil Boring
SD = Sediment
VOCs = Volatile Organic Compounds
X = Analyte selected for laboratory analysis

For the purposes of this investigation, sediments include residues and waste material associated with chemical containers and deposits on the lake bottom historically discarded in Torch Lake.

Table 3-2
Sampling and Analysis Summary
Tamarack Sands Area
C&H Tamarack City Operations
Houghton County, Michigan

Proposed Sampling Location	Sample Date	Field Sample Identification	Laboratory Work Order Number	Longitude	Latitude	Sample Interval/Screen Interval (feet)	Sampling Rationale	Sample Description	Sample Notes	Sampling Method	Sample Type/Matrix						Sample Analyses								Water Quality Parameters			
											Surface Soil	Subsurface Soil	Groundwater	Surface Water	Sediment	Drums, Containers, and Building Materials/SACM	VOCs	PNAs	Metals	PCBs	Cyanide	Asbestos	Chloride/Sulfate	Oil and Grease	Temperature (°C)	Conductivity (mS/cm)	Dissolved Oxygen (%)	pH
Soil Borings																												
CHTC-SB15-0-6"	5/18/2015	CHTC-SB15-0-6"	1505192 240-51101-1	47.16734258	-88.43572444	0 - 0.5	Proximity to observed suspect asbestos panel	TOPSOIL	Grab Sample	Direct Push Boring	X									X		X						
CHTC-SB15-X-Y'	5/18/2015	CHTC-SB15-6"-5'	1505192	47.16734258	-88.43572444	0.5 - 5	Proximity to observed suspect asbestos panel	FILL, Sand and gravel to 4.5 ft; SAND, Fine grained, Brown to 5 ft	Composite Sample	Direct Push Boring		X								X								
CHTC-SB34-0-6"	5/18/2015	CHTC-SB34-0-6"	1505192	47.1662463	-88.43547256	0 - 0.5	Proximity to reported dumping/disposal areas	TOPSOIL to .5 ft; SAND, Medium, reddish brown, saturated at 4 ft	Grab Sample	Direct Push Boring	X									X								
CHTC-SB34-X-Y'	5/18/2015	CHTC-SB34-6"-2'	1505192	47.1662463	-88.43547256	0.5 - 2	Proximity to reported dumping/disposal areas	SAND, Medium, reddish brown, saturated at 4 ft	Composite Sample	Direct Push Boring		X								X								
CHTC-SB35-0-6"	8/22/2015	CHTC - SB - 35 - 0-6"	1508212	47.1655784	-88.43791352	0 - 0.5	Proximity to reported dumping/disposal areas	SAND, Fine to medium, dark gray, saturated at 1 foot	Grab Sample	Direct Push Boring	X									X		X						
CHTC-SB36-0-6"	8/22/2015	CHTC - SB - 36 - 12"-18"	1508212	47.16317224	-88.43682999	1 - 1.5	Downgradient of reported dumping/disposal areas	CLAY CAP to .5 ft; SAND, Fine, dark gray, saturated at 4 ft.	Grab Sample	Direct Push Boring	X							X		X								
CHTC-SB36-X-Y'	8/22/2015	CHTC - SB - 36 - 18"-4'	1508212	47.16317224	-88.43682999	1.5 - 4	Downgradient of reported dumping/disposal areas	SAND, Fine, dark gray, saturated at 4 ft.	Composite Sample	Direct Push Boring		X								X								
CHTC-SB37-0-6"	8/22/2015	CHTC - SB - 37 - 6"-12"	1508212	47.16416586	-88.43862567	0.5 - 1	Downgradient of reported dumping/disposal areas	CLAY CAP to .5 ft; SAND, Fine, dark gray, saturated at 1 ft.	Grab Sample	Direct Push Boring	X									X								
CHTC-SB37-X-Y'	--	--	NS	--	--	--	Downgradient of reported dumping/disposal areas	SAND, Fine, dark gray, saturated at 1 ft.	Sample not collected; Low recovery	Direct Push Boring		X								X								
CHTC-SB38-0-6"	8/22/2015	CHTC - SB - 38 - 6"-12"	1508212	47.15878542	-88.44431592	0.5 - 1	Proximity to reported dumping/disposal areas	CLAY CAP to .5 ft; SAND, Fine, dark gray, saturated at 17 ft.	Grab Sample	Direct Push Boring	X						X	X	X	X	X							
CHTC-SB38-X-Y	8/22/2015	CHTC - SB - 38 - 1'-17'	1508212	47.15878542	-88.44431592	1 - 17	Proximity to reported dumping/disposal areas	SAND, Fine, dark gray, saturated at 17 ft.	Composite Sample	Direct Push Boring		X					X	X	X	X	X							
CHTC-SB39-0-6"	8/22/2015	CHTC - SB - 39 - 6"-12"	1508212	47.16451069	-88.43691704	0.5 - 1	Downgradient of reported dumping/disposal areas	CLAY CAP to .5 ft; SAND, Fine, dark gray, saturated at 1 ft.	Grab Sample	Direct Push Boring	X									X								
CHTC-SB39-X-Y	--	--	NS	--	--	--	Downgradient of reported dumping/disposal areas	SAND, Fine, dark gray, saturated at 1 ft.	Sample not collected; Low recovery	Direct Push Boring		X								X								
CHTC-SB40-0-6"	8/22/2015	CHTC - SB - 40 - 6"-12"	1508212	47.16178931	-88.44004394	0.5 - 1	Data Gap - Lack of historical data	CLAY CAP to .5 ft; SAND, Fine, dark gray, saturated at 13 ft.	Grab Sample	Direct Push Boring	X									X								
CHTC-SB40-X-Y'	8/22/2015	CHTC - SB - 40 - 1'-13'	1508212	47.16178931	-88.44004394	1 - 13	Data Gap - Lack of historical data	SAND, Fine, dark gray, saturated at 13 ft.	Composite Sample	Direct Push Boring		X								X								
CHTC-SB41-0-6"	8/22/2015	CHTC - SB - 41 - 6"-12"	1508212	47.16027381	-88.44198056	0.5 - 1	Data Gap - Lack of historical data	CLAY CAP to .5 ft; SAND, Fine, dark gray, saturated at 17 ft.	Grab Sample	Direct Push Boring	X								X	X	X	X						
CHTC-SB41-X-Y'	8/22/2015	CHTC - SB - 41 - 1'-17'	1508212	47.16027381	-88.44198056	1 - 17	Data Gap - Lack of historical data	SAND, Fine, dark gray, saturated at 17 ft.	Composite Sample	Direct Push Boring		X							X	X	X							
--	8/22/2015	CHTC - SB - 41 - 1'-17' DUP	1508212	47.16027381	-88.44198056	1 - 17	QA/QC Duplicate Sample	SAND, Fine, dark gray, saturated at 17 ft.	Composite Sample	Direct Push Boring									X	X	X							
CHTC-SB42-0-6"	8/21/2015	CHTC - SB42 - 6"-12"	1508214	47.15902261	-88.44554643	0.5 - 1	Data Gap - Lack of historical data	CLAY CAP to .5 ft; SAND, Fine, dark gray, saturated at 7 ft.	Grab Sample	Direct Push Boring	X									X								
CHTC-SB42-X-Y	8/21/2015	CHTC - SB - 42 - 1'-7'	1508212	47.15902261	-88.44554643	1 - 7	Data Gap - Lack of historical data	SAND, Fine, dark gray, saturated at 7 ft.	Composite Sample	Direct Push Boring		X								X								
CHTC-SB43-0-6"	8/21/2015	CHTC - SB43 - 6"-12"	1508214	47.15794567	-88.44224413	0.5 - 1	Data Gap - Lack of historical data	CLAY CAP to .5 ft; SAND, Fine, dark gray, saturated at 5 ft.	Grab Sample	Direct Push Boring	X						X	X	X	X	X							
CHTC-SB43-X-Y'	8/21/2015	CHTC - SB43 - 1'-5'	1508214	47.15794567	-88.44224413	1 - 5	Data Gap - Lack of historical data	SAND, Fine, dark gray, saturated at 5 ft.	Composite Sample	Direct Push Boring		X					X	X	X	X	X							
CHTC-SB45-0-6"	8/22/2015	CHTC - SB - 45 - 15"-21"	1508212	47.16417885	-88.44138545	1.25 - 1.75	Reported disposal area	CLAY CAP to 1.25 ft; SAND, Medium to coarse, reddish brown, saturated at 8 ft.	Grab Sample	Direct Push Boring	X						X	X	X	X	X							
CHTC-SB45-X-Y	8/22/2015	CHTC - SB - 45 - 21"-8'	1508212	47.16417885	-88.44138545	1.75 - 8	Reported disposal area	SAND; Medium to coarse, reddish brown, saturated at 8 ft.	Composite Sample	Direct Push Boring		X					X	X	X	X								
CHTC-SB47-0-6"	8/22/2015	CHTC - SB - 47 - 0-6"	1508212	47.1655571	-88.43643298	0 - 0.5	Reported disposal area	SAND; Medium to coarse, dark gray, saturated at 15 ft.	Grab Sample	Direct Push Boring	X						X	X	X	X	X							
CHTC-SB47-X-Y'	8/22/2015	CHTC - SB - 47 - 6"-5'	1508212	47.1655571	-88.43643298	0.5 - 5	Reported disposal area	SAND; Medium to coarse, dark gray, saturated at 15 ft.	Composite Sample	Direct Push Boring		X					X	X	X	X	X							
CHTC-SB48-0-6"	8/21/2015	CHTC - SB48 - 12"-18"	1508214	47.16389061	-88.44182066	1 - 1.5	Reported disposal area	CLAY CAP to 1 ft; SAND, Fine grained, Dark gray.	Grab Sample	Direct Push Boring	X						X	X	X	X	X							
CHTC-SB48-X-Y'	8/21/2015	CHTC - SB48 - 18"-24'	1508214	47.16389061	-88.44182066	1.5 - 24	Reported disposal area	SAND, Fine grained, dark gray to 14 ft; SAND, Fine to medium, reddish brown, saturated at 24 ft.	Composite Sample	Direct Push Boring		X					X	X	X	X	X							
Surface Soil																												
CHTC-SS01	8/20/2015	CHTC - SS01 - 3"-9"	1508214	47.1653915	-88.43684904	0.25 - 0.75	Observed staining or proximity to observed wastes	Surface Soil Sample	Grab Sample	Hand Tools	X						X	X	X	X	X							
CHTC-SS11	8/22/2015	CHTC - SS - 11 - 0-6"	1508212	47.16554003	-88.43634183	0 - 0.5	Observed staining or proximity to observed wastes	Surface Soil Sample	Grab Sample	Hand Tools	X							X	X	X	X							
Groundwater																												
CHTC-GW11-X-Y'	5/18/2015	CHTC-GW11-10'-15'	1505191	47.16734258	-88.43572444	10 - 15	Data Gap - Lack of historical data	Temporary Screen Interval: 10 ft - 15 ft	Grab Sample	Peristaltic Pump			X				X	X		X					--	--	--	--
CHTC-GW29-X-Y'	5/18/2015	CHTC-GW29-10'-15'	1505191	47.1662463	-88.43547256	10 - 15	Data Gap - Lack of historical data	Temporary Screen Interval: 10 ft - 15 ft	Grab Sample	Peristaltic Pump			X				X	X		X					--	--	--	--
CHTC-GW30-X-Y'	8/22/2015	CHTC - GW - 30 - 7'-12'	1508211	47.1655784	-88.43791352	7 - 12	Data Gap - Lack of historical data	Temporary Screen Interval: 7 ft - 12 ft	Grab Sample	Peristaltic Pump			X				X	X		X					--	--	--	--
CHTC-GW31-X-Y'	8/22/2015	CHTC - GW - 31 - 10'-15'	1508211	47.16317224	-88.43682999	10 - 15	Data Gap - Lack of historical data	Temporary Screen Interval: 10 ft - 15 ft	Grab Sample	Peristaltic Pump			X				X	X		X					--	--	--	--
--	8/22/2015	CHTC - GW - 31 - 10'-15' DUP	1508211	47.16317224	-88.43682999	10 - 15	QA/QC Duplicate Sample	Temporary Screen Interval: 10 ft - 15 ft	Grab Sample	Peristaltic Pump			X				X	X		X					--	--	--	--
CHTC-GW32-X-Y'	8/22/2015	CHTC - GW - 32 - 6'-10'	1508211	47.16416586	-88.43862567	6 - 10	Data Gap - Lack of historical data	Temporary Screen Interval: 6 ft - 10 ft	Grab Sample	Peristaltic Pump			X				X	X		X					--	--	--	--
CHTC-GW33-X-Y'	8/22/2015	CHTC - GW - 33 - 21'-25'	1508211	47.15878542	-88.44431592	21 - 25	Data Gap - Lack of historical data	Temporary Screen Interval: 21 ft - 25 ft	Grab Sample	Peristaltic Pump			X				X	X	X	X					--	--	--	--
CHTC-GW34-X-Y	8/22/2015	CHTC - GW - 34 - 6'-10'	1508211	47.16451069	-88.43691704	6 - 10	Data Gap - Lack of historical data	Temporary Screen Interval: 6 ft - 10 ft	Grab Sample	Peristaltic Pump			X				X			X					--	--	--	--
CHTC-GW35-X-Y	8/22/2015	CHTC - GW - 35 - 16'-21'	1508211	47.16178931	-88.44004394	16 - 21	Data Gap - Lack of historical data	Temporary Screen Interval: 16 ft - 21 ft	Grab Sample	Peristaltic Pump			X				X			X					--	--	--	--
CHTC-GW36-X-Y	8/22/2015	CHTC - GW - 36 - 20-25'	1508211	47.16027381	-88.44198056	20 - 25	Data Gap - Lack of historical data	Temporary Screen Interval: 20 ft - 25 ft	Grab Sample	Peristaltic Pump			X				X			X					--	--	--	--
CHTC-GW37-X-Y	8/21/2015	CHTC - GW - 37 - 9-13'	1508211	47.15902261	-88.44554643	9 - 13	Data Gap - Lack of historical data	Temporary Screen Interval: 9 ft - 13 ft	Grab Sample	Peristaltic Pump			X				X			X					--	--	--	--
CHTC-GW38-X-Y	8/21/2015	CHTC - GW - 38 - 6'-10'	1508211	47.15794567	-88.44224413	6 - 10	Data Gap - Lack of historical data	Temporary Screen Interval: 6 ft - 10 ft	Grab Sample	Peristaltic Pump			X				X			X					--	--	--	--
CHTC-GW40-X-Y	8/22/2015	CHTC - GW - 40 - 13'-17'	1508211	47.16417885	-88.44138545	13 - 17	Reported disposal area	Temporary Screen Interval: 13 ft - 17 ft	Grab Sample	Peristaltic Pump			X				X	X	X	X					--	--	--	--
CHTC-GW43-X-Y	8/22/2015	CHTC - GW - 43 - 10'-15'	1508211	47.1655571	-88.43643298	10 - 15	Reported disposal area	Temporary Screen Interval: 10 ft - 15 ft	Grab Sample	Peristaltic Pump			X				X	X	X	X					--	--	--	--
CHTC-GW44-X-Y	8/21/2015	CHTC - GW - 44 25-30'	1508211	47.16389061	-88.44182066	25 - 30	Reported disposal area	Temporary Screen Interval: 25 ft - 30 ft	Grab Sample	Peristaltic Pump			X				X	X	X	X					--	--	--	--

Table 3-2
Sampling and Analysis Summary
Tamarack Sands Area
C&H Tamarack City Operations
Houghton County, Michigan

Proposed Sampling Location	Sample Date	Field Sample Identification	Laboratory Work Order Number	Longitude	Latitude	Sample Interval/Screen Interval (feet)	Sampling Rationale	Sample Description	Sample Notes	Sampling Method	Sample Type/Matrix						Sample Analyses								Water Quality Parameters			
											Surface Soil	Subsurface Soil	Groundwater	Surface Water	Sediment	Drums, Containers, and Building Materials/SACM	VOCs	PNAs	Metals	PCBs	Cyanide	Asbestos	Chloride/Sulfate	Oil and Grease	Temperature (°C)	Conductivity (mS/cm)	Dissolved Oxygen (%)	pH
Sediment																												
CHTC-SD06-0-6"	7/11/2015	CHTC-SD-06-0-6"	1507171	47.16477712	-88.43217863	0 - 0.5	Data Gap - Lack of historical data.	SAND; Dark brown to black; wet; medium dense; fine angular sand	Grab Sample	Vibracore					X				X	X	X							
CHTC-SD06-1-3'	7/11/2015	CHTC-SD-06-1-3'	1507171	47.16477712	-88.43217863	1 - 3	Data Gap - Lack of historical data	SAND; Dark brown to black; wet; medium dense; fine angular sand	Composite Sample	Vibracore					X			X		X								
CHTC-SD06-3-6'	7/11/2015	CHTC-SD-06-3-3.92'	1507171	47.16477712	-88.43217863	3 - 3.92	Data Gap - Lack of historical data	SAND; Dark brown to black; wet; medium dense; fine angular sand	Composite Sample	Vibracore					X					X								
CHTC-SD07-0-6"	7/11/2015	CHTC-SD-07-0-6"	1507171	47.16372206	-88.42925472	0 - 0.5	Data Gap - Lack of historical data	SILT; Dark brown; soft to firm; black staining visible at .5 ft	Grab Sample	Vibracore					X					X								
CHTC-SD07-1-3'	7/11/2015	CHTC-SD-07-1-3'	1507171	47.16372206	-88.42925472	1 - 3	Data Gap - Lack of historical data	CLAY wth SAND; Dark brown; wet; soft; clay with fine sand to 1.3'; SILT with SAND; Dark brown; wet; soft to firm; silt with fine angular sand	Composite Sample	Vibracore					X					X								
--	7/11/2015	CHTC-SD-07-1-3' DUP	1507171	47.16372206	-88.42925472	1 - 3		CLAY with SAND; Dark brown; wet; soft; clay with fine sand to 1.3'; SILT with SAND; Dark brown; wet; soft to firm; silt with fine angular sand	Composite Sample	Vibracore					X					X								
CHTC-SD07-3-5'	7/11/2015	CHTC-SD-07-3-5'	1507171	47.16372206	-88.42925472	3 - 5	Data Gap - Lack of historical data	SILT with SAND; Dark brown; wet; soft to firm; silt with fine angular sand	Composite Sample	Vibracore					X					X								
CHTC-SD09-0-6"	7/8/2015	CHTC-SD09-0-6"	1507117	47.16162313	-88.43148735	0 - 0.5	Data Gap - Lack of historical data	SAND, Dark brown to red, Loose, Fine grained	Grab Sample	Vibracore					X					X								
CHTC-SD09-1-3'	7/8/2015	CHTC-SD09-1-3'	1507117	47.16162313	-88.43148735	1 - 3	Data Gap - Lack of historical data	SAND, Dark brown to red, Loose, Fine grained to 1 ft; SAND, Dark brown to purple brown, Soft, With clay to 2 ft, SAND, Dark brown to red brown, Loose, Fine grained, With silt	Composite Sample	Vibracore					X					X								
CHTC-SD09-3-5'	7/8/2015	CHTC-SD09-3-5'	1507117	47.16162313	-88.43148735	3 - 5	Data Gap - Lack of historical data	SAND, Dark brown to red brown, Loose, Fine grained, With silt	Composite Sample	Vibracore					X					X								
CHTC-SD10-0-6"	7/10/2015	CHTC-SD10-0-6"	1507176	47.16283852	-88.43440217	0 - 0.5	Data Gap - Lack of historical data.	SAND, Dark brown, red, and green, Loose, Coarse to fine grained	Grab Sample	Vibracore					X				X	X	X							
CHTC-SD10-1-3'	7/10/2015	CHTC-SD10-1-3'	1507176	47.16283852	-88.43440217	1 - 3	Data Gap - Lack of historical data	SAND, Dark brown, red, and green, Loose, Coarse to fine grained to 2.5 ft; SILT, dark brown, Soft to firm	Composite Sample	Vibracore					X			X		X								
	7/10/2015	CHTC-SD10-3-4.75'-DUP	1507176	47.16283852	-88.43440217	3 - 4.75	Data Gap - Lack of historical data	SILT, Dark brown, Soft to firm to 4.25 ft; SILT, Dark brown, Soft, Fine grained, Metallic streaking from 4.7 to 4.75 ft	Composite Sample	Vibracore					X					X								
CHTC-SD10-3-6'	7/10/2015	CHTC-SD10-3-4.75'	1507176	47.16283852	-88.43440217	3 - 4.75	Data Gap - Lack of historical data	SILT, Dark brown, Soft to firm to 4.25 ft; SILT, Dark brown, Soft, Fine grained, Metallic streaking from 4.7 to 4.75 ft	Composite Sample	Vibracore					X				X	X	X							
CHTC-SD11-0-6"	7/10/2015	CHTC-SD11-0-6"	1507176	47.16118744	-88.4335593	0 - 0.5	Data Gap - Lack of historical data	SILT, Dark brown to black, Soft, With organics	Grab Sample	Vibracore					X					X								
CHTC-SD11-1-3'	7/10/2015	CHTC-SD11-1-3'	1507176	47.16118744	-88.4335593	1 - 3	Data Gap - Lack of historical data	SILT, Dark brown to black, Soft, With organics to 0.75 ft; CLAY, dark brown with purple hue, Soft, With silt	Composite Sample	Vibracore					X					X								
CHTC-SD11-3-5'	7/10/2015	CHTC-SD11-3-5'	1507176	47.16118744	-88.4335593	3 - 5	Data Gap - Lack of historical data	CLAY, dark brown with purple hue, Soft, With silt	Composite Sample	Vibracore					X					X								
CHTC-SD13-0-6"	7/11/2015	CHTC-SD13-0-6"	1507176	47.15914907	-88.43446093	0 - 0.5	Data Gap - Lack of historical data	CLAY with Trace SAND; Dark brown to black; wet; soft; clay with trace fine sand	Grab Sample	Vibracore					X					X								
CHTC-SD13-1-3'	7/11/2015	CHTC-SD13-1-3'	1507176	47.15914907	-88.43446093	1 - 3	Data Gap - Lack of historical data	SAND with SILT; Dark brown; wet; loose to medium dense; fine angular sand with silt	Composite Sample	Vibracore					X					X								
CHTC-SD13-3-5'	7/11/2015	CHTC-SD13-3-5'	1507176	47.15914907	-88.43446093	3 - 5	Data Gap - Lack of historical data	SAND; Dark brown; wet; loose to medium dense; fine to medium angular sand	Composite Sample	Vibracore					X					X								
CHTC-SD14-0-6"	7/11/2015	CHTC-SD14-0-6"	1507176	47.15891286	-88.43676632	0 - 0.5	Data Gap - Lack of historical data.	CLAY; Dark brown to black; wet; soft; clay with organics	Grab Sample	Vibracore					X				X	X	X							
CHTC-SD14-1-3'	7/11/2015	CHTC-SD14-1-2.75'	1507176	47.15891286	-88.43676632	1 - 2.75	Data Gap - Lack of historical data	SAND with Some SILT; Dark brown to black; wet; loose; fine angular sand with some silt to 1.5'; SAND, Dark brown to black; wet; loose; coarse angular	Composite Sample	Vibracore					X			X		X								
--	7/11/2015	CHTC-SD14-1-2.75'-DUP	1507176	47.15891286	-88.43676632	1 - 2.75	QA/QC Duplicate Sample	SAND with Some SILT; Dark brown to black; wet; loose; fine angular sand with some silt to 1.5'; SAND, Dark brown to black; wet; loose; coarse angular	Composite Sample	Vibracore					X			X		X								
CHTC-SD14-3-5'	--	--	1507176	--	--	--	Data Gap - Lack of historical data	--	Sample not collected; Low recovery	Vibracore					X					X								
CHTC-SD15-0-6"	7/10/2015	CHTC-SD15-0-6"	1507176	47.1574588	-88.43906869	0 - 0.5	Data Gap - Lack of historical data	SILT, Dark brown with purple hue, Very soft, Black streaking in upper 2 ft	Grab Sample	Vibracore					X					X								
CHTC-SD15-1-3'	7/10/2015	CHTC-SD15-1-3'	1507176	47.1574588	-88.43906869	1 - 3	Data Gap - Lack of historical data	SILT, Dark brown with purple hue, Very soft, Black streaking in upper 2 ft	Composite Sample	Vibracore					X					X								
CHTC-SD15-3-5'	7/10/2015	CHTC-SD15-3-5'	1507176	47.1574588	-88.43906869	3 - 4.33	Data Gap - Lack of historical data	SILT, Dark brown with purple hue, Very soft	Composite Sample	Vibracore					X					X								
CHTC-SD17-0-6"	7/12/2015	CHTC-SD-17-0-6"	1507171	47.15518852	-88.44127635	0 - 0.5	Data Gap - Lack of historical data	SAND; Dark brown to red-brown; wet; loose to medium dense; fine to medium angular sand	Grab Sample	Vibracore					X					X								
CHTC-SD17-1-3'	7/12/2015	CHTC-SD-17-1-3'	1507171	47.15518852	-88.44127635	1 - 3	Data Gap - Lack of historical data	SAND; Dark brown to red-brown; wet; loose to medium dense; fine to medium angular sand; Metallic streaking visible at 2.75'	Composite Sample	Vibracore					X					X								
CHTC-SD17-3-5'	7/12/2015	CHTC-SD-17-3-5'	1507171	47.15518852	-88.44127635	3 - 5	Data Gap - Lack of historical data	SAND; Dark brown to red-brown; wet; loose to medium dense; fine to medium angular sand	Composite Sample	Vibracore					X					X								
CHTC-SD18-0-6"	7/12/2015	CHTC-SD-18-0-6"	1507171	47.15614637	-88.44405673	0 - 0.5	Data Gap - Lack of historical data.	CLAY; Dark brown to black; wet; very soft; clay with organics and root matter	Grab Sample	Vibracore					X				X	X	X							
CHTC-SD18-1-3'	7/12/2015	CHTC-SD-18-1-3'	1507171	47.15614637	-88.44405673	1 - 3	Data Gap - Lack of historical data	SAND; Dark red-brown; wet; loose to medium dense; fine to medium angular sand	Composite Sample	Vibracore					X			X		X								
CHTC-SD18-3-5'	7/12/2015	CHTC-SD-18-3-5'	1507171	47.15614637	-88.44405673	3 - 5	Data Gap - Lack of historical data	SAND; Dark red-brown; wet; loose to medium dense; fine to medium angular sand	Composite Sample	Vibracore					X					X								
CHTC-SD19-0-6"	7/10/2015	CHTC-SD19-0-6"	1507176	47.15743049	-88.44784187	0 - 0.5	Data Gap - Lack of historical data	SILT; dark brown, wet, soft, organic silt	Grab Sample	Vibracore					X				X	X	X							
CHTC-SD19-1-3'	7/10/2015	CHTC-SD19-1-3'	1507176	47.15743049	-88.44784187	1 - 3	Data Gap - Lack of historical data	SILT, dark brown, Soft, Organic to 1 ft; CLAY, Dark brown to purple brown, Soft, No cohesion	Composite Sample	Vibracore					X					X								
CHTC-SD19-3-5'	7/10/2015	CHTC-SD19-3-4.75'	1507176	47.15743049	-88.44784187	3 - 4.75	Data Gap - Lack of historical data	SILT, dark brown, Soft, Organic to 1 ft; CLAY, Dark brown to purple brown, Soft, No cohesion to 3.25 ft; SAND, Dark brown, Loose, Fine grained	Composite Sample	Vibracore					X					X								
Bulk Asbestos																												
CHTC-ASBBLK09A	6/29/2015	CHTC-ASBBLK09A-062915	240-52869-1	47.1656341	-88.43802231	--	Suspect Asbestos Containing Material	Whitish-gray fibrous material, damaged, weathered, friable	Grab Sample	Hand Tools						X						X							
CHTC-ASBBLK09B	6/29/2015	CHTC-ASBBLK09B-062915	240-52869-1	47.16563601	-88.43799919	--	Suspect Asbestos Containing Material	Whitish-gray fibrous material, damaged, weathered, friable	Grab Sample	Hand Tools						X						X							
CHTC-ASBBLK09C	6/29/2015	CHTC-ASBBLK09C-062915	240-52869-1	47.16561875	-88.43801216	--	Suspect Asbestos Containing Material	Whitish-gray fibrous material, damaged, weathered, friable	Grab Sample	Hand Tools						X						X							
CHTC-ASBBLK10A	6/29/2015	CHTC-ASBBLK10A-062915	240-52869-1	47.16571493	-88.43663566	--	Suspect Asbestos Containing Material	Green asphaltic roofing material	Grab Sample	Hand Tools						X						X							
CHTC-ASBBLK10B	6/29/2015	CHTC-ASBBLK10B-062915	240-52869-1	47.16574255	-88.43660568	--	Suspect Asbestos Containing Material	Green asphaltic roofing material	Grab Sample	Hand Tools						X						X							
CHTC-ASBBLK10C	6/29/2015	CHTC-ASBBLK10C-062915	240-52869-1	47.16574247	-88.43663903	--	Suspect Asbestos Containing Material	Green asphaltic roofing material	Grab Sample	Hand Tools						X						X							
CHTC-ASBBLK11A	6/29/2015	CHTC-ASBBLK11A-062915	240-52869-1	47.16576659	-88.43660138	--	Suspect Asbestos Containing Material	Orange asphaltic roofing material	Grab Sample	Hand Tools						X						X							

Notes:
% = Percent
°C = Degrees Celsius
CHTC = C&H Tamarack City Operations
ft = Feet
GW = Groundwater
mS/cm = Millisiemens per Centimeter
MW = Mointoring Well
NM = Not Measured
PNAs = Polynuclear Aromatic Hydrocarbons
PCBs = Polychlorinated Biphenyls
SB = Soil Boring
SD = Sediment
VOCs = Volatile Organic Compounds
X = Analyte selected for laboratory analysis

For the purposes of this investigation, sediments include residues and waste material associated with chemical containers and deposits on the lake bottom historically discarded in Torch Lake.

FIGURES

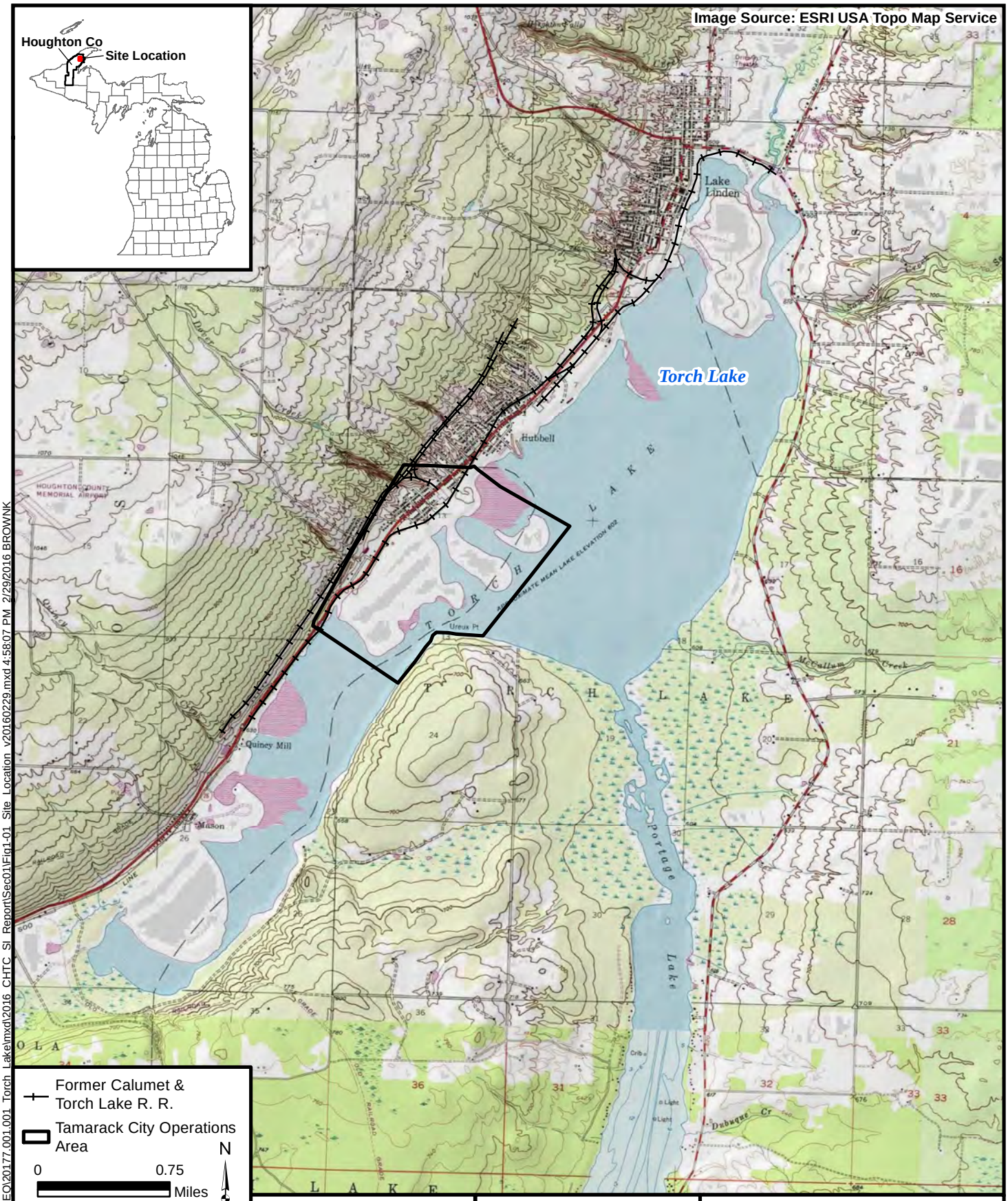

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Figure 1-1
Site Location Map
C&H Tamarack City Operations
Tamarack City, Houghton County, Michigan

Image Source: MIS - Public Imagery

Ahmeek Stamp Mill
Ahmeek Boiler House
Ahmeek Pump House
Ahmeek Power House - Post 1930 update
Ahmeek Boiler House - Post 1930 update

Tamarack Processing Area
-Tamarack Reclamation Plant Complex
-Tamarack Stamp Mill Complex
-Osceola Stamp Mill

Ahmeek Mill Processing Area
-Osceola Township Park
-Ahmeek Stamp Mill Complex

Approximate Location of Observed Asbestos Bag

Tamarack Electric Substation
Tamarack Regrinding Plant
Tamarack Classifying Plant
Alleged Historic Municipal Dump
Tamarack Flotation Plant
Lake Stamp Mill No. 2 (Tamarack Mill No. 2)
Tamarack Leaching Plant
Tamarack Mill No.1
Osceola Stamp Mill
Mutual Water, Light and Power Pump House

Tamarack Sands Area
-Historic Municipal Dump

Map Extent

- Identified Industrial Areas of Interest
- Soil and Vegitative Cap (from MDEQ GIS files)
- Estimated Cap Limits
- Mining Era Buildings and Structures
- Study Areas (DRAFT)
- Tamarack City Operations Geographic Area

Mining Era Buildings and Structures from:
- *Michigan Technical University Archive Research Phase II Report Addendum*

N
0 750 Ft
Coordinate System: MIGeoRef(m)

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Figure 1-2
C&H Tamarack City Operations
Study Area Map
Tamarack City, Houghton County, Michigan

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Soil and Vegitative Cap (from MDEQ GIS files)

Estimated Cap Limits

Mining Era Buildings and Structures

Study Area

N

0 500 Feet

Coordinate System: MIGeoRef(m)

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Figure 2-1
Ahmeek Mill Processing Area
Site Location and Features Map
C&H Tamarack City Operations
Tamarack City, Houghton County, Michigan

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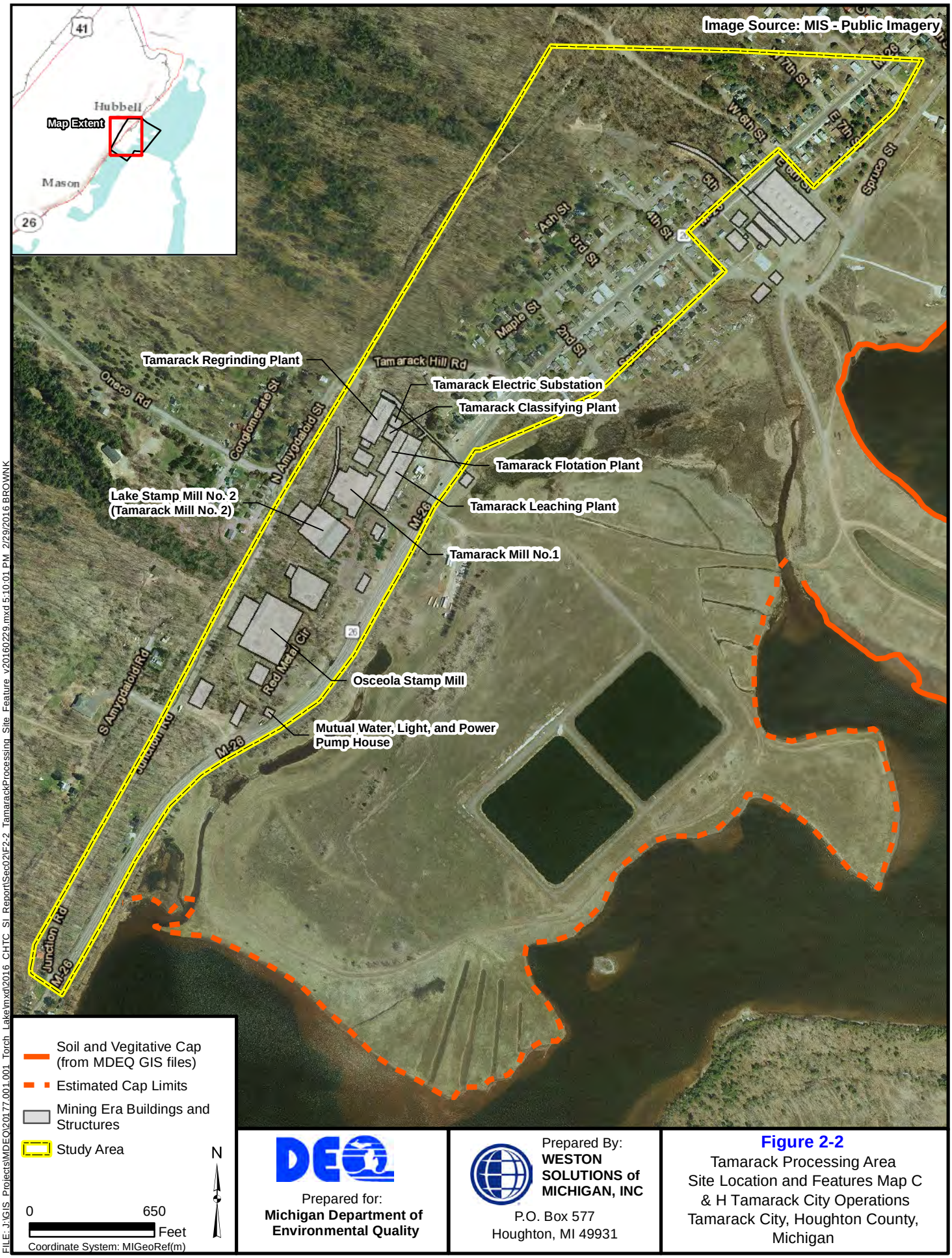

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Figure 2-2
Tamarack Processing Area
Site Location and Features Map C & H Tamarack City Operations
Tamarack City, Houghton County, Michigan

Soil and Vegitative Cap (from MDEQ GIS files)

Estimated Cap Limits

Mining Era Buildings and Structures

Study Area

N

0 850 Feet

Coordinate System: MIGeoRef(m)

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Figure 2-3
Tamarack Sands Area
Site Location and Features Map
C & H Tamarack City Operations
Tamarack City, Houghton County, Michigan

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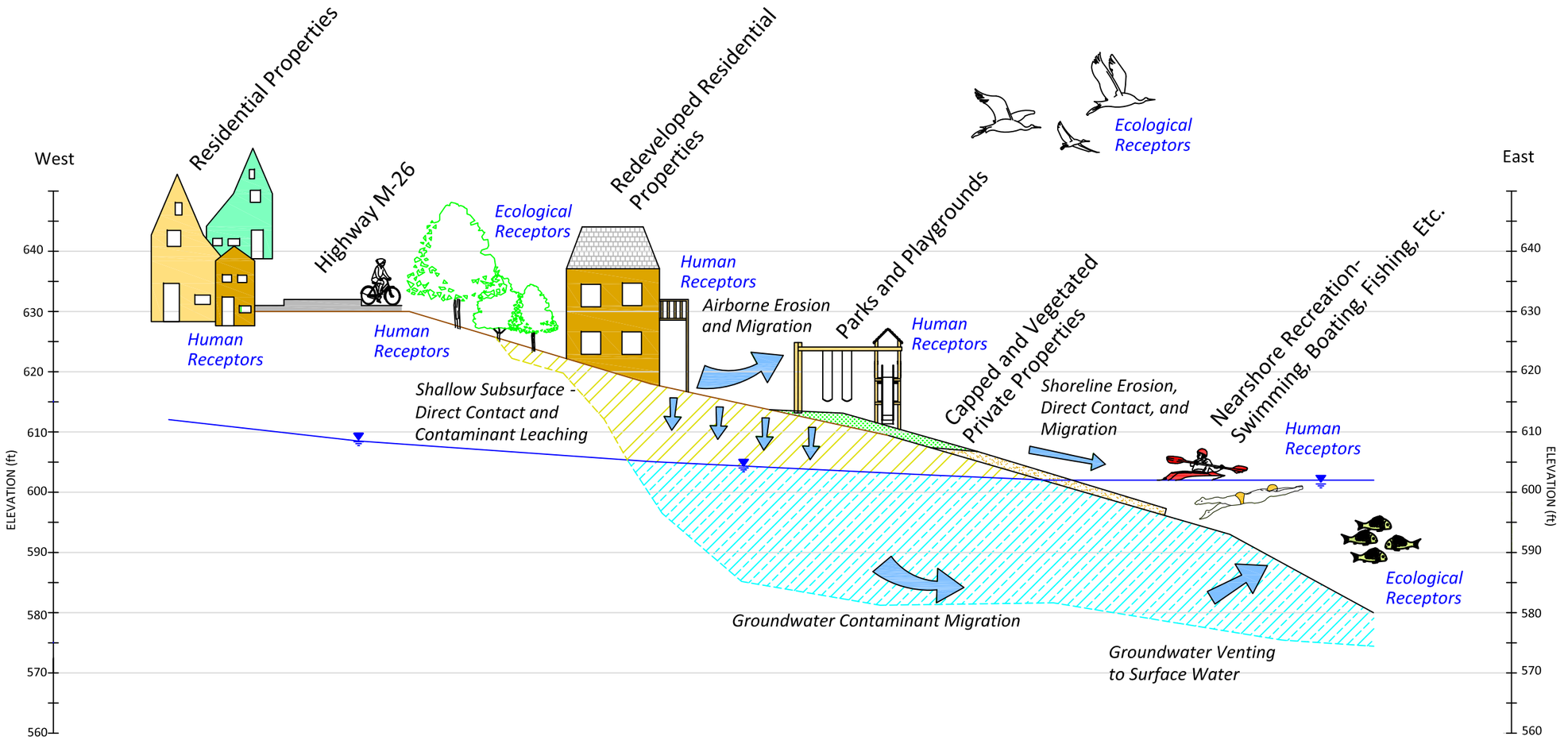
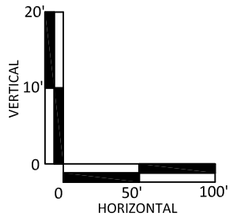


LEGEND

- Conceptual Extent of Contaminated Soil and Wastes
- Conceptual Extent of Groundwater Contamination
- Conceptual Groundwater and Surface Water Elevations



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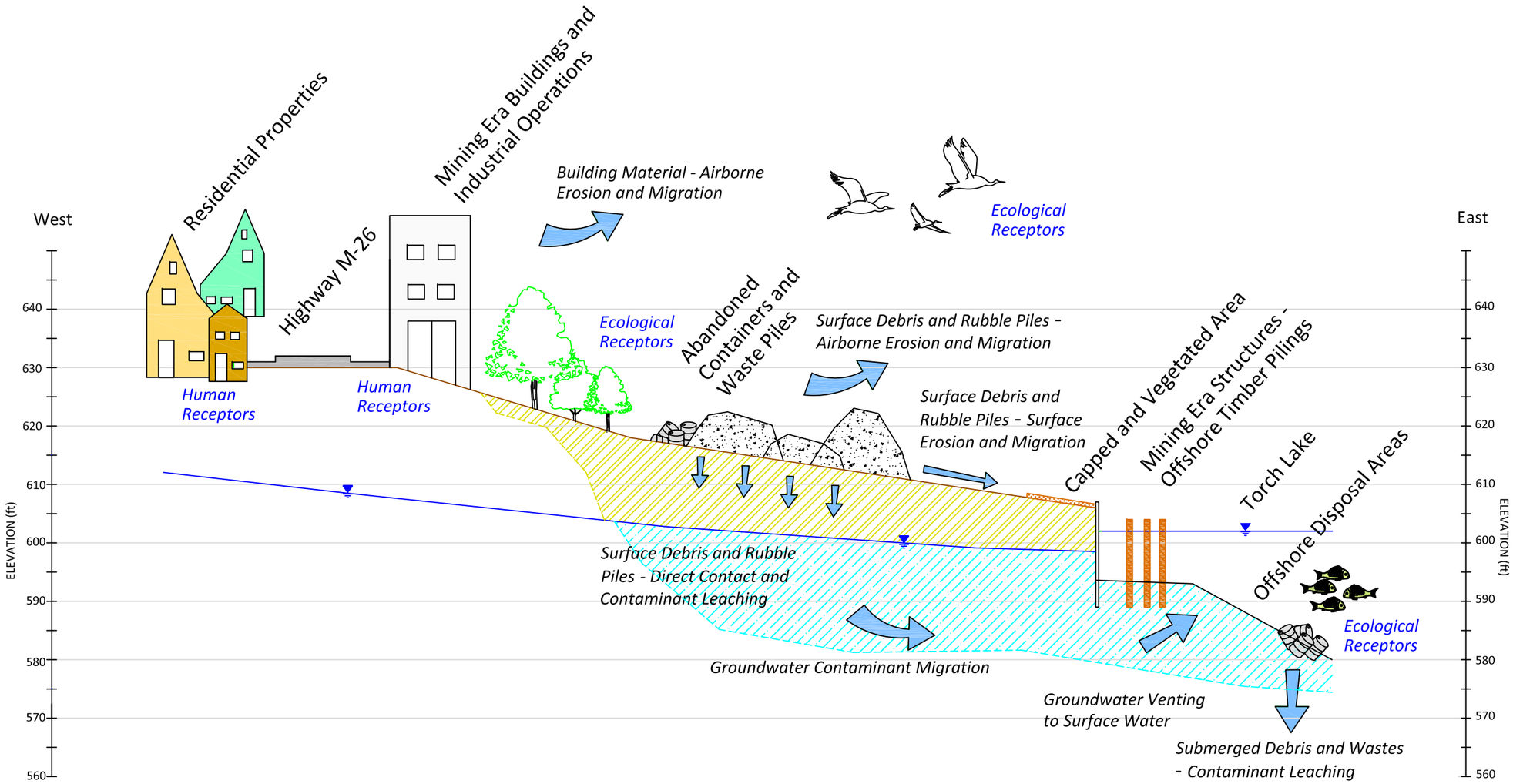
CONCEPTUAL SITE MODEL
RESIDENTIAL/RECREATIONAL LAND USE SCENARIO

TORCH LAKE NON-SUPERFUND SITE
HOUGHTON COUNTY, MICHIGAN

SCALE:	DRAWN:	DATE:	CHECKED BY:	
AS NOTED	DPL	12/2014		FIGURE 4-1



LEGEND

- Conceptual Extent of Contaminated Soil and Wastes
- Conceptual Extent of Groundwater Contamination
- Conceptual Groundwater and Surface Water Elevations

VERTICAL: 20', 10', 0
HORIZONTAL: 0, 50', 100'

K:\Torch Lake NS Site\2014 Report\Figures\Section 4\Figure 4-2_NonResCSM

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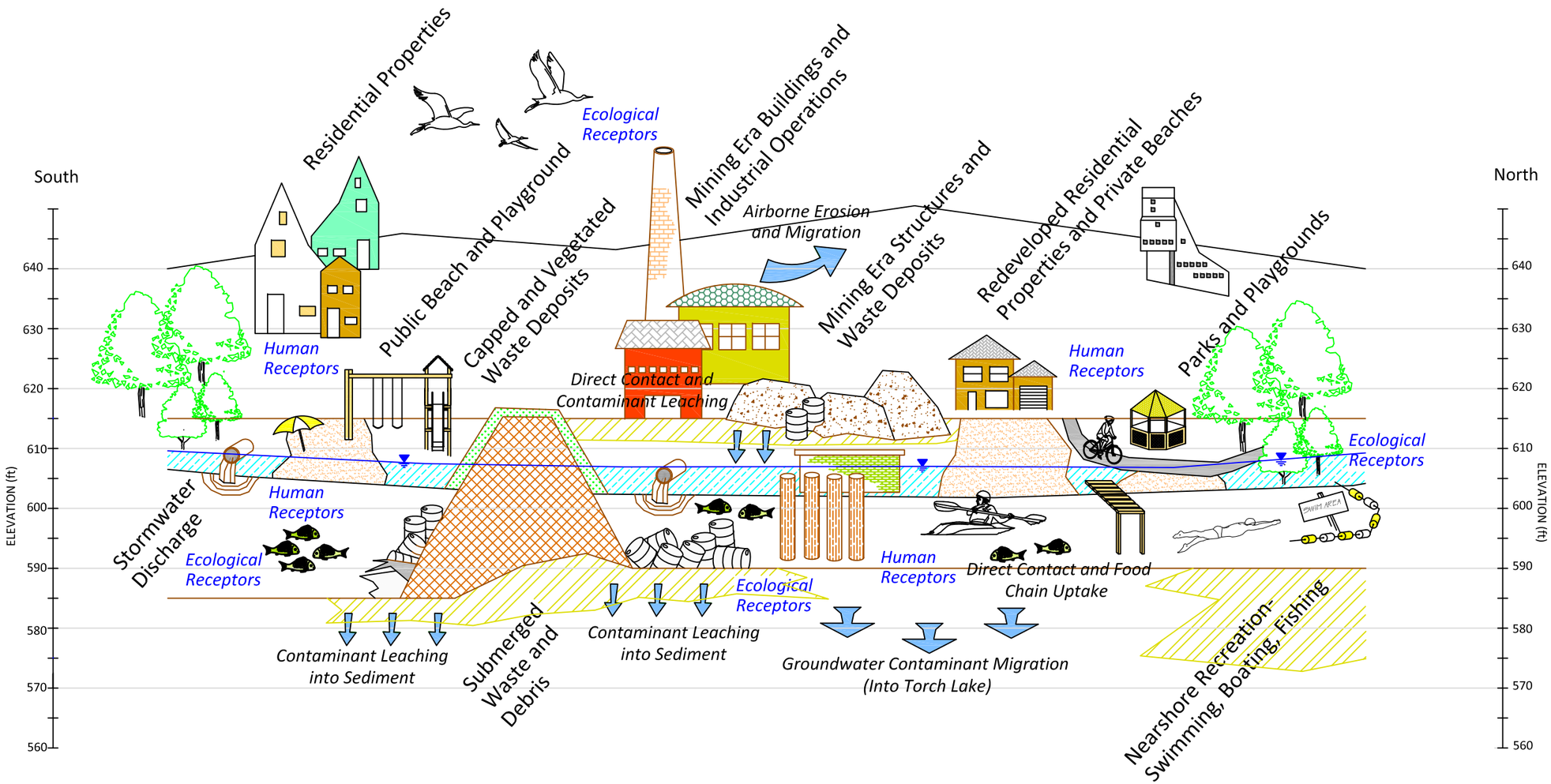
CONCEPTUAL SITE MODEL
NON-RESIDENTIAL USE SCENARIO

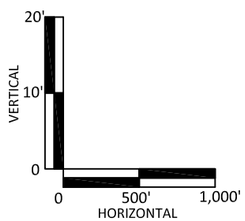
TORCH LAKE NON-SUPERFUND SITE
HOUGHTON COUNTY, MICHIGAN

SCALE:	DRAWN:	DATE:	CHECKED BY:	
AS NOTED	DPL	12/2014		FIGURE 4-2



LEGEND

- Conceptual Extent of Contaminated Soil and Sediment
- Conceptual Extent of Groundwater Contamination
- Conceptual Groundwater Elevation



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CONCEPTUAL SITE MODEL LONGITUDINAL

TORCH LAKE NON-SUPERFUND SITE HOUGHTON COUNTY, MICHIGAN

SCALE:	DRAWN:	DATE:	CHECKED BY:	
AS NOTED	DPL	12/2014		FIGURE 4-3

APPENDICES

Provided on CD as separate files.

Appendix A	**Michigan Tech Historical Summary**
Appendix B	**Side Scan Sonar Imagery**
Appendix C	**Underwater Videos**
Appendix D	**Site Inspections – Reconnaissance Logs**
Appendix E	**Site Inspections – Targeted Inspection Forms**
Appendix F	**Photographic Log**
Appendix G	**Boring Logs**
Appendix H	**Sediment Core Logs**
Appendix I	**Laboratory Analytical Reports**