SITE INSPECTION REPORT

FOR

C & H LAKE LINDEN OPERATIONS

LAKE LINDEN, MICHIGAN 49945

U.S. EPA ID NO.: MIN000510619

JUNE 25, 2014

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Prepared by: _____ DATE: 6/25/2014
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United States Environmental Protection Agency, Region 5

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1. EXECUTIVE SUMMARY

The United States Environmental Protection Agency (U.S. EPA) has been authorized to conduct assessments of sites of environmental concern under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 (jointly referred to as CERCLA) and the Federal Water Pollution Control Act, as amended through P.L. 107-303 of 2002 (commonly known as the Clean Water Act [CWA]). The term "site" is defined by the U.S. EPA as "areas where a hazardous substance has been deposited, stored, disposed, or placed, or has otherwise come to be located. Such areas include multiple sources and may include the area between sources" (U.S. EPA, 1990. Details regarding the CERCLA site assessment process are found in the National Oil and Hazardous Substances Pollution Contingency Plan which is established pursuant to Section 105 of CERCLA and Section 311 of the CWA. CERCLA site assessment activities in the state of Michigan are conducted by the Michigan Department of Environmental Quality (MDEQ) under the authority of a cooperative agreement (CA) with the U.S. EPA. This report summarizes the results of a Site Inspection (SI) of the C & H Lake Linden Operations site (Site) conducted by the MDEQ as part of the site assessment activities designated in the CA between the U.S. EPA and the MDEQ.

Approval was given to the MDEQ by the U.S. EPA to conduct an SI of the Site on April 1, 2011. Authority for conducting the SI is given under Section 104 of CERCLA. The Comprehensive Environmental Response, Compensation and Liability Information System identification number for the Site is MIN000510619.

The Site is located along the northwest and north shores of Torch Lake, between Hubbell and the Trap Rock River, in Houghton County, Michigan. The location coordinates for the approximate center of the Site, at an entrance to the village of Lake Linden's park, are 47.1882 decimal degrees north latitude and -088.4096 decimal degrees west longitude.

The Site was initially discovered into the CERCLA Pre-Remedial process by the U.S. EPA on April 4, 2011. The Site was initially evaluated in the form of a Preliminary Assessment (PA) that was submitted to the U.S. EPA, Region 5. The PA was prepared by Mr. John E. Spielberg of the MDEQ and was dated October 7, 2011 (MDEQ, 2011a).

The MDEQ completed an SI work plan for the Site on October 7, 2011 (MDEQ, 2011c) and conducted field activities the following week. The SI field work for the Site was conducted from October 10 to 13, 2011. The SI included interviews with Site representatives; a reconnaissance inspection of the Site; the installation of groundwater monitoring wells; the collection of soil, groundwater, surface water, sediment, and blank samples; the collection of sample location coordinates; and the collection of photographs of samples, sample locations, and Site conditions.

The purposes of SIs have been developed by the U.S. EPA, Region 5 in response to U.S. EPA Administration Guidance outlining Pre-Remedial Program strategies. The

program plan provides that all sites will receive a SI to meet the investigative requirements of CERCLA Section 105 to provide sufficient data for National Priorities List (NPL) or No Further Remedial Action Planned (NFRAP) decisions and/or to support the need for time-critical or non-time-critical actions. If an NPL decision is made, the SI will: 1) collect additional data beyond the PA to enable a more refined preliminary Hazard Ranking System (HRS) score, 2) establish priorities among sites most likely to qualify for the NPL, and 3) identify the most critical data requirements for NPL listing. Based on the refined preliminary HRS score, the SI, and other technical judgment factors, the site will then either be designated as NFRAP or carried forward as a NPL listing candidate. A candidate NPL site will not automatically be placed on the NPL. First, the site will go through a management evaluation to determine whether it can be addressed by another authority, such as the Resource Conservation and Recovery Act, 1976 PA-94-580, as amended. Sites that are designated NFRAP or deferred to other statutes are not candidates for further investigation or action in the Superfund program.

The scope and objectives of the SI are designed to address all the data requirements of the revised HRS using field screening and NPL level data quality objectives. It may also provide needed data in a format to support remedial investigation work plan development.

The Site is associated with former Calumet and Hecla Mining Company copper mining activities that occurred between 1867 and 1956. Copper ore processing at the Site included stamping, smelting, reprocessing of stamp sands, flotation, and leaching operations, and included a former laboratory. The company also reprocessed and smelted scrap metals from surplus World War II munitions, which included lead-containing materials. Throughout the history of this Site, mining and plant operations wastes were used as fill material along the shoreline of Torch Lake. The company also used portions of the Site for the direct disposal of plant wastes. Known waste disposal areas include slag disposal in the northeast and southern portions of the Site, and sludge disposal in the center of the Site between Lake Linden's public beach and marina.

Other than a 2007 emergency removal completed at the village of Lake Linden's park and numerous previous investigations conducted by state, federal, and private parties, no other known response activities have been completed at the Site. Investigations have shown high levels of metals and asbestos in surficial soils; lead and arsenic in sludge removed; semi-volatile organic compounds and polychlorinated biphenyls in waste materials; volatile organic compounds venting into Torch Lake from contaminated groundwater; and metals in groundwater.

The findings of this SI indicate that significant quantities of waste are present; and shallow and subsurface soils, groundwater, and sediments have become contaminated with heavy metals, especially arsenic, chromium, copper, and lead.

2. SITE BACKGROUND

2.1 Introduction

This section includes information obtained from Site Inspection (SI) work plan preparation, file review, and site representative interviews for the Site. Individual subsections address the C & H Lake Linden Site (Site) location, description, operational history, previous investigations, and waste characteristics.

2.2 Site Location and Description

The Site is located along the northwest and north shores of Torch Lake, between Hubbell and the Trap Rock River, in Houghton County, Michigan. The location coordinates for the approximate center of the Site, at an entrance to the village of Lake Linden's park, are 47.1882 decimal degrees north latitude and -088.4096 decimal degrees west longitude. The Site's town, range, and section designations include: T.55N., R.32W., sections 5, 6, and 7. See Figure 1, Site Location Map.

The Site consists of 155 acres of land stretching about two miles along the shore of Torch Lake, and traverses some 22 different parcels with different owners. Contaminants attributable to the Site are primarily metals, but also include polychlorinated biphenyl (PCBs). The Site currently consists of a variety of mixed use commercial and industrial properties along with vacant areas and historical and recreational parks, and is situated in mixed residential/ non-residential areas within the villages of Lake Linden and Hubbell. The Site is located adjacent to the Torch Lake Superfund site but none of this Site’s properties are part of the Torch Lake Superfund site. A Site 4-Mile Radius Map is provided in Appendix A. A Site 15-Mile Surface Water Target Distance Limit Map (TDL) is provided in Appendix B.

The near surface geology in the area of the Site consists predominantly of a ground moraine with coarse-textured, reddish brown, sandy loam, glacial till (MDEQ, 2011b; Michigan Center for Shared Solutions & Technology Partnerships, 2011; Schwenner et al., 1991). These deposits vary in composition and thickness and do not appear to be laterally extensive over the entire four-mile radius. These deposits range in thickness at the Site from approximately 11 to 50 feet below ground level (Curran et al., 1981), but can be thicker. For example, well #35 in Appendix G was installed just north of the Site to a depth of 227 feet and did not encounter any bedrock. The well log for that well included many clay-containing layers, but most of these layers also contained sand or silt or gravel. One 35 feet thick clay layer was found from 45 to 80 feet depth in that well.

The bedrock geology underlying the glacial deposits in the area consists of Jacobsville Sandstone in the east two-thirds of the four-mile radius and Portage Lake Lava Series in the west one-third just west of the Keweenaw Fault (MDEQ, 2011b; Schwenner et al., 1991).

Drinking water within the four-mile radius is obtained entirely from groundwater sources. Of 247 water well records included in a Geographic Information System shapefile for wells within four miles of the Site, 152 are rock wells and 89 are drift wells, with the rest unknown or unclassified. Eighty-four of the 89 drift wells are located in the Trap Rock River watershed north of the Site, along the east side of Torch Lake, and along the Portage River. Some of the water used by residents along State Highway M-26 from Calumet and Laurium to the village of Lake Linden, and then south along State Highway M-26 to Hubbell is from a public supply source outside the four-mile radius. The nearest known surface water intakes used for public drinking supplies are located about 11 miles south of the Portage Lake connection to Lake Superior, which are about 25 miles south of the Site.

It appears that the surficial deposits throughout the four-mile radius consist mainly of coarse-grained glacial deposits interbedded and mixed with finer silts and clays. Therefore, the drift aquifers and bedrock aquifers are likely interconnected.

2.3 Site Operational History

The following is an operational history of the Site taken from the Preliminary Assessment (PA) (MDEQ, 2011a). C & H Mining Company (C & H) operations at this Site began in 1867 with the construction of the stamp mill in Lake Linden. As time went on, C & H added additional mills along with smelters, reclamation plants, and leaching plants to the operations on this Site. The operations at this Site included stamping copper ore, reprocessing stamp sands to reclaim copper, and smelting the copper. Throughout the history of this Site, mining and plant operations wastes were used as fill material along the shoreline of Torch Lake. The company also used portions of the Site for the direct disposal of plant wastes. The known waste disposal areas include a slag disposal area in the northeast portion of the Site in Subarea A and sludge disposal areas at the north end of the main operations area in the center of the Site in Subarea C. At times, the company also reprocessed and smelted various scrap metals including lead from surplus World War II ammunition. Operations on portions of the Site ceased at various times with final C & H operations ending in approximately 1956.

2.4 Summary of Previous Investigations

Of the 11 previous investigations noted in the PA, some new information is now available. The Former C & H Power Plant property, which is included as part of the Site but not investigated during this SI, is undergoing a United States Environmental Protection Agency (U.S. EPA) removal action. The removal is likely to continue through 2014. The property has been fenced to restrict access from unauthorized users. Some removal of asbestos-containing materials has been completed. Later removal will include demolition of the old Power Plant building, treatment of the contaminated water in the basement areas of the building, contaminated soil removal with further characterization, and closure of the building basement area. Confirmation sampling will be completed after removal. The Potentially Responsible Party (PRP), Honeywell, is cooperating with the U.S. EPA in this removal action.

Another limited investigation, not included in the PA, was completed at the Traprock Slag Area in Subarea A in October 2002. Michigan Department of Environmental Quality (MDEQ) staff collected three samples, which were identified as "EAST," "SLAG," and "CENTER." Actual sample locations are not known. Two of the samples appear to be soil, while the other contained slag. The three samples were analyzed for inorganic parameters at the MDEQ Environmental Laboratory. Cobalt, copper, and lithium exceeded concentrations that could potentially leach into groundwater at concentrations harmful to surface water resources if the groundwater vents to the lake or the Trap Rock River, based on a comparison to cleanup standards developed by the state of Michigan. Arsenic and lead concentrations were below statewide default background levels.

Two areas of the Site have documented waste quantities based on previous studies noted in the PA, but these two areas were not sampled by the MDEQ. One of these, the power plant property, had an estimated 5.8 acres of contaminated soils or waste. The other area, the Peninsula Copper Industries (PCI) property, contained an estimated 5.8 acres of contaminated soil or waste. These two areas together contain about 11.6 acres of contaminated soils or waste. The extent of these areas can be seen in Figures 3C and 3E of the PA report.

2.5 Waste Characteristics

Field staff documented significant areas of waste and soil contamination in surficial soils in all three areas of investigation during the SI. All the contaminated soil/waste areas add up to about 42 acres. If we add in the two areas noted in the above section not investigated during this SI, the total acreage of significantly contaminated soils comes to about 53.6 acres, which is about one-third of the Site. The thickness of this waste, based on soil boring sample results and descriptions, is about 1.5 feet.

The most significant degree of soil contamination and waste was found in the southern parts of the Site, in both the Coal Dock property and the Mineral Building property. Based on X-Ray Fluorescence (XRF) screenings and soil sampling results, the area of soil contamination above state direct contact criteria added up to over 1.4 million square feet, or 33 acres. Appendix C is a table showing XRF screening results. Cells in red contain concentrations of contaminants that exceed state soil direct contact criteria. Results for this area start at about the middle of the table, from XRF105 to XRF207. Fifty-three of the screening results had concentrations above state direct contact criteria. Some of the highest concentrations are from waste material, but soil and mixed soil/waste materials contained high concentrations as well. The soil contamination and waste found in this area is attributable to the Site since this is where the main C & H smelting operation took place. XRF screening and soil sample locations are shown in Figures 4A, 4B, 4C, 5, and 6.

A little north, in the village park and the Houghton County Historical Society properties, three areas had significant soil contamination exceeding state direct contact criteria, adding up to an estimated 325,200 square feet, or 7.5 acres. Soil contamination in this area is mostly from arsenic and lead, and some copper. Soil, waste, and combined soil/waste materials all contained high levels of arsenic and lead. This contamination is attributable to the Site since this area is where the two stamp mills and other mine processing facilities were located. The stamp mill remnants can still be observed, and parts are used by the Houghton County Historical Society to show visitors a history of the area's mining past.

Two areas of the Site had smaller areas of soil contamination. In the northern part of the Site, at the slag dump area, only about 60,000 square feet of area were documented to contain significant soil contamination above state direct contact criteria, or about 1.4 acres. At the former C & H Laboratory, only one XRF screening result out of 11 readings exceeded state direct contact criteria.

3. SITE REGULATORY HISTORY

3.1 Introduction

This section presents information regarding the regulatory history of the Site. This information was obtained through file review and Site representative interviews.

3.2 Regulatory History

The following is a regulatory history taken from the PA, but includes some revisions based on new information.

Parts of the Site are subject to various local, state, or federal regulatory actions. The only known local action recently completed is the village of Lake Linden, Houghton County, Michigan Torch Lake NPS Pollution Reduction Project, U.S. EPA Grant Number GLOOE 00627-0. Because this project included new asphalt to be installed in early August 2011 in a part of Subarea C between a former C & H Flotation Plant and a U.S. EPA sludge removal area completed in 2007, the MDEQ arranged with the village of Lake Linden to complete a limited investigation of this area before the new parking lot was to be completed. See Sections 5.2.1 and 6.2.1 for a discussion of that investigation.

The MDEQ has also listed five sites of environmental contamination as facilities in the state cleanup program within the Site. The five sites include the slag area in Subarea A, an area in the northeast corner of Subarea C near a footbridge over a drain emptying into Torch Lake, the former C & H Stamp Mill and Power Plant in Subarea C, the Mineral Building in Subarea E, and the PCI facility in Subarea E. The MDEQ's District Office took these actions to bring attention to potential environmental risks in these areas, which have also been identified by the MDEQ's Superfund program. One underground storage tank release site is located just northwest of the State Highway M-26 and First Street intersection. Although this location is not on the proposed Site but adjacent to it, the leaking tank could affect groundwater quality on the Site.

One federal action included a U.S. EPA 2007 removal in Subarea C, which the U.S. EPA completed on August 12, 2007. A U.S. EPA contractor removed sludge material containing high concentrations of lead up to 78,000 parts per million (ppm) in one area and sludge from another area containing high arsenic levels; 1,000 cubic yards were removed and properly disposed of. The lead-contaminated material was disposed of as hazardous waste because the material did not pass a leach test for lead. The high arsenic waste was properly disposed as non-hazardous waste. Since both sludge removal areas

were found at the water's edge and extending into the water, an observed release to the surface water pathway can be documented. This removal action only removed the sludge that posed a direct contact threat. Weston Solutions, Inc., the U.S. EPA's contractor for this removal action, issued a letter report dated November 30, 2007, which documented this removal (Weston, 2007). During the same week as the removal action, the MDEQ and the U.S. EPA documented that lead-containing sludge is still present in Torch Lake at a distance beyond the removal area (Alexander, 2008).

Another federal action completed by the U.S. EPA, in December 2010, was a removal site assessment for the former C & H Power House in Subarea C. For information regarding this action, see Section 3.0 Past Environmental Investigations of the PA (p 5). As noted in Section 2.4 above, the U.S. EPA is now undertaking a removal action, based on the completed assessment and in cooperation with the PRP for the Site, Honeywell.

Other federal actions include various permits issued to the PCI facility in Subarea E. These are listed in U.S. EPA's Envirofacts Warehouse website, in its Facility Registry System. PCI has at least two National Pollutant Discharge Elimination System permits. It is also listed in U.S. EPA's RCRAINFO database, last updated on March 3, 2011. However, PCI is not regulated as a Resource Conservation and Recovery Act facility, according to the MDEQ's Resource Management Division, as noted in a June 24, 2011, letter from the MDEQ to the U.S. EPA, Region 5.

4. RECONNAISSANCE ACTIVITIES

4.1 Introduction

This section outlines procedures and observations of the reconnaissance work portion of the SI for the Site. Individual subsections address the site representative interviews and reconnaissance inspection observations.

4.2 Site Representative Interviews

The Team Leader has had several direct communications with Site representatives by phone or e-mail. Some of these communications occurred during the Site reconnaissance in June or October 2011, some a few days before and afterwards, and others during the last year or so while preparing for fieldwork and later while evaluating field activities. These are summarized below:

Public water supplies: Ms. Amy Keranen, MDEQ, Upper Peninsula District Office, stated in a June 2011 e-mail that "[Lake Linden] has a municipal supply which covers the whole town to [approximately] 9th street, but no further down Bootjack Road. Laurium and Calumet have water supplies as well and those wells are on the shore of Lake Superior." On February 7, 2012, the Team Leader spoke by phone with Mr. Ralph Hager, Supervisor, Torch Lake Area Sewage Authority, about an irrigation well shown on maps to be located on the Mineral Building property. As far as public water supplies go, he said that the Michigan American Water Company has public water authority.

Subsurface geophysics: On August 22, 2011, the Team Leader first contacted Dr. Wayne Pennington, Michigan Technological University (Michigan Tech) professor and Geology Department chair, about having some students do geophysics at the Site prior to MDEQ staff mobilizing to the Site for fieldwork in October 2011. The purpose of seeking geophysics data for priority areas at the Site was to use such information to target sampling activities at locations more likely to find waste or contamination. At that time, Dr. Pennington indicated that there are students who could do the geophysics. Later, he was able to get a group of students to do a senior design project, which included electromagnetic surveys in the Lake Linden village park, where former C & H Stamp Mills and mine process facilities were once located. The students and their professor advisor shared their results with the MDEQ prior to the October fieldwork.

Former C & H Power Plant property: In a September 12, 2011, phone conversation with the owner, Mr. Louis Meneguzzo, he indicated that Honeywell is the potentially responsible party. He told the Team Leader that the property will be fenced and that Mr. Ralph Dollhopf will be the U.S. EPA staff managing

the project. The U.S. EPA has begun a removal action at this property, according to Mr. Dollhopf. See Section 2.4 above.

Coals Docks property: The Team Leader talked to the owner, Mr. Ken Buchanan, on October 17, 2011. Numerous previous attempts to contact Mr. Buchanan were not successful. He indicated that he will send a signed access form to the MDEQ, but none was received. He said he bought the property for his lumber business. He said he had plans to build a sawmill, but did not due to the low demand for housing. He said that Mr. Bob Kulpi, who lives in Lake Linden, manages the property.

The Mineral Building property: According to Mr. Matt Arko, it is owned by Silver Shores Enterprises (Bill and Pat Siler, contractors). According to Ms. Pat Siler in a September 6, 2011 phone conversation, the Silers bought the Mineral Building property from Michigan Tech Ventures more than five years ago, which she said was owned by Michigan Tech. She indicated an interest in redeveloping the property into a marina. Also, the MDEQ has information suggesting the presence of an irrigation well at the Mineral Building property, according to geographic information files on MDEQ server computers. Mr. Hager said that there is no well on the Mineral Building property, and thinks that the well information the MDEQ has for the Mineral Building property may actually be for a well that is used at the sewage lagoons northeast of the Mineral Building property on the stamp sands.

Peninsula Copper Industries property: A September 1, 2011, phone conversation with Mr. Matt Arko, Land Assessor for Torch Lake and Schoolcraft Townships, revealed some land and company ownership information. He said that the land and some buildings where PCI operates are owned by Mr. Mike Lahti, the company is owned by Ormos (Tennessee), and PCI owns some buildings. In a phone conversation, on December 8, 2011, with Ms. Sharon Baker, MDEQ Water Resources Division, she revealed some impacts from past operations. Old circuit boards used during World War II had a lot of lead in the solder. She also said she has documented 20 foot tall piles of yellow, powdery arsenic. She also told the Team Leader that according to an MDEQ geologist, a local man has had health problems, allegedly from arsenic or lead exposure.

4.3 Reconnaissance Inspection Observations

MDEQ investigation teams conducted reconnaissance inspections of the Site and surrounding area on June 23 and October 10-13, 2011, in accordance with MDEQ Health and Safety guidelines. The June reconnaissance inspection included a walkover of the Site to help characterize the Site and to familiarize the investigation teams with the Site area. The Team Leader held a Site safety meeting the morning of October 10, to determine and discuss appropriate health

and safety requirements for conducting sampling activities; and to point out work plan features related to planned sampling and inspection events. The Team Leader conducted another walkover of the Site later that day for the purpose of flagging sample locations, as well as during the rest of the October 10-13 period.

Based on personal observations during reconnaissance activities, the Site consists of several potential sources of contamination. Beginning at the northeast end of the Site, where the Traprock Slag Dump is located in Subarea A, slag waste was observed over several acres of the area. Figure 3A shows the extent of waste and contaminated soils documented during this SI and by previous investigators. The slag was found in numerous chunks as tall as a person, but the ground was also covered with much smaller pieces (six inches and smaller). See the photo log in Appendix D, pages 52 to 55. In the southern part of this area, the slag was buried but now exposed from excavation activities or erosion; for example, page 54 of Appendix D. The slag contained many colors: blue, black, brown, and red. This area was not fenced at the time of the SI.

The village park area in Subarea C is used primarily for recreation. Appendix D photos document this use. Page 56 has a ball field and pavilion. Pages 57 to 58 document a loon that was observed swimming on two different occasions in Torch Lake near the village park. The common loon is a state threatened species. Page 58 shows a tennis court that was being used by a handful of players at the time of the SI. South of the tennis courts are the remains of a C & H Regrinding Plant. Two views of the marina are shown on page 59 of Appendix D. The bottom of that page is the approximate location of the 2007 U.S. EPA removal action that removed soils contaminated with high levels of arsenic. MDEQ staff has observed numerous persons walking the area. The north entrance of the park is from the south end of Front Street, which will take you to a newly asphalted parking lot. This new paving is where the MDEQ completed a limited subsurface investigation in June 2011 before the lot was asphalted. The park was unfenced at the time of the SI. See Figure 3C, which also shows areas of waste and soil contamination documented during this SI.

Southwest of the village park is the former Calumet Stamp Mill property, owned by the Houghton County Historical Society, which they use as an interpretive historical park. The property includes a museum and archives, a train that can take the public on a circle tour of the former mill and other copper country structures used in past mine-related operations. The most prominent feature of this property is the remaining concrete base of the former Calumet Stamp Mill, used in the past by the C & H Mining Company. XRF screening and soil sample results indicated considerable soil contamination at the surface at levels above direct contact criteria. See pages 60 to 61 of Appendix D and Figure 3C. This property was unfenced at the time of the SI, but the entrance off State Highway M-26 is generally monitored during the warm season by the Historical Society.

Across State Highway M-26 from the southwest corner of the Historical Society property is the former C & H Laboratory, now used as a shop for tourists visiting the area. This property contains one main building housing the shop. The west side of the property has a small wooded area, which also contains a concrete-lined channel with unknown past uses. This property was not fenced at the time of the SI. See Figure 3C and page 62 of Appendix D.

South of the Historical Society is the former C & H Power Plant. The power plant building is still standing but inactive. The U.S. EPA completed a removal assessment in 2010 and has now begun active removal. Because of this, the MDEQ decided not to sample this property. Walkovers of the property documented the poor condition of the former plant, and also found some areas of waste located around the property. The remains of the Hecla Stamp Mill are found here. For photos, see pages 63 to 65 of Appendix D. Figure 3C also shows areas of documented waste and soils contaminated with high levels of asbestos-containing materials, lead, arsenic, copper, and antimony. This property was not fenced at the time of the SI but according to Mr. Ralph Dollhopf of the U.S. EPA, the property is fenced or is scheduled to be fenced soon.

Continuing south is the Coal Docks property, owned by Buchanan Forest Products. MDEQ field staff has observed coal piles with water at the base, and coal spread about various parts of the property. Waste in rusted drums has been observed in the south third of the property. The most prominent feature is the massive concrete base of the former dock area, which extends along at least half the property's shoreline. Walking this area in June 2011, field staff observed surface runoff during a rain event that lasted most of the day. Some of that runoff was observed flowing into Torch Lake at the north end of the concrete base, as shown in the photo on page 66 of Appendix D. Coal piles and waste can be seen on pages 67 to 70 of the appendix. XRF screening and surficial soil sampling results indicate extensive soil contamination in this area, as seen in Figure 3D. About one-half of the property is still wooded, especially along State Highway M-26. This property was fenced at the time of the SI, and is still fenced according to Ms. Amy Keranen of the Upper Peninsula District Office of the MDEQ. However, the property is accessible by boat from the lake and also from an entrance drive off of State Highway M-26.

The southernmost property investigated by the MDEQ during this SI was the Mineral Building property, owned by Silver Shores Enterprises, Inc. The most prominent feature of this property is the large building along State Highway M-26, which has come to be called the Mineral Building, an inactive building once involved in smelting operations of the C & H Mining Company. South of the building is a fallen chimney. Between the Mineral Building and the lake are many piles of soil, debris, and waste. XRF screening and soil sampling results have documented extensive soil contamination on most of the property. A gray sludge waste found in an inner layer of the chimney was found to be very high in arsenic.

Much of the soil in this area is also high in arsenic. A portion of this property along Torch Lake is a part of the NPL Superfund site and is not a part of this SI. This property was fenced at the time of the SI, along State Highway M-26 and between the property and the PCI property to the south.

Surface runoff and shallow groundwater flow would be expected to be toward Torch Lake, based on observations made during reconnaissance activities. The natural topography of the area of the Site consists of steep terrain toward the west, with a much gentler slope between State Highway M-26 and Torch Lake. This can be seen in the topographic elevation contours of Figure 1. The TDL for surface water in this SI is 15 miles from the probable point of entry (PPE) of Site contaminants into the nearest surface water. The PPE of either surface runoff or shallow groundwater into the surface water is along the Site's shoreline with Torch Lake. The 15-Mile TDL extends throughout Torch Lake, then down the Portage Canal and into Portage Lake, and ends at the city of Houghton to the west and about two miles north of where the Portage River empties into Lake Superior to the south.

Areas around the Site consist mainly of a mix of residential, retail, and recreational land uses. State Highway M-26, located adjacent to most of the Site, is a major traffic route between the cities of Houghton, Lake Linden, and Calumet.

5. FIELD INSPECTION AND SAMPLING PROCEDURES

5.1 Introduction

This section outlines the sampling procedures of the SI of the Site. Individual subsections address the media-specific sampling procedures. Rationale for specific activities is also provided. The SI was conducted in accordance with the U.S. EPA approved work plan, dated October 7, 2011. Photographs of samples collected and the sample locations are provided in Appendix D. The Team Leader's field log book for the field inspection activities is provided in Appendix E.

5.2 Sampling and Screening Procedures

Samples were collected at the Site by the investigation team between October 10 and 13, 2011. These samples were collected to determine potential contaminant source areas, the presence or impacts of Site wastes, background concentrations in the target media, and observed releases to the four pathways used by the U.S. EPA to evaluate sites.

The team collected 20 surficial soil, 14 soil boring, 12 groundwater, 5 surface water, and 5 sediment samples, along with 2 field blanks and 2 pump blanks. In addition, field staff collected six duplicate samples. No split samples were collected.

Standard MDEQ sample collection, preservation, and decontamination procedures, as outlined in the work plan, were followed for all samples except as noted in the next paragraph. Sample collection and preservation followed the MDEQ Remediation and Redevelopment Division (RRD) Operational Memorandum No. 2, Attachments 4-6 (MDEQ, 2007a, 2007b, 2007c). Soil samples analyzed for volatile organic compounds (VOCs) were field preserved with methanol. Soil samples collected for other analyses were not chemically preserved. Water samples analyzed for VOCs were field preserved with hydrochloric acid. Water samples analyzed for semi-volatile organic compounds (SVOCs), pesticides, and PCB compounds were not field preserved. Water samples analyzed for total metals were field preserved with nitric acid to a hydrogen ionization potential (pH) of less than 2 and water samples analyzed for cyanide were field preserved with sodium hydroxide to a pH of more than 12.

A few exceptions for field activities compared to the approved work plan are noted below:

1. Ten groundwater samples were planned according to the approved work plan, but 12 were collected. One additional groundwater sampling location, MW-12, was added east of the tennis courts in the village park. A soil

boring, SB-13, at this location found a sludge layer high in lead, so a monitoring well at this location made sense. Another groundwater sample, MW-11, was added to make up for additional groundwater samples added in the village park area, where buried wastes have been documented in the past and during this SI. The Team Leader manually made additional bottle labels and tags for these two additional groundwater samples.

2. The work plan states that monitoring wells shall be developed according to certain low-flow standards, including the stabilization of groundwater parameters such as temperature, pH, conductivity, total dissolved solids (TDS), and oxidation-reduction potential (ORP). Stabilization was to be evaluated after three consecutive readings of the parameters. Samples were collected in three cases when the parameter readings were not yet within the standards noted in the work plan. The parameter reading ranges and the difference between the low and high measurements of the last three readings are shown in the table below. The shaded cells are ones where the difference between a high and low reading is above the standard noted in the work plan. While the ORP readings were above the work plan standards for three samples, the difference between readings for MW-08 steadily decreased, indicating a stabilizing trend. For MW-02, ORP increased by 33, then 5, and then 15, suggesting a decreasing difference and stabilizing effect. For sample MW-12, ORP decreased by 10, then 11, then 1, and then 11, suggesting a potentially decreasing trend, although all the other parameters had stabilized.

well	pH range	pH diff	conductivity range	cond diff	TDS range	TDS diff	ORP range	ORP diff
MW-01	6.41 to 6.42	.01	399	0	265 to 266	1	-72 to -69	3
MW-02	6.34 to 6.38	.04	345 to 346	1	229	0	-80 to -60	20
MW-03	6.73 to 6.75	.02	295 to 300	5	192 to 195	3	-88 to -84	4
MW-04	6.95 to 7.0	.05	685 to 687	2	481 to 482	1	-83 to -80	3
MW-05	7.02	0	599	0	405 to 406	1	-2 to 3	5
MW-06	7.24 to 7.26	.02	572 to 588	16	386 to 399	13	50 to 58	8
MW-07	6.98 to 7.01	.03	838 to 840	2	573 to 576	3	6 to 8	2
MW-08	6.84 to 6.85	.01	724 to 725	1	512 to 513	1	-22 to 0	22
MW-09	6.55 to 6.57	.02	1158 to 1169	11	842 to 852	10	35 to 37	2
MW-10	6.00 to 6.07	.07	191 to 192	1	128 to 129	1	-59 to -50	9
MW-11	6.63 to 6.68	.05	660 to 662	2	445 to 446	1	23 to 27	4
MW-12	7.01 to 7.06	.05	778 to 784	6	527 to 531	4	46 to 58	12
standard		0.1		3%		*		10

* The work plan has 10% here, but this is for turbidity and not TDS.

3. The work plan calls for monitoring the water level drawdown while collecting a sample and limiting the drawdown to four inches, in accordance with low-flow protocols. This was not done during this SI. None of the field staff reported ever pumping the monitoring wells dry, nor did they report any problem with purging the wells and clearing up the samples prior to

sampling. This suggests the shallow aquifer recharges sufficiently to the monitoring wells without significant drawdown.

4. Seven groundwater samples – MW-03, MW-05, MW-08, MW-09, MW-10, MW-11, and MW-12 – were shipped to the MDEQ Laboratory to analyze for ammonia, chemical oxygen demand, nitrate/nitrite, total phosphorus, total Kjeldahl nitrogen, and total organic carbon. These analyses were not planned in the original work plan, but were added since ammonia has been a contaminant of concern at the Site as pointed out by MDEQ district staff during the SI. Field sample preservation for these analyses is normally sulfuric acid, but sample MW-05 was preserved with hydrochloric acid instead, according to the MDEQ lab report and the field data sheet for MW-05. Sulfuric acid was not available in the field initially, so hydrochloric acid was used instead until MDEQ district staff provided the needed sulfuric acid.
5. Thirty-five soil samples were planned according to the approved work plan. Thirty-four samples were collected, with an additional three duplicates. This is not in significant variance with the work plan, since the plan allows in Section C the Team Leader to change locations or numbers of samples during the SI "in response to site conditions."
6. Soil samples were to include a designated background sample: one for the surficial soil samples and one for the soil boring samples. No background sample was initially designated in the field for the soil boring samples. Rather, sample SB-02 was chosen as the background sample for the soil boring samples after an evaluation of the laboratory results. SB-02 had generally lower levels of analytes and compounds.
7. A group of Michigan Tech students completed a geophysical survey of several areas within the Lake Linden village park during September and early October 2011. This work was not included in the work plan. The Team Leader requested this work from Michigan Tech in order to evaluate subsurface conditions in the village park that could detect buried wastes; wastes which were suspected in this area from past C & H operations. The MDEQ has had this capability in the recent past, but due to retirements, this capability was lost and has not yet been developed to sufficient professional standards. The Michigan Tech students were able to fill this need, which resulted in data that helped the MDEQ find lead-containing waste near the tennis courts in the village park.

Field staff adhered to standard MDEQ decontamination procedures during the collection of all samples (MDEQ, 2003). Prior to mobilizing to the field, this included the scrubbing of all hand trowels with a tri-sodium phosphate and tap water solution and rinsing with tap and deionized water. In the field, all used sampling equipment was power washed with a steam cleaner before reusing for further sampling.

All samples were processed in accordance with U.S. EPA and MDEQ required procedures. The volatile fraction of soil samples was sent to the MDEQ Laboratory. Remaining soil samples and organic water samples were labeled and placed in individual protective bubble plastic bags. Inorganic water samples were labeled and placed in individual zip-lock bags. All samples were placed in shipping coolers. The interiors of the coolers were kept at a temperature of approximately 4^{o} Celsius with ice. A small glass water-filled bottle was placed in each cooler and marked "TEMPERATURE," for use by the laboratory to measure temperature. The coolers were sent by UPS next-day delivery to the laboratories assigned to the project by the U.S. EPA Contract Laboratory Program (CLP) or to the MDEQ Laboratory. Sample identity, security, and chain of custody procedures specified by the CLP and MDEQ were followed. Samples were analyzed by the MDEQ Laboratory or by a CLP laboratory. The U.S. EPA approved of the volatile fraction analysis of soil samples to be completed at the MDEQ Laboratory. The U.S. EPA directed which CLP laboratories to use for the rest of the analyses. The table below summarizes which laboratory completed what analysis. Pesticide analysis was not requested and was not, therefore, completed.

	Soil/Sediment Samples				**Water Samples**			
Laboratory	**V**	**SV**	**PCB**	**IN**	**V**	**SV**	**PCB**	**IN**
MDEQ Laboratory 3350 N. Martin Luther King Blvd. Bldg. 44, 3rd Floor Lansing, MI 48909	x							x*
Spectrum Analytical, Inc. 8405 Benjamin Road, Suite A Tampa, FL 33634		x	x		x	x	x	
Chemtech Consulting Group 284 Sheffield Street Mountainside, NJ 07092				x				x

V = volatile; SV = semi-volatile; PCB = polychlorinated biphenyls; IN = inorganic

*Some groundwater samples were analyzed for inorganics by the MDEQ Environmental Laboratory (MW-03, MW-05, MW-08, MW-09, MW-10, MW-11, and MW-12). Only MW-12 was analyzed for the full inorganics analysis, while the rest of the samples were analyzed only for ammonia, chemical oxygen demand, nitrate+nitrite, total organic carbon, total Kjeldahl nitrogen, and total phosphorus.

5.2.1 June 2011 Limited Investigation

In June 2011, the MDEQ completed a limited subsurface soil investigation in the vicinity of the village of Lake Linden's parking lot at the south end of Front Street.

That parking lot is used for access to the village park and public beach. The village had notified MDEQ Project Manager, Mr. Scott Cornelius, that it was planning to asphalt their parking lot by August 2011. Because of continuing concerns about possible buried waste in this area, from past C & H Mining Company operations, the MDEQ agreed to investigate subsurface soils in this area before the planned asphalting of the parking lot in order to minimize damages to the new asphalt surface.

MDEQ field staff used a Geoprobe® to bore into ten locations, and field screen the boring cores with an XRF model XL3t700 unit. The ten borings were located in an area of the parking lot that Village Manager, Dr. Ed Fisher, told the Team Leader would be the location of the August asphalting. After each four-foot long core was removed from the subsurface, field staff screened each core with the XRF unit. The locations of the 2011 borings are shown in Figure 3C.

5.2.2 Geophysics Procedures

Seven Michigan Tech students used geophysics procedures outlined in a draft report (Rouleau et al., 2011) shared with the MDEQ. Their methods included magnetics and electromagnetics, along with resistivity measurements and the use of a Global Positioning System (GPS). The magnetics method measures primarily iron-containing metal objects below ground, while the electromagnetic method measures a variety of conductive materials. The students established six survey grids to conduct the magnetic and electromagnetic surveys. These grids were located in the Lake Linden village park from the newly asphalted village parking lot in the north to an area east-southeast of the village tennis courts near the lakeshore in the south. The extent of the Michigan Tech study is shown in Figure 3C.

The same draft report stated that resistivity measurements were used to document the depth to the local water table and to measure changes in soil composition, with the potential of finding contaminants in the subsurface. Two different methods were used. Resistivity measurements were conducted along seven transects, all located in the same vicinity as the six grids.

5.2.3 Surficial Soil Samples

Field staff collected 22 surficial soil samples, which included 2 duplicate samples, from around the Site from October 10 to 12, 2011. The locations of these samples are shown on Figure 5. Location information and sample descriptions for the surficial soil samples can be found in Table 1. The Team Leader designated sample SS-01 as the background sample. This sample was located north of the Traprock Slag area, across Bootjack Road, in an area where no slag was

observed and where site impacts are assumed to be minimal, based on observations made by field staff.

The surficial soil samples were obtained using stainless steel trowels from depths ranging from 0 to 12 inches below the ground surface. The volatile portion of each sample was collected first using a dedicated syringe. An approximate 10 gram sample of soil was collected in the syringe directly from the hole created by collecting the sample. This soil was then immediately placed in a 40 milliliter (ml) glass vial and preserved with 10 ml of methanol. The remainder of the soil sample was transferred from the sample location to an aluminum pan where all visible debris (stones, roots, etc.) was removed. The sample was then thoroughly mixed and transferred to the appropriate sample containers using a stainless steel trowel.

5.2.4 XRF Screening Procedures

XRF screening of surficial soil and other surficial materials was conducted between October 10 and 12, 2011. This screening was conducted in conjunction with the surficial soil sampling. The sampling team first screened a suspect area with the XRF unit, and if high levels of metals were found, a surficial soil sample was also collected at that location. XRF screening descriptions and results are shown in Appendix C. XRF screening locations are shown in Figures 4A, 4B, and 4C.

5.2.5 Soil Boring Samples

Field staff collected 15 deep soil samples, which included 1 duplicate sample, from 14 individual boring locations around the Site from October 10 to 11, 2011. The locations of these samples are shown on Figure 6. Location information, soil boring lithology, and sample descriptions for the soil boring samples can be found in Table 2. No background sample was initially designated in the field. Rather, sample SB-02 was chosen as the background sample after evaluating soil boring sample results.

The deep soil boring samples were collected utilizing a Geoprobe® rig with a high density polyethylene lined Macro-Core® sampler from depths ranging from zero to eight feet below the ground surface according to the procedures outlined in the work plan. These procedures included screening the core with a photoionization detector to help determine the presence of VOCs and potential sampling points within the cores. Upon screening of the core, the volatile portion of the sample was collected with the use of a dedicated syringe. An approximate 10 gram sample of soil was collected in the syringe directly from the core. This soil was then immediately placed in a 40 ml glass vial and preserved with 10 ml of methanol. The remainder of the soil boring sample was transferred from the core to an aluminum pan where all visible debris (stones, roots, etc.) was removed.

The sample was then thoroughly mixed and transferred to the sample containers using a stainless steel spoon.

All soil boring boreholes were properly abandoned following an approved standard operating procedure. This procedure entailed slowly filling the abandoned borehole with bentonite chips to within six inches of the surface and then topping off the borehole with immediate surrounding material.

5.2.6 Groundwater Monitoring Well Samples

Monitoring wells were installed using a Geoprobe® rig. The Geoprobe® rig is a van mounted hydraulic/pneumatic rig that installs small diameter monitoring wells by driving a well screen and casing into the aquifer system. Upon installing these wells, readings were taken using a photoionization detector. No readings above background levels were detected at any of the temporary wells. Static water level readings and well depths were recorded for each temporary well to determine the standing water elevation and the volume of standing water in the wells. These measurements were made with an electronic water level indicator.

Field staff collected 13 groundwater monitoring well samples, including 1 duplicate sample, from 12 monitoring wells from October 11 to 13, 2011, to determine whether organic and inorganic contaminants had migrated into the glacial aquifer underlying the Site. The monitoring well sample locations are shown in Figure 7. Location information, some basic groundwater parameters, and sample descriptions for the groundwater samples can be found in Table 3. Three of the monitoring wells – MW-01, MW-09, and MW-10 – were designated as background wells. These three locations were chosen as background locations for two reasons: all three are hydraulically upgradient from the release sample locations, and three locations were chosen to represent the three areas investigated during this SI.

Field staff developed the monitoring wells by using disposable tubing and a peristaltic pump at a high pumping rate (greater than 500 ml/minute [min]) to remove a large enough volume of water to account for the water introduced in the aquifer during installation. The wells were then purged at a lower flow rate (less than 500 ml/min), until a steady flow rate of water free of heavy suspended solids was established. During purging, staff measured groundwater parameters – including pH, conductivity, temperature, TDS, and ORP – generally every five minutes. This was done until these parameters stabilized. This indicated that the groundwater was now representative of the water in the aquifer and ready for sampling.

These wells were then sampled using the same pump and tubing. The volatile portion of the sample was collected first with the pump set at a low-flow rate of

less than 500 ml/min to minimize bubble formation and sparging. The remaining portions of the sample were then collected by pumping the water directly into the sample bottles.

Since disposable tubing was used for collecting monitoring well samples, there was no need to decontaminate any of the sampling equipment between samples. All well screens, casing, and Geoprobe® rods are steam cleaned prior to use in a monitoring well. Two deionized water field blank samples and two deionized water pump blank samples were also collected in accordance with the U.S. EPA quality assurance/quality control requirements to test the possibility of cross-contamination.

After completion of monitoring well sampling, the MDEQ completed a water table elevation survey on October 12, 2011, in the village park only. The other two investigation areas did not contain enough water elevation points to do an adequate water level survey. Field staff opened all the well covers prior to initiating the survey in order to allow the wells to equilibrate to atmospheric pressure. Field staff used a survey level and rod to measure the top of casing elevations – at the seven monitoring wells in the village park – to the nearest 0.01 foot. Staff also measured the well casing stickup, which is the distance from the top of the well casing to the ground level, which can later be used to calculate distances below ground level of water levels, screens, and bottoms of wells. The survey team found an established elevation benchmark at a utility pole in the village park, which had an elevation of 611.32 marked on it. All water levels were surveyed in to that elevation. To determine depth to groundwater, staff used an electronic water level meter to measure the distance from the top of casing to the water table, which is the static water level. Static water level elevations were then determined using these measurements, by subtracting the depth to groundwater from the top of casing elevation. Table 4 contains the groundwater elevation data.

Based on the water table elevation survey of October 12, 2011, the groundwater flow direction appears to be to the east-southeast, toward Torch Lake. Figure 8 displays the estimated groundwater elevation contours and elevation data at each monitoring well used as a piezometer.

Soon after the final static water level elevations were collected, the monitoring wells were removed and the boreholes were properly abandoned following an approved standard operating procedure. This procedure entailed slowly filling the abandoned borehole with bentonite chips to within six inches of the surface then topping off the borehole with immediate surrounding material.

5.2.7 Surface Water Samples

Field staff collected six surface water samples, including one duplicate sample, from five locations in Torch Lake to determine whether contaminants had migrated from the Site into Torch Lake and, thus, into the surface water pathway. See Figure 9 for Surface Water and Sediment Sample Locations. Location information and sample descriptions can be found in Table 5. The background sample, SW-01, was collected from the east side of Torch Lake, where no known mining operations took place. Sampling commenced with the background sample first, followed by SW-03, SW-04, SW-05, and then SW-02. The first four samples were collected from a boat provided by Michigan Department of Natural Resources (MDNR) Conservation Officer, Dennis Gast. Sample SW-02 was collected by MDEQ field staff without the aid of a boat.

All surface water samples were collected directly into the sample bottles by submerging each bottle slightly below the lake surface to collect the sample. Conductivity, pH, temperature, ORP, and TDS readings were recorded for the water at each sampling location. After samples were collected, they were placed in sample coolers containing ice.

5.2.8 Sediment Samples

Field staff collected six sediment samples, including one duplicate sample, from five locations in Torch Lake to determine whether contaminants from the Site had migrated into the lake sediments and thus into the surface water pathway. The sediment sample locations can be found in Figure 9. Location information, sediment lithology, and sample descriptions for these samples can be found in Table 6. All of these sediment samples were collected in association with surface water samples. The background sample, SD-01, was collected from the east side of Torch Lake, where no known mining operations took place. Sampling commenced with the background sample first, followed by SD-03, SD-04, SD-05, and then SD-02. The first four samples were collected with the aid of the MDNR boat noted above. Sample SD-02 was collected by MDEQ field staff without the aid of a boat.

Four sediment samples – SD-01, SD-03, SD-04, and SD-05 – were collected by ponar dredge. These four samples were collected with the aid of the MDNR boat noted above. After arriving by boat at the desired location, the boat operator anchored the boat to steady the boat at the location. After completing collection of the surface water sample at that location, field staff lowered the ponar dredge until it struck bottom. At that time, the ponar is designed to close automatically. Field staff reported that sometimes the jaws of the ponar did not close at the time of the first attempt, but staff was eventually able to get the jaws to close and collect the sample. Field staff estimated the depth of the ponar's penetration into the bottom

sediment by the amount of sample collected during any one ponar collection event.

One sediment sample, SD-02, was collected without the aid of a boat, but with field staff going by foot to the location near the north Traprock Slag area. This sample was collected with a sediment corer, which is a stainless steel tube about two feet long with a rubber point on the lower end and a rubber cap at the top to aid in extracting the sample without losing the sample. Staff would push the corer into the sediment and then pull it up to extract a sample.

Each of the five samples was then processed in the field. Each sample was placed in a disposable aluminum tray from the collection device. The volatile fraction of the sample was collected first with the use of a dedicated syringe. An approximate 10 gram sample of sediment was collected in the syringe directly from the sample in the aluminum tray. For the volatile fraction, the sample was disturbed as little as possible while collecting it, and then placed immediately into a 40 ml glass vial and preserved with 10 ml of methanol. The remainder of the sediment sample was examined for visible debris (stones, roots, etc.), which was removed. The sample was then thoroughly mixed and transferred to its respective sample containers using a stainless steel spoon or trowel. After samples were collected, they were placed in sample coolers containing ice.

6. ANALYTICAL RESULTS

6.1 Introduction

This section includes results of chemical analysis of all samples collected during this SI. Laboratory analytical data with the laboratory narratives for the water and soil/sediment sample analyses are provided in Appendix F.

6.2 Sample Analytical Results

All samples were analyzed by the MDEQ Environmental Laboratory or by a U.S. EPA CLP laboratory. All water samples were analyzed for organic compounds by Spectrum Analytical, Inc., Tampa, Florida, a CLP Laboratory, using U.S. EPA CLP Statement of Work SOM01.2. The water samples were analyzed for inorganic compounds by Chemtech Consulting Group, Mountainside, New Jersey, a CLP laboratory, using U.S. EPA CLP Statement of Work ILM05.4. All soil/sediment samples were analyzed for VOCs by the MDEQ Environmental Laboratory according to U.S. EPA method 5035/MDEQ method 8260. Soil/sediment samples were analyzed for SVOCs and PCBs by Spectrum Analytical, Inc. using U.S. EPA CLP Statement of Work SOM01.2. All soil/sediment samples were analyzed for inorganic compounds by Chemtech Consulting Group using U.S. EPA CLP Statement of Work ILM05.4. Pesticide analysis was not requested during this SI.

A note about naphthalene and 2-methylnaphthalene analyses is included here. The state's laboratory analyzes for both naphthalene and 2-methylnaphthalene using methods 8260 for VOCs and 8270 for SVOCs. These analyses are responsive to guidance in the MDEQ's RRD Operational Memorandum No. 2. The laboratory qualifies method 8260 results for these two compounds stating that since these compounds have boiling points greater than 200^{o} Celsius, these compounds are better analyzed by method 8270. However, method 8270 potentially underestimates the actual concentration due to low extraction recovery. To comprehensively reflect laboratory data that have been generated for this Site, both 8260 and 8270 results are listed in the sample data summary tables under their respective analysis - volatiles and/or semi-volatiles. For purposes of this report, the unqualified data represented by method 8270 for naphthalene and 2-methylnaphthalene were selected for comparison to Part 201, Environmental Remediation, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (Part 201), Criteria to represent environmental conditions and risks at this Site. However, given the conundrum between these two analytical methods for these two chemicals, without a more comprehensive data set from this Site this data selection approach included in this report may not accurately represent the risks posed by these chemicals.

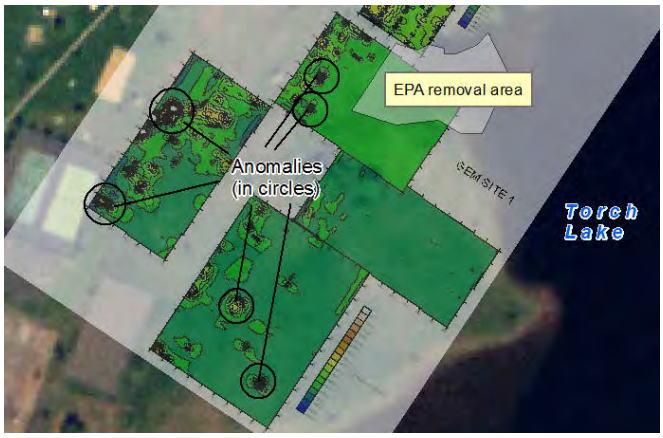
Key sample analytical results are summarized in the appropriate tables for the media presented in the following subsections when the sample analytical results met either of the following criteria: the sample concentration is greater than three times the background concentration, or the sample concentration is greater than the detection limit when the background sample concentration was not detected at the laboratory reporting limit. These key sample results are an indication of what is considered an "observed release" for Hazard Ranking System scoring for the Site.

6.2.1 June 2011 Limited Investigation

The results of the limited investigation were favorable to the village in that only one screening result contained a contaminant exceeding state soil direct contact criteria. One boring, at a depth of approximately three feet, contained arsenic at a concentration of 13 ppm, exceeding the state direct contact criterion of 7.6 ppm.

6.2.2 Geophysics Results

Of particular significance to this SI was the early result of the Michigan Technological University students' electromagnetic (EM) survey. During September and early October 2011, the group shared their results with the MDEQ. The EM survey in the vicinity of the village tennis courts and the 2007 U.S. EPA removal area showed several elevated soil conductivity areas, or anomalies, as seen in the upper figure at right. At the urging of MDEQ Environmental Engineer, Mr. Mark Henry, the Team Leader obtained coordinates of these anomalies from his laptop in the field trailer. With these coordinates, field staff was able to navigate to the anomalies using a GPS, where several soil boring locations were chosen, as



shown in the figure on the lower right. One of these anomalies was the location where the Team Leader flagged soil boring sample SB-13 and monitoring well MW-12. That location turned out to contain a gray sludge at a depth of about two feet below ground, which was high in lead, as described below in section 6.2.5.

6.2.3 Surficial Soil Samples

Analysis of the surficial soil samples revealed the presence of VOCs, SVOCs, PCBs, and inorganic analytes at high enough concentrations to be considered observed releases. The key surficial soil sample analytical results are provided in Table 7. The following organic compounds and inorganic analytes were found to be observed releases in surficial soil samples:

- VOCs: benzene, cyclohexane, ethylbenzene, 2-methylnaphthalene, n-butylbenzene, n-propylbenzene, styrene, toluene, total xylenes, and 1,2,4-trimethylbenzene;
- SVOCs: acenaphthene, bis(2-ethylhexyl)phthalate, dibenzofuran, hexachlorobenzene, 2-methylnaphthalene, naphthalene, phenanthrene, and 1,2,4,5-tetrachlorobenzene;
- PCBs: Aroclor-1254 and Aroclor-1260; and
- Inorganics: antimony, arsenic, cadmium, chromium, copper, lead, manganese, silver, and zinc.

As noted in section 2.5 on waste characteristics, surficial soil sampling results along with XRF screening has documented considerable waste and soil contamination at the Site, primarily due to inorganic contaminants associated with waste. The most significant contamination was found in the southern part of the Site, on the Coal Docks and Mineral Building properties, as can be seen in Figures 3D and 3E. A gray sludge was found within the former C & H chimney remains south of the Mineral Building. This sludge contained arsenic at concentrations of 2,200 to 3,000 ppm and lead above 1,000 ppm, based on XRF measurements. Surficial soil sample results in this area exceeded state soil direct contact criteria for arsenic, copper, and lead. Contaminated soils in Subarea C also exceeded state direct contact criteria for arsenic, copper, and lead. Some of the contaminated shallow soils seem to be associated with three suspect areas. These include the location near the lead sludge 2007 removal action, and a location where buried lead-containing sludge was found near the tennis courts, and also the area between the former Calumet Stamp Mill and Torch Lake. A smaller area of surficial soil contamination was documented in the northern part of the Site at the Traprock Slag area. Only one surficial soil sample in this area documented an observed release of lead and manganese. Lead in sample SS-03

was at 506 ppm, exceeding the 400 ppm state direct contact criterion, with XRF screenings in this area of 400 to 500 ppm lead.

Observed releases of organic compounds in surficial soil samples were documented only in Subareas D and E. The samples summarized in Table 7 starting at SS-13 and up are from these areas. Two PCB Aroclors – 1254 and 1260 – were documented in samples SS-16 and SS-18, which are located in the southern part of the Coal Docks property and also in the Mineral Building property, both near the shoreline of Torch Lake.

6.2.4 XRF Screening Results

XRF screening results were used to delineate areas of contaminated soil or waste at the ground surface. These numerical results are shown in Appendix C. Any result in bold lettering indicates the concentration measured by XRF exceeds the concentration considered by the MDEQ to be safe for direct contact. Arsenic and lead exceeded their direct contact criteria the most, followed by copper and antimony. The locations where XRF readings exceeded direct contact criteria were used in Figures 3A, C, D, and E to determine the extent of surficial waste or contaminated soils near the ground surface. Such areas are indicated in the figures by a stipple pattern with dots. The figures reveal about 45 acres of the 155-acre Site to be contaminated with mining-related waste at the ground surface. Waste piles based on other information sources amount to 11.3 acres. Acreage values are based on calculations in a Geographic Information System (GIS).

6.2.5 Soil Boring Samples

Analysis of the soil boring samples revealed the presence of SVOCs and inorganic analytes at high enough concentrations to be considered observed releases. The key soil boring sample analytical results are provided in Table 8. The following organic compounds and inorganic analytes were found to be observed releases in soil boring samples:

- SVOCs: acetophenone, anthracene, benzaldehyde, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, fluoranthene, 2-methylnaphthalene, phenanthrene, and pyrene; and
- Inorganics: arsenic, cadmium, chromium, cobalt, copper, lead, manganese, mercury, nickel, silver, vanadium, and zinc.

The most significant observed releases in subsurface soils appear to be located in Subarea C, primarily due to inorganic analytes. These areas are associated with documented waste sludge buried in the subsurface. At a depth of 2-2.5 feet in soil

boring SB-13, a gray sludge layer was discovered during the soil boring installation. XRF screening of that sludge documented lead at 16,726 ppm. The soil sample below the sludge contained lead at 16,100 ppm. Subarea C has the most number of inorganic parameters in observed releases. Fewer numbers of inorganic parameters were found in subsurface soils in other areas of the Site.

Observed releases of organic compounds in subsurface soil samples were only of the semi-volatile kind. No VOCs or PCBs were found at high enough levels to be considered observed releases. SVOCs in subsurface soil boring samples were found mostly in samples SB-04 and SB-05, located in the village parking lot of Subarea C.

6.2.6 Groundwater Monitoring Well Samples

Analysis of the groundwater monitoring well samples revealed the presence of only inorganic analytes at high enough concentrations to be considered observed releases. The key groundwater sample analytical results are provided in Table 9. The following inorganic analytes were found to be observed releases in monitoring well samples: arsenic, possibly chromium, copper, lead, mercury, nickel, silver, and zinc. The laboratory analyzed total chromium, and did not speciate between chromium (VI) and chromium (III). Chromium (III) can be naturally occurring, while chromium (VI) is not naturally occurring and is the more toxic form.

The most significant groundwater contamination, based on SI groundwater sampling, appears to be in Subareas C and E. Sample MW-07, located in the village park and near the lakeshore, had the most number of metals as observed releases. Sample MW-12, located at the same location as high lead-containing soil boring sample SB-13, had the next most number of metals as observed releases.

6.2.7 Surface Water Samples

Analysis of the surface water samples revealed the presence of only inorganic analytes at high enough concentrations to be considered observed releases. The key surface water sample analytical results are provided in Table 10. The following inorganic analytes were found to be observed releases in monitoring well samples: cadmium, cyanide, and manganese.

Observed releases of the metals noted above occurred in only two of the five samples collected. One of those, sample SW-02, was collected near the Traprock Slag area. The other one, sample SW-03, was collected in Subarea C near the 2007 removal area.

6.2.8 Sediment Samples

Analysis of the sediment samples revealed the presence of VOCs, SVOCs, PCBs, and inorganic analytes at high enough concentrations to be considered observed releases. The key sediment sample analytical results are provided in Table 11. The following organic compounds and inorganic analytes were found to be observed releases in surficial soil samples:

- VOCs: only iodomethane in SD-05;
- SVOCs: 1,1-biphenyl, 1,2,4,5-tetrachlorobenzene, 2-methylnaphthalene, acenaphthene, acetophenone, anthracene, benzaldehyde, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, bis(2-ethylhexyl)phthalate, chrysene, dibenzofuran, fluoranthene, hexachlorobenzene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene;
- PCBs: Aroclor-1254 and Aroclor-1260 only in sample SD-05; and
- Inorganics: antimony, arsenic, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, mercury, nickel, silver, vanadium, and zinc.

Significant observed releases were documented in all the sediment samples collected. All sediment samples collected contained ten or more inorganic contaminants at concentrations high enough to be considered observed releases. Sample SD-04 also contained many SVOCs, while SD-02 only contained two and SD-05 contained one. Sample SD-05 contained the only VOC and PCBs as observed releases.

7. DISCUSSION OF MIGRATION PATHWAYS

7.1 Introduction

This section discusses data and information that apply to possible contaminant migration pathways and possible sources of contamination that may be attributable to the Site. The four migration pathways of concern discussed are groundwater, surface water, soil exposure, and air. Observed releases into the groundwater pathway have been documented to be at high enough concentrations to very likely cause impacts in the surface water pathway from venting groundwater.

7.2 Groundwater

The analysis of groundwater samples collected during this SI investigation has documented an observed release of contaminants to the groundwater in the area of the Site. The key sample results are summarized in Table 12. To determine an inherent risk, this table also compares the contaminant concentration ranges to Michigan's Part 201 cleanup criteria for drinking water, groundwater surface water interface (GSI), and groundwater contact.

Nine of the inorganic analytes found to be observed releases in groundwater samples also exceeded risk-based cleanup criteria established by the MDEQ pursuant to Part 201, especially GSI criteria. **Copper and lead** had the most exceedances, found in seven samples each. Copper ranged in concentration from 143 to 24,700 micrograms per liter (ug/l), which exceeds the 4.7 ug/l GSI standard in all seven samples. The highest concentration was found in sample MW-07, located almost at the lakeshore, thus posing a high risk to Torch Lake from groundwater venting to the lake at this location. Lead ranged in concentration from 11.8 to 310 ug/l, which exceeds the 4.0 ug/l drinking water standard and also exceeds the 4.7 ug/l GSI standard. The highest lead concentration was found in sample MW-12, located at the same location as soil boring sample SB-13, where the high-lead containing sludge was found. Closer to the lakeshore, lead in sample MW-07 was found to be 282 ug/l, exceeding the 4.7 ug/l GSI standard, also posing a risk to Torch Lake from groundwater venting to the lake. **Arsenic** exceeded drinking water and GSI criteria in three samples. The highest concentration of arsenic was found in MW-12 at 220 ug/l, while the second highest concentration was found in MW-07 at 136 ug/l. Both these monitoring well locations are in the village park and close to Torch Lake. Thus, arsenic also poses a potential risk to Torch Lake from venting groundwater.

Except for zinc, all the metals shown in Table 9 for samples MW-04, MW-07, and MW-11 are likely to pose a risk to Torch Lake from venting groundwater due to the close proximity of these sample locations to Torch Lake. These inorganic contaminants appear to be leaching out of Site wastes in source areas, then into

surficial and subsurface soils, and into groundwater that is flowing toward Torch Lake. Such groundwater is very likely venting into Torch Lake and causing impacts to targets in the surface water pathway.

This contamination in the groundwater is attributable to the Site in that it is found in close association with wastes found in source areas. Inorganic contaminants found in wastes documented in surficial soils at the Mineral Building property and wastes also documented in subsurface soils at the village park were found also in groundwater samples near these source areas. There is also a potential for continued migration of contaminants from the Site to groundwater based on the following information:

- There are no engineered caps or liners in the source areas to inhibit infiltration and migration to groundwater;
- Some of the soils on the Site have shown elevated levels of contaminants;
- There is no containment in the areas of contaminated soils to keep contaminants from leaching into groundwater;
- The soils in the area are comprised of highly permeable sands; and
- The groundwater is located near the surface at depths of less than 2 feet to about 12 feet.

As noted above in the Site background section, the geology in the area of the Site throughout the four-mile radius consists of surficial deposits mainly of coarse-grained glacial deposits interbedded and mixed with finer silts and clays. Therefore, the drift aquifers and bedrock aquifers are likely interconnected.

The geology of the area within the 4-Mile Radius consists of bedrock at the surface in places and relatively shallow glacial deposits overlying bedrock (Curran et al., 1981; MDEQ, 2011; Rheaume, 1991; Schwenner et al., 1991), according to data gathered for the PA. The glacial deposits are relatively thin ground moraines typically consisting of coarse-textured glacial till interbedded and mixed with finer silts and clays, only 0 to 50 feet thick to the east and west of the Site. The depth of these deposits in the general area of the Site is approximately 11 to 50 feet. Some thicker lacustrine sand and gravel deposits are found to the north, up to about 250 feet thick. The bedrock in the area of the Site consists of Jacobsville sandstone to the southeast and Portage Lake Lava Series to the west and northwest. These glacial deposits and underlying bedrock are capable of producing limited supplies of groundwater. Select drinking water well logs for the surrounding area can be found in Appendix G. The numbers in the upper right of each well log is a reference to its location on the 4-Mile Radius Map in Appendix A. Because the glacial deposits in the area contain clay aquicludes only to a limited extent or are mixed with sands and silts, the drift aquifers and bedrock aquifers are likely interconnected.

According to PA data, all area residents utilize groundwater for their drinking water. Residents of the village of Lake Linden obtain their drinking water from three municipal wells operated by the village. These wells are located in the northeast part of the village limits, about one-third of a mile north of the Site, inside the one-fourth to one-half mile ring. The total population served by these wells is approximately 1,081, based on 2000 census data. The remainder of the population located within the 4-Mile Radius of the Site utilizes residential wells and a public water supply from water wells located on the north shore of Lake Superior, outside the 4-Mile Radius. Many of the more populated areas within four miles of the Site, for example along State Highway M-26 from Calumet to Laurium to Lake Linden to Hubbell, are served by the north shore wells, according to a personal communication with Mr. Steve Dlubala, contact person for the Michigan American Water Company, which owns and operates the north shore wells.

The approximate population served by groundwater within four miles of the Site by radius ring is listed in the table below:

Distance from Site	Estimated population served by residential wells	Estimated population served by municipal wells
0 – ¼ Mile	524	none
¼ - ½ Mile	230	1,081
½ - 1 Mile	398	none
1 – 2 Mile	356	none
2 – 3 Mile	245	none
3 – 4 Mile	1,600	none
Total	3,353	1,081

7.3 Surface Water

The entire area to the west and north of the Site is at higher elevations and, thus, surface runoff will flow across the Site and into surface waters. The topography to the west is steep and considerably higher than the Site, as seen in the topographic contours of Figures 1 and 2. In the vicinity of the village of Lake Linden, the village is immediately uphill of the Site, and any surface runoff in this area will flow across village properties before flowing across the Site and into Torch Lake. The northern part of the Site is part of the Trap Rock River watershed, and the topography is less steep than west of the Site. However, the slope in this area is still toward Torch Lake. Thus, surface runoff in this area will also flow across the Site and into the Torch Lake backwater or possibly into Trap Rock River. Much surficial soil contamination has been documented throughout the Site and, thus, surface runoff into Torch Lake is likely to contain the contaminants documented in the shallow soils. The soils of the Site are quite permeable in nature, so some surface runoff will percolate into the contaminated soils, leaching contaminants into shallow groundwater. This contaminated groundwater is flowing toward the lake and is

likely to cause impacts in the surface water pathway. The PPE of contaminants into the surface water pathway is along the whole shoreline of the Site. Some surface runoff has been directly observed by the Team Leader at the Coal Docks property, as described in the Reconnaissance section above. See the 15-Mile Surface Water TDL Map in Appendix B for surface water pathway features.

The surface water samples collected from areas adjacent to documented source areas indicate an observed release of contaminants into Torch Lake at these source areas. Surface water key sample results are summarized in Table 13. To determine an inherent risk, this table also compares the contaminant concentration ranges to Part 201 criteria for drinking water, GSI, and groundwater contact. These Part 201 criteria are used here as screening levels. Two inorganic analytes were found to be observed releases into surface water. Manganese did not exceed any Part 201 criteria. Cyanide was detected at a concentration of 15.2 ug/l in sample SW-03, exceeding the Part 201 GSI criterion of 5.2 ug/l.

The sediment samples taken from areas adjacent to documented source areas indicate an observed release of contaminants into Torch Lake at these source areas. These contaminants are summarized in the Key Sediment Sample Summary table, Table 14. This table also compares the contaminant concentration ranges to various screening criteria values. The concentrations of 13 inorganic contaminants were found to exceed at least some of these screening values. Of these 13 contaminants, 10 exceeded GSI protection levels and 5 exceeded drinking water protection levels. Since no public water intakes are found within the 15-Mile TDL, the exceedances of drinking water protection screening levels are not significant. Of greater significance are the GSI protection exceedances since this implies a potential impact to surface water targets. Arsenic, cadmium, chromium, cobalt, copper, lead, mercury, nickel, silver, and zinc exceeded GSI protection screening levels.

Here is an evaluation of potential risk to sediments for the areas investigated during this SI:

- The Traprock Slag area appears to pose <u>low risk to adjacent surface waters (including sediments)</u> based on XRF screening and soil/water/sediment sampling results compared to GSI and GSI protection criteria. Copper and cadmium pose a slight risk from surface runoff into Torch Lake and accumulation in sediments. XRF screening levels for copper were highest on the southwest side of the area, nearest where sediment sample SD-02 was collected. This could pose a slight risk from surface runoff into the lake. The sediment sample contained copper at a concentration of 131 ppm, exceeding the GSI protection screening level of 32 ppm. For cadmium, all the XRF screening levels were below the limit of detection and none of the soil samples had observed releases of cadmium. However, the sediment

sample contained 1.9 ppm cadmium, just exceeding the GSI protection screening level of 1.5 ppm. Both the copper and cadmium concentrations exceed consensus-based threshold effect concentrations (TECs), which are levels below which harmful effects are unlikely to be observed (MDEQ 2006).

- Screening and sampling in Subarea C suggests high risk to the surface water pathway from copper, arsenic, and lead. Sediment samples SD-03 and SD-03D both exceeded GSI protection criteria for copper, but the same samples were below the GSI protection criteria for arsenic and lead. Sample SD-03 was collected just east of the 2007 removal area, where lead was found to be over 40,000 ppm, so it is possible that the high lead sediment was already removed from the location where SD-03 was collected. An MDEQ report (Alexander, 2008) from a sediment survey in this area found lead at 7,800 ppm and copper at 28,000 ppm in shallow sediments, at a location perhaps 130 feet further east-southeast of sample SD-03, suggesting still existing contamination in the sediment in this area. Another reason why copper, arsenic, and lead are likely to pose a high risk to the surface water pathway is that all three metals significantly exceed GSI criteria in three monitoring wells, while copper and lead exceed the GSI criteria in three additional wells. Monitoring well MW-07, located at the GSI, had the highest concentration of copper of all water samples collected: 24,700 ppb, exceeding the GSI criterion of 4.5 ppb by more than 5,000 times. With groundwater flowing toward the lake in this area, venting groundwater is likely to cause an impact to surface water. In addition, considerable surficial contamination exists, especially at the area from the Historical Society to the lakeshore, which could contribute to surface runoff of the three metals into Torch Lake waters and sediment.

- The Coal Docks property and the Mineral Building property were documented to have contaminants that pose a high risk to sediments. Two sediment samples – SD-04 and SD-05, respectively – were collected in this area, and both samples had observed releases of metals and SVOCs at concentrations above sediment screening levels. More than eight metals exceeded GSI protection criteria used as screening levels. The Mineral Building property sample had higher concentrations of metals and PCBs than the Coal Docks property, while the Coal Docks property had most of the SVOC contamination. SD-04 at the Coal Docks property contained observed releases of copper and lead above consensus-based probable effect concentrations (PECs), levels above which harmful effects are likely to be observed (MDEQ, 2006). This was true also for sample SD-05 at the Mineral Building property, where arsenic, nickel, and zinc also exceeded the PECs. Most of the SVOCs found as observed releases were found in SD-04. Of

these, seven SVOCs exceeded TECs and two exceeded PECs. Total PCBs in SD-05 also exceeded the TEC for total PCBs.

The presence of these contaminants in the surface water pathway has indicated an observed release to that pathway. These contaminants are attributable to the Site based on the following information:

- This area has extensive waste and surficial contamination, as documented by XRF screening and shallow soil sampling, and these on-site sources and samples taken close to source areas are at levels elevated above background concentrations;
- There is no complete containment of the contaminants in the source areas to prevent their migration into the surface water pathway, except for a partial barrier at the Coal Docks property due to the presence of the concrete structure from the former C & H Docks, which limits surface runoff to areas north and south of the dock remains; and
- Runoff from the Site over areas with surficial contamination flows into Torch Lake, the backwater area in the north, and potentially also into the Trap Rock River.

There is a strong potential for continued migration of contaminants from the Site to the surface water pathway. The PPE of contaminants into the surface water pathway is along the entire shoreline of Torch Lake adjacent to the Site. Runoff from areas of surficial contamination flows into the surface waters of Torch Lake and accumulates in sediments. The PPE for contaminants entering the surface water pathway as runoff would be the entire shoreline of the Site adjacent to Torch Lake, except for the area where the concrete dock remains are still present. The PPE for contaminants entering the surface water pathway as contaminated groundwater venting into Torch Lake would occur along the whole shoreline of the Site adjacent to Torch Lake.

The 15-Mile TDL for the surface water pathway lies within all of Torch Lake proper and reaches into portions of Portage Lake, but does not reach into Lake Superior. There are no known surface water intakes along the TDL but the waters of Torch Lake are used for numerous purposes. Observations made during the field sampling event noted area residents using the public beach near the village of Lake Linden and boaters using the lake in the area. Also, according to a 2007 MDEQ report, the *Biennial Remedial Action Plan Update For the Torch Lake Area of Concern*, "Torch Lake is used for fishing, boating, limited contact recreation (swimming, jet skis, and water skis), non-contact cooling water supply, treated municipal waste assimilation, and wildlife habitat." Sensitive environments located within the 15-Mile TDL include a state wildlife area, habitat known to be used by five state designated threatened species, and approximately 17 miles of wetland frontage.

The threatened species were documented through a search of the Michigan Natural Features Inventory database. The inventory query for the entire 15-Mile TDL can be found in Appendix H. The state designated threatened species include three fish (lake herring, sauger, lake sturgeon), the common loon, and chives. MDEQ personnel observed a common loon on June 23, 2011, in Torch Lake waters adjacent to the Site. See Appendix D photo log, page 57.

The state designated wildlife area is the Sturgeon River Sloughs State Wildlife Area (Michigan Department of Natural Resources, 2006), parts of which are located in the southern part of the 15-Mile TDL. The large wetland in the southern part of Portage Lake is a part of that wildlife area. The wetlands frontage was measured using a geographic information system to measure the wetlands features on the following United States Geological Survey topographic maps: Hancock, Michigan; Laurium, Michigan; Chassell, Michigan; Point Mills, Michigan; and Portage Entry, Michigan.

7.4 Soil Exposure

The MDEQ has observed area residents using parts of the Site with documented contamination in excess of concentrations that pose direct contact risks. XRF screening has documented many areas where metals contamination concentrations exceed Part 201 direct contact criteria. The XRF data spreadsheet cells with bolded numbers in Appendix C indicate these direct contact exceedances. Nine or more of the 20 surficial soil samples also exceeded direct contact criteria for PCBs, arsenic, copper, and lead, as seen in Table 15 where Criteria Category numbers 19 or 27 are shown. These areas of waste and surficial soil contamination and their estimated extent are shown in Figures 3A, 3C, 3D, and 3E. Deeper soil also poses a direct contact risk, as shown in Table 15, but such soil would become a risk only during excavation.

Vehicular and pedestrian access to the Site is only partially restricted. The Site is surrounded by residential and commercial properties. The Traprock Slag area part of Subarea A is not fenced and is easily accessible by walking. This area is accessible to vehicular traffic in the northern part near Bootjack Road, where construction vehicles have been observed. The school athletic field in Subarea A, however, is fenced and may have limited accessibility, even though students and their families use this area during school events. Moving south, Subarea B appears to be largely accessible to vehicles and pedestrians. The northern part of Subarea C is fenced where the ball field is located, but residents in the area use it for recreational purposes. The entire village-owned part of Subarea C is easily accessible to pedestrian and vehicular traffic, including the village park and marina. The former C & H Power Plant property will be fenced, according the U.S. EPA. The U.S. EPA has documented significant surficial soil contamination at the power plant property. The MDEQ has observed recreational vehicles and pedestrians accessing this area prior to fencing being installed. The Historical

Society property is accessible, although its main entrance off of State Highway M-26 may limit access to those visitors who come there to see historical remains and artifacts associated with past mining operations. The east side of the Historical Society can be accessed by pedestrians through the village park. Subarea D and E properties are fenced along State Highway M-26.

The Site is located in an area of residential and commercial uses and little fencing is present in the northern half of the Site to restrict access to areas where surface contamination is present. A total of approximately 2,523 people live within a one-mile radius of the Site. The total population living within the various distance rings is summarized in the table below.

Distance Ring	**0-¼ Mile**	**¼-½ Mile**	**½-1 Mile**
Population	724	1,391	408

7.5 Air

A release of potential contaminants to the air was not documented during the investigation of the Site, but potential releases to air are likely. Following the U.S. EPA approved work plan, further air sampling was not conducted. However, significant surficial waste and soil contamination have been documented in the village park, the Historical Society property, the former Power Plant property, the Coal Docks property, and the Mineral Building property. Some of these areas are only minimally vegetated and are, therefore, subject to winds disturbing the surficial contaminants and causing them to become airborne. The Houghton County soil survey (Schwenner, 1991, p 67) defines portions of the Site closest to the lake, from the Coal Docks to the village park and school property, as being "very susceptible to wind erosion." Some samples had arsenic, chromium, and manganese concentrations that exceeded particulate soil inhalation criteria, Criteria Categories #18 and #26, as seen in Table 15, suggesting a risk to residents downwind of the Site.

There are approximately 8,650 people living within a 4-Mile Radius of the Site. The total population living within the various 4-mile distance rings is summarized in the table below.

Distance Ring	**0-¼ Mile**	**¼-½ Mile**	**½-1 Mile**	**1–2 Mile**	**2–3 Mile**	**3–4 Mile**
Population	724	1,391	408	456	945	4,726

8. BIBLIOGRAPHY

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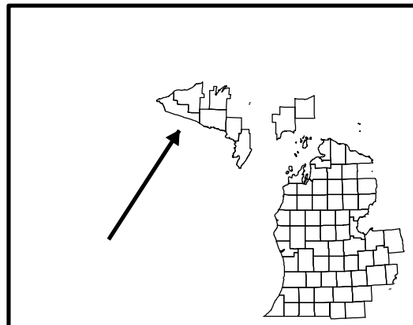
FIGURES

FIGURE 1
SITE LOCATION WITH BASIC FEATURES



Legend

- Entrance point, approx. center of Site
- State Highway 26
- Former Calumet & Torch Lake R. R.
- Site boundary
- Site subarea
- Public land survey section
- Village of Lake Linden

Notes:

- In the 3 sections shown, the label describes the township, then the range, then the section (55N32W06 is township 55 north, range 32 west, section 6)
- The topographic map is a 1975 photorevision of the 1946 USGS Laurium Quadrangle
- Approximate center of Site, near an entrance to the village park, is latitude 47.1882, longitude -088.4096
- The subareas shown here and in other figures in no way are meant to break the Site up into separate operational areas or separate sites but are meant to aid with the visual definition of the Site by showing these subareas in greater detail in later figures. These subareas are the same as those found in the preliminary assessment report.

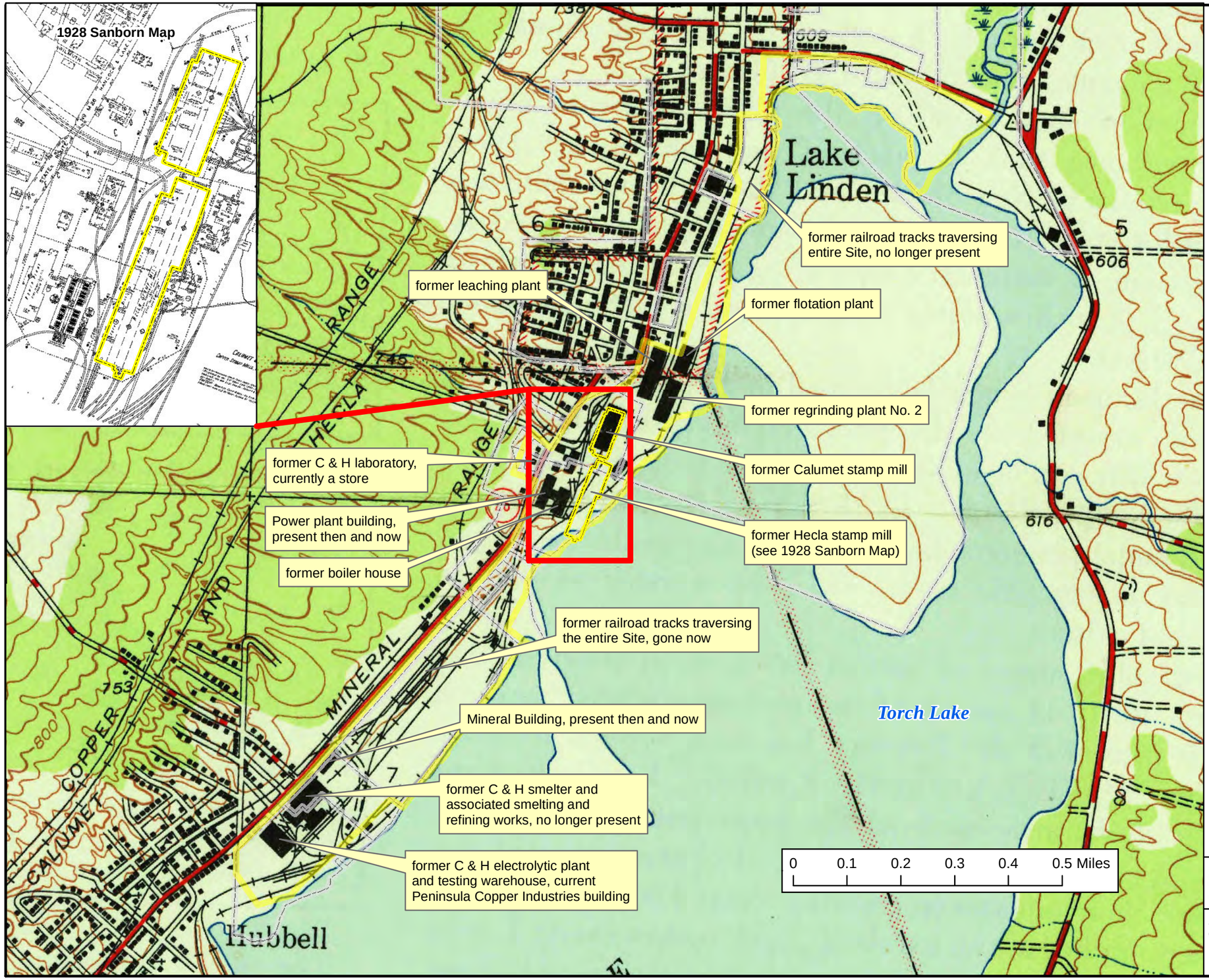
Compiled 7/29/11 by JES
(revised 3/13/12, 1/8/13, JES)
Projected coordinate system:
Michigan GeoRef, NAD-83, meters
Done in ESRI ArcView 10.1

Site Inspection Report
C & H Lake Linden Operations, MIN000510619

Michigan Department of Environmental Quality
Remediation and Redevelopment Division - Superfund Section
Site Assessment and Site Management Unit

Sources: DEQ files and databases, geographic data available from state websites, direct observation during SI fieldwork

FIGURE 2
HISTORICAL FEATURES



Legend

- Site boundary
- Former stamp mill
- Current property boundary

Notes:

- **The topographic map is the 1946 Laurium Quadrangle from the U.S. Geological Survey website**
- **Many of the former C & H facilities can still be seen in this 1946 topographic map**

Compiled 7/29/11 by JES
(revised 3/13/12, 1/9/13, JES)
Projected coordinate system:
Michigan GeoRef, NAD-83, meters
Done in ESRI ArcView 9.3

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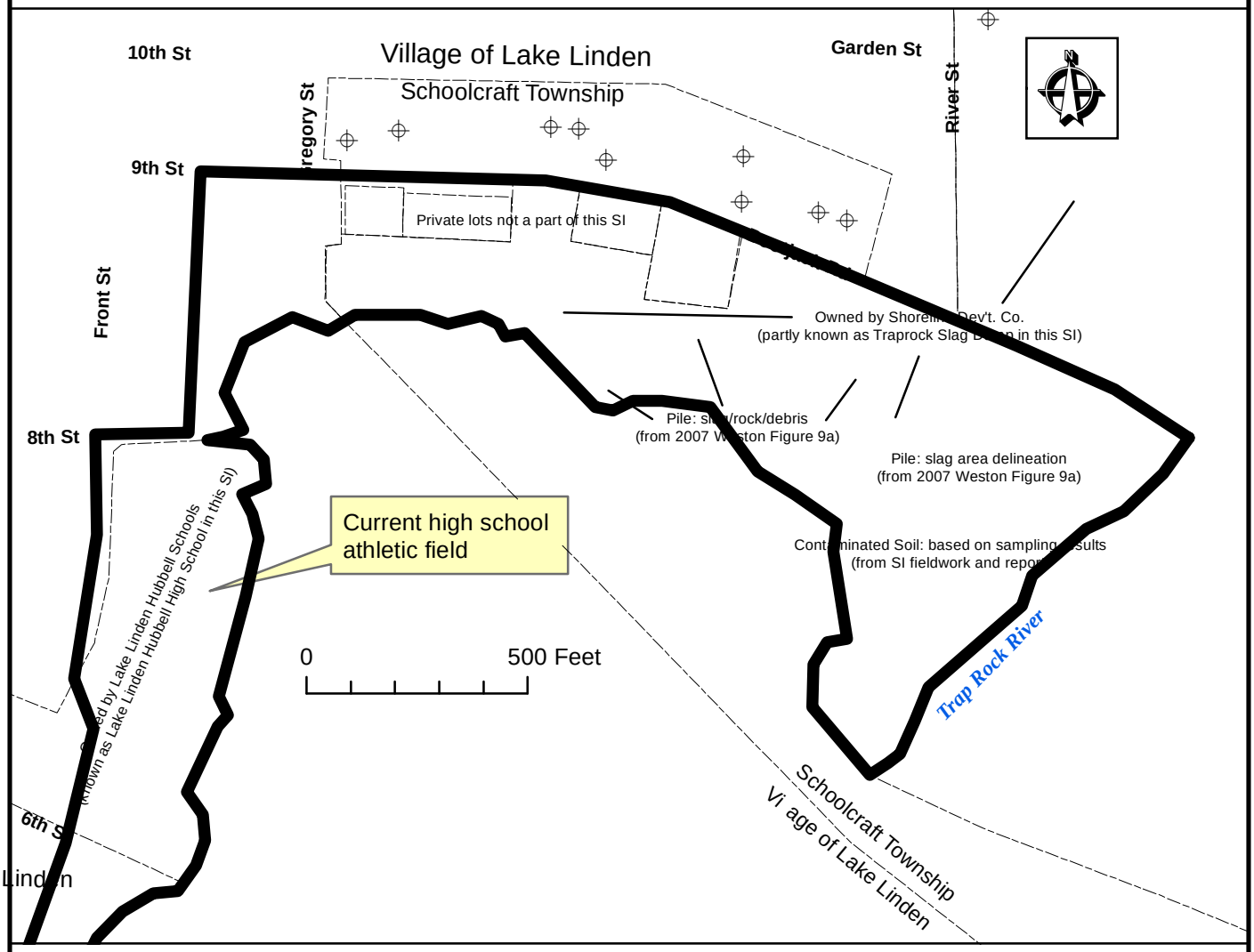
C & H Lake Linden Operations, MIN000510619

Michigan Department of Environmental Quality
Remediation and Redevelopment Division - Superfund Section
Site Assessment and Site Management Unit

Sources: DEQ files and databases, geographic data available from state websites, Sanborn Fire Insurance maps (1893 to 1954)

FIGURE 3A
CURRENT SITE FEATURES: SUBAREA A



Sources: 2010 aerial photograph from Michigan State University's GIS and Remote Sensing website; DEQ files; observations during SI fieldwork

Notes:
*This map is a revision of site feature maps contained in the Preliminary Assessment report.
*The waste or contaminated soil areas are areas where waste was documented or where soil concentrations exceeded Part 201 direct contact criteria.

Legend

- Known residential water well
- C & H Subarea from PA
- Approximate property boundary
- Site boundary
- Waste or contaminated soil

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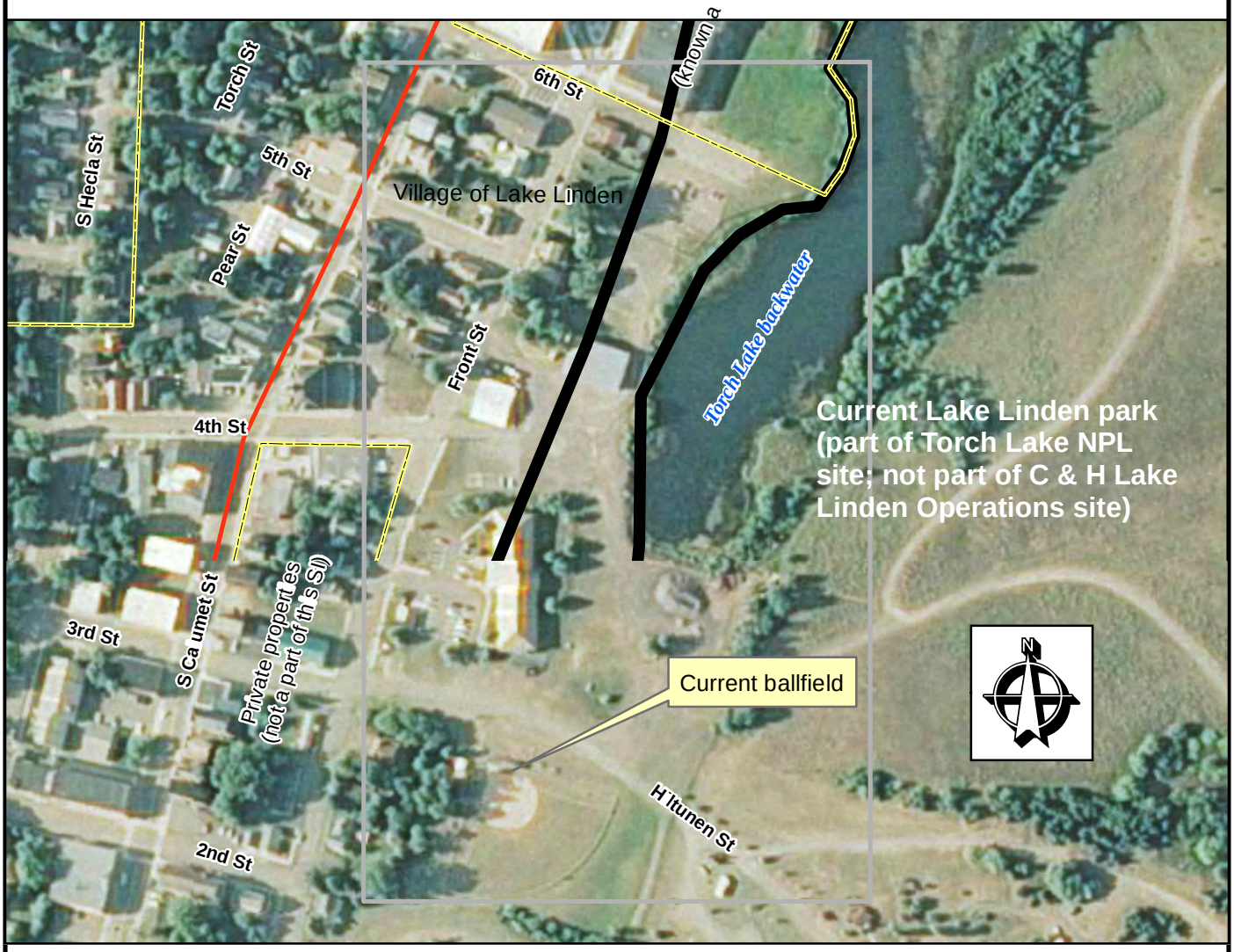
Compiled by JES, 7/29/2011
(revised 3/13/2012, JES)
Projected coordinate system:
Michigan GeoRef, NAD-83, meters
Done in ESRI ArcView 9.3

FIGURE 3B
CURRENT SITE FEATURES: SUBAREA B



Sources: 2010 aerial photograph from Michigan State University's GIS and Remote Sensing website; DEQ files; observations during SI fieldwork

0 250 500 Feet

Note: This map is a revision of site feature maps contained in the Preliminary Assessment report

Legend

- State Highway 26
- C & H Subarea from PA
- Approximate property boundary
- Site boundary
- Waste or contaminated soil

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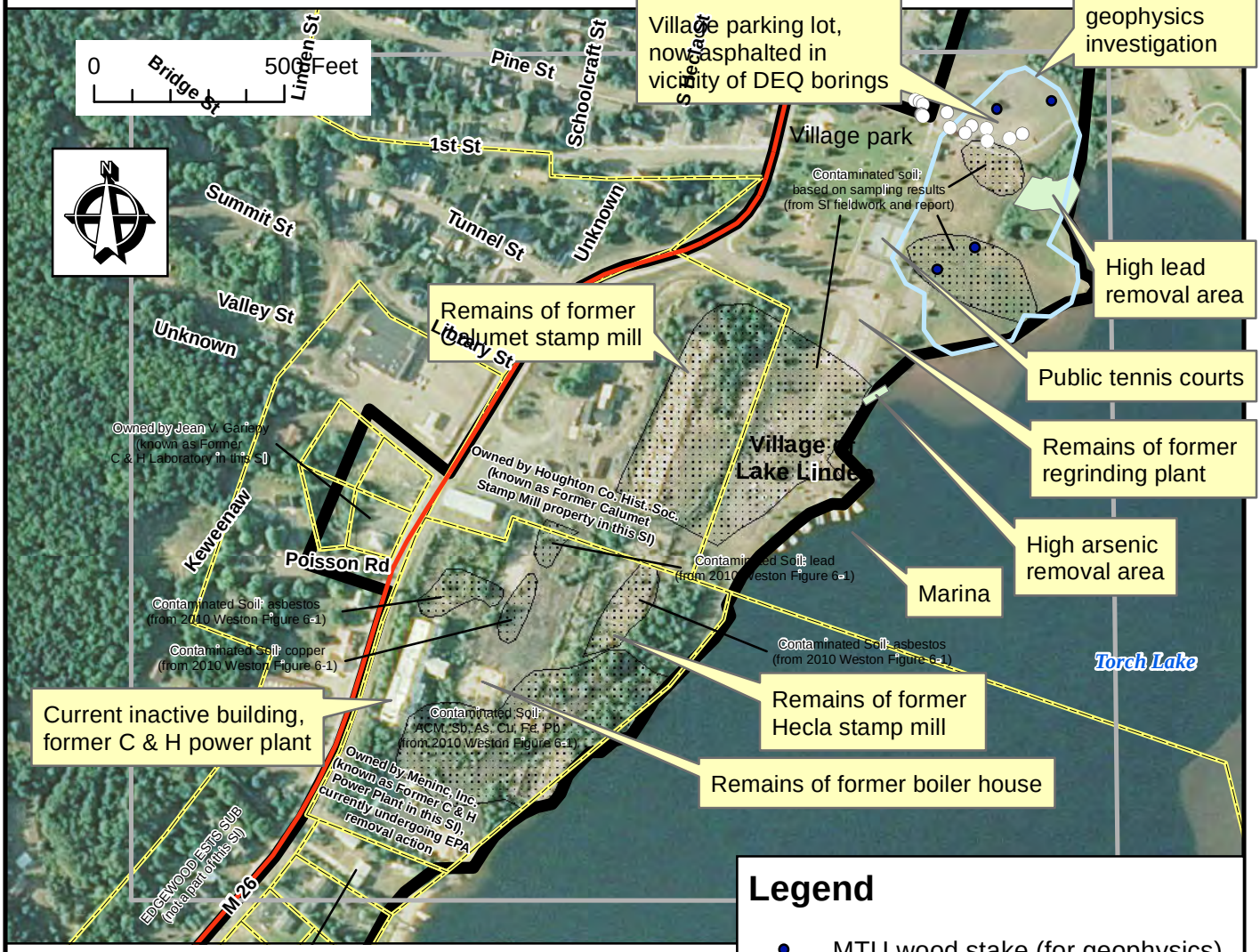
Compiled by JES, 7/29/2011
(revised 3/13/2012, JES)
Projected coordinate system:
Michigan GeoRef, NAD-83, meters
Done in ESRI ArcView 9.3

FIGURE 3C
CURRENT SITE FEATURES: SUBAREA C



Legend

- MTU wood stake (for geophysics)
- June 2011 DEQ subsurface boring
- State Highway 26
- MTU study extent
- U.S. EPA removal area, 2007
- C & H Subarea from PA
- Approximate property boundary
- Site boundary
- Waste or contaminated soil

Sources: 2010 aerial photograph from Michigan State University's GIS and Remote Sensing website; DEQ files; observations during SI fieldwork

Notes:
*This map is a revision of site feature maps contained in the Preliminary Assessment report.
*The waste or contaminated soil areas are areas where waste was documented or where soil concentrations exceeded Part 201 direct contact criteria.

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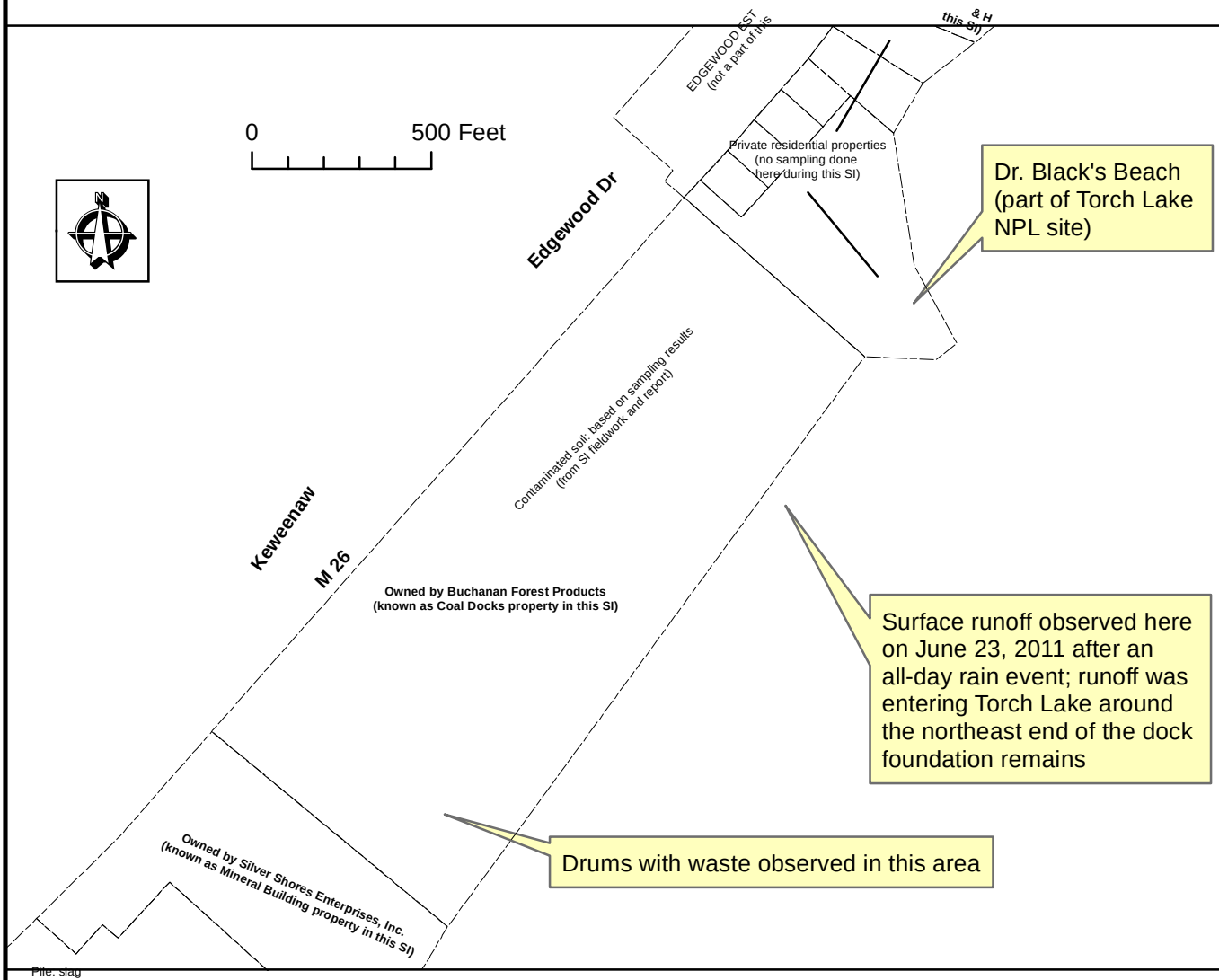
Site Assessment and Site Management Unit

Compiled by JES, 7/29/2011
(revised 3/13/2012, JES)
Projected coordinate system:
Michigan GeoRef, NAD-83, meters
Done in ESRI ArcView 9.3

FIGURE 3D
CURRENT SITE FEATURES: SUBAREA D



Sources: 2010 aerial photograph from Michigan State University's GIS and Remote Sensing website; DEQ files; observations during SI fieldwork

Notes:
*This map is a revision of site feature maps contained in the Preliminary Assessment report.
*The waste or contaminated soil areas are areas where waste was documented or where soil concentrations exceeded Part 201 direct contact criteria.

Legend

- Remaining coal dock foundation
- State Highway 26
- C & H Subarea from PA
- Approximate property boundary
- Site boundary
- Waste or contaminated soil

Site Inspection Report
C & H Lake Linden Operations, MIN000510619
Michigan Department of Environmental Quality
Remediation and Redevelopment Division - Superfund Section
Site Assessment and Site Management Unit

Compiled by JES, 7/29/2011
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Projected coordinate system:
Michigan GeoRef, NAD-83, meters
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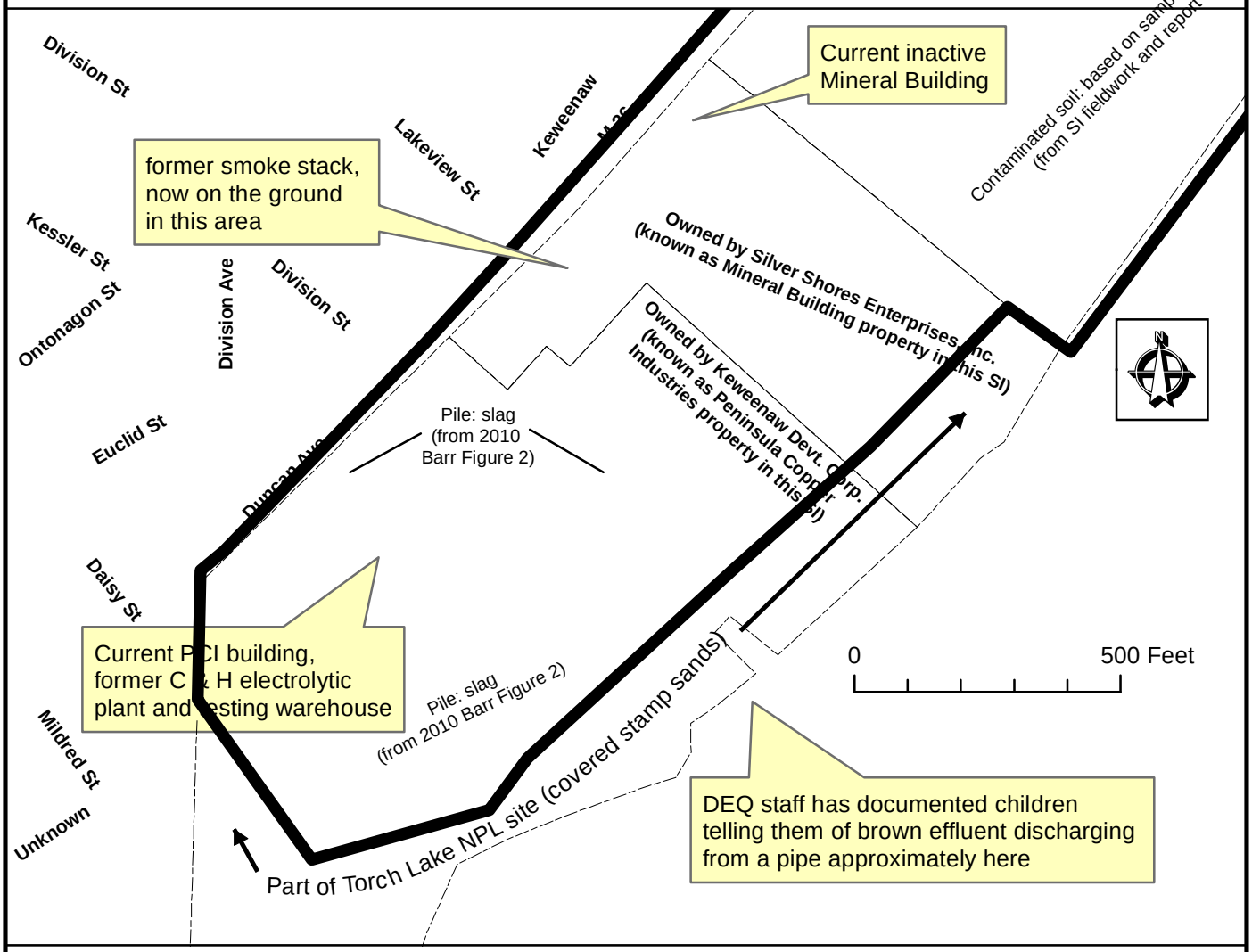
FIGURE 3E
CURRENT SITE FEATURES: SUBAREA E



Sources: 2010 aerial photograph from Michigan State University's GIS and Remote Sensing website; DEQ files; observations during SI fieldwork

Notes:
*This map is a revision of site feature maps contained in the Preliminary Assessment report.
*The waste or contaminated soil areas are areas where waste was documented or where soil concentrations exceeded Part 201 direct contact criteria.

Legend

- State Highway 26
- C & H Subarea from PA
- Approximate property boundary
- Site boundary
- Waste or contaminated soil

Site Inspection Report
C & H Lake Linden Operations, MIN000510619
Michigan Department of Environmental Quality
Remediation and Redevelopment Division - Superfund Section
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Done in ESRI ArcView 10.1

FIGURE 4A
XRF LOCATIONS IN THE TRAPROCK SLAG DUMP AREA

Sources: MDEQ field activities, October 10 to 13, 2011

0 250 500 Feet

Legend

- × XRF point
- □ Surficial sample location
- Waste or contaminated soil
- Estimated property boundary
- Site boundary

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Michigan Department of Environmental Quality
Remediation Division - Superfund Section
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Compiled by JES, 9/19/2011
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Projected coordinate system:
Michigan GeoRef, NAD-83, meters
Done in ESRI ArcView 10.1

FIGURE 4B
XRF LOCATIONS
IN SUBAREA C

0 500 Feet

Note:

All XRF locations were GPSed by MDEQ field staff unless asterisked (*), in which case the location was estimated. XRF90 is the screening result for the gray sludge found in soil boring sample SB-13.

Legend

- × XRF point and label
- Surficial sample location
- Waste or contaminated soil
- EPA removal area
- Estimated property boundary
- Site boundary

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Michigan Department of Environmental Quality
Remediation Division - Superfund Section
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Compiled by JES, 9/19/2011
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Projected coordinate system:
Michigan GeoRef, NAD-83, meters
Done in ESRI ArcView 10.1

FIGURE 4C
XRF LOCATIONS
IN THE SOUTH AREAS

Legend

- × XRF point with label
- Surficial soil sample location
- Waste or contaminated soil
- Estimated property boundary
- Site boundary

Note:

All XRF locations were GPSed by MDEQ field staff unless asterisked (*), in which case the location was estimated.

Compiled 2/10/2012 by JES
(revised 3/2,29/12, JES)
Projected coordinate system:
Michigan GeoRef, NAD-83, meters
Done in ESRI ArcView 10.1

Site Inspection Report
C & H Lake Linden Operations, MIN000510619

Michigan Department of Environmental Quality
Remediation Division - Superfund Section
Site Assessment and Site Management Unit

FIGURE 5
SURFICIAL SOIL SAMPLE LOCATIONS

Legend

SS-01 Surficial Soil 01

0 0.2 0.4 Miles

Note:
Surficial soil sample SS-01 is the designated background soil sample.

Compiled 2/10/2012 by JES
(revised 3/13/12, 1/9/13, JES)
Projected coordinate system:
Michigan GeoRef, NAD-83, meters
Done in ESRI ArcView 10.1

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Source: MDEQ field activities, October 10 to 13, 2011; 2010 aerial photograph from state website

FIGURE 6
SOIL BORING SAMPLE LOCATIONS

Note:
Soil boring sample SB-02 is the designated background soil sample.

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(revised 3/13,30/2012, JES)
Projected coordinate system:
Michigan GeoRef, NAD-83, meters
Done in ESRI ArcView 10.1

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C & H Lake Linden Operations, MIN000510619
Michigan Department of Environmental Quality
Remediation Division - Superfund Section
Site Assessment and Site Management Unit

Source: MDEQ field activities, October 10 to 13, 2011

FIGURE 7
GROUNDWATER MONITORING WELL SAMPLE LOCATIONS

MW-01
MW-02
MW-03
MW-05/MW-05D
MW-09
MW-04
MW-08
LLML2-30'bgs
MW-12
LAKE
MW-07
MW-06
MW-10
MW-11
Torch Lake

Legend

- ⊗ DEQ multi-level well
- MW-01 ✚ Monitoring Well 01
- Water Table Elevation Contour, feet

0 0.2 0.4 Miles

Notes:

* Monitoring well samples MW-01, MW-09, and MW-10 are the designated background samples for the monitoring wells in the three areas investigated. "LAKE" is not a well but the approximate location where the lake's water level was measured.

* Water table contours are from DEQ GIS server computers.

Compiled 2/10/2012 by JES
(revised 3/13/12, 1/9/13, JES)
Projected coordinate system:
Michigan GeoRef, NAD-83, meters
Done in ESRI ArcView 10.1

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Michigan Department of Environmental Quality
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Source: MDEQ field activities, October 10 to 13, 2011; 2010 aerial photograph from state website

FIGURE 8
GROUNDWATER ELEVATION CONTOURS IN THE VILLAGE PARK

608.26

607

606

605

604

603

602

601

601.22

601.28

601.49

600.28

602.56

601.07

600.91

Legend

602.56 Monitoring well with elevation in feet

Estimated water table contour elevation, feet

0 100 200 Feet

Compiled 2/10/2012 by JES
(revised 3/13/12, 1/9/13, JES)
Projected coordinate system:
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Source: MDEQ field activities, October 10 to 13, 2011; 2010 aerial photograph from state website

FIGURE 9
SURFACE WATER AND SEDIMENT SAMPLE LOCATIONS

This summer 2010 aerial photograph is derived from aerial photography, acquired for the National Agriculture Imagery Program (NAIP). The 2010 NAIP collected four band digital ortho imagery during the agricultural growing season in Michigan. The DEQ has a connection to this imagery through the Michigan Center for Shared Solutions & Technology Partnerships website.

SW-02 SD-02

SW-03,03D SD-03,03D

SW-04 SD-04

SW-05 SD-05

SW-01 SD-01

Legend

- Surface Water/Sediment Sample
- Estimated property boundary
- Site boundary

0 0.2 0.4 Miles

Notes:

* DEQ field staff collected samples 01, 03, 04, and 05 from a boat operated by DNR conservation officer, Dennis Gast. Staff collected sample 02 without a boat.

*Samples SW-01 and SD-01 are the designated background samples for surface water and sediment release samples.

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Projected coordinate system:
Michigan GeoRef, NAD-83, meters
Done in ESRI ArcView 9.3

Source: MDEQ field activities, October 10 to 13, 2011; 2010 aerial photograph from state website

TABLES

C & H Lake Linden Operations
Lake Linden, Michigan
October 10-13, 2011

TABLE 1

SURFICIAL SOIL SAMPLE DESCRIPTIONS

SAMPLE LOCATION	LOCATION COORDINATES		DEPTH (in.)	DESCRIPTION	SAMPLE INTERVALS AND COMMENTS
	Northing	Easting			
SS-01	741048.83	318294.26	0-9 in.	Moist, dark brown, silty sand, with some organic root material.	Volatile Organic Analysis (VOA) fraction at 3 inches. Remainder 0 to 9 inches. Designated background sample.
SS-02 **SS-02D**	740943.35	318128.93	0-3 in.	Moist, brown slag gravel.	VOA fraction at 1 inch. Remainder 0 to 3 inches.
SS-03	740899.93	318186.69	0-4 in.	Metal, glass, some slag in soil.	VOA fraction at 2 inches. Remainder 0 to 4 inches.
SS-04	740314.90	317427.93	0-2 in. 2-5 in.	Moist, dark brown, silty sand; some gravel, slag. Moist, brown, medium sand.	VOA fraction at 2 inches. Remainder 0 to 5 inches.
SS-05	740220.95	317456.83	0-2 in. 2-14 in.	Moist, dark brown silty; lots of organic material. Very moist, reddish brown, stamp sand.	VOA fraction at 6 inches. Remainder 2 to 10 inches.
SS-06	740175.13	317378.72	0-1 in.	Moist, dark brown silty; fine to medium sand with trace gravel and scale material (flat angular).	VOA fraction at 1 inch. Remainder 0 to 1 inch.
SS-07	740053.03	317331.41	9-12 in.	Sample taken from side wall of washout near lakeshore. Slightly moist, reddish gray, medium to course sand with some silt and gravel; noticeable green copper flakes.	VOA fraction at 3 inches. Remainder 9 to 12 inches.

TABLE 1

SURFICIAL SOIL SAMPLE DESCRIPTIONS

SAMPLE LOCATION	LOCATION COORDINATES		DEPTH (in.)	DESCRIPTION	SAMPLE INTERVALS AND COMMENTS
	Northing	Easting			
SS-08	739948.01	317204.49	0-6 in.	Moist, dark brown sand and slag with a little crushed brick; some organic root material.	VOA fraction at 3 inches. Remainder 0 to 6 inches.
SS-09	740012.87	317230.68	0-2 in.	Moist, brown silty, fine sand with some root material.	VOA fraction at 1 inch. Remainder 0 to 2 inches.
SS-10	739966.04	316949.75	0-8 in.	Moist, dark brown silty, fine to medium sand; lots of gravel, slag, some metal debris and brick.	VOA fraction at 4 inches. Remainder 0 to 8 inches.
SS-11	740128.40	317201.49	0-8 in.	Moist, dark brown silty, fine to medium sand; lots of gravel, slag, and some wood debris.	VOA fraction at 4 inches. Remainder 0 to 8 inches.
SS-12 **SS-12D**	739998.40	317139.55	0-8 in.	Moist, dark brown silty, fine to medium sand; some gravel, slag, and metal debris.	VOA fraction at 4 inches. Remainder 0 to 8 inches.
SS-13	739455.47	316735.47	1-10 in.	Moist, black stamp sand; some slag and coal.	VOA fraction at 6 inches. Remainder 0 to 10 inches.
SS-14	739232.58	316590.04	0-10 in.	Moist, black silty, fine to medium sand with some slag, coal, wood, metal, and brick.	VOA fraction at 5 inches. Remainder 0 to 10 inches.
SS-15	739293.97	316782.35	0-2 in. 2-6 in.	Moist, blackish brown, fine to medium sand. Moist, orange brown, fine to coarse sand with a little slag and coal.	VOA fraction at 2 inches. Remainder 0 to 6 inches.
SS-16	739044.74	316574.68	0-1 in. 1-2 in.	Greenish gray silt; some stamp sand, coal, and slag. Black stamp sand, wood debris, slag, and wire mixed in soil.	VOA fraction at 1 inch. Remainder 0 to 2 inches.

TABLE 1

SURFICIAL SOIL SAMPLE DESCRIPTIONS

SAMPLE LOCATION	LOCATION COORDINATES		DEPTH (in.)	DESCRIPTION	SAMPLE INTERVALS AND COMMENTS
	Northing	Easting			
SS-17	739139.77	316408.17	0-8 in.	Gray, fine slag material.	VOA fraction at 6 inches. Remainder 0 to 8 inches.
SS-18	738899.23	316439.37	0-6 in.	Dry to slightly moist, grayish brown silty; sand, some slag, gravel, and debris.	VOA fraction at 3 inches. Remainder 0 to 6 inches.
SS-19	738973.66	316274.23	0-4 in.	Moist, gray sludge.	VOA fraction at 2 inches. Remainder 0 to 4 inches.
SS-20	738945.32	316222.35	0-¾ in.	Dry, gray silt with some fine sand; slag and scale on top of concrete pad.	VOA fraction at ¾ in. inch. Remainder 0 to ¾ inch.

Location Coordinates: Michigan Georef North American Datum (NAD) 1983 meters

C & H Lake Linden Operations
Lake Linden, Michigan
October 10-13, 2011

TABLE 2

SOIL BORING SAMPLE DESCRIPTIONS

SAMPLE LOCATION	LOCATION COORDINATES		SPOON INTERVAL (ft.)	RECOVERY (in.)	UNIT THICKNESS (in.)	LITHOLOGICAL DESCRIPTION WITH PHOTOIONIZATION DETECTOR (PID) READING*	SAMPLE INTERVALS AND COMMENTS
	Northing	Easting					
SB-01	740953.90	318138.12	0-4 ft.	37 in.	0-5 in.	Moist, orange, clayey, fine sand.	Volatile Organic Analysis (VOA) fraction at 42 inches of 4-8 ft core. Remaining sample collected from 31-42 inches of 4-8 ft core.
					5-8 in.	Moist, gray-orange, clayey silt and fine sand.	
					8-20 in.	Wet, fine to course sand.	
					20-27 in.	Grades from moist, black peat, with fines and roots, very organic.	
					27-37 in.	Moist, dark brown, fine silty sand, with wood fibers and roots. PID = 0.0	
			4-8 ft.	42 in.	0-5 in.	Moist, dark brown, fine to medium silty; sand traces to coarse sand.	
					5-19 in.	Moist, brown, fine silty sand.	
					19-33 in.	Moist, dark brown, fine silty sand with roots and fibers.	
					33-42 in.	Moist, gray, fine sand. PID = 0.0 to 0.1	

TABLE 2

SOIL BORING SAMPLE DESCRIPTIONS

SAMPLE LOCATION	LOCATION COORDINATES		SPOON INTERVAL (ft.)	RECOVERY (in.)	UNIT THICKNESS (in.)	LITHOLOGICAL DESCRIPTION WITH PHOTOIONIZATION DETECTOR (PID) READING*	SAMPLE INTERVALS AND COMMENTS
	Northing	Easting					
SB-02	740964.84	318213.45	0-4 ft.	33 in.	0-16 in. 16-21 in. 21-29 in. 29-33 in. PID = 0.0	Fill. Gravel and brown, slag piles. Moist, gray, coarse sand. Moist, brown silty sand and fine sand. Moist, native, fine brown sand.	VOA fraction at 39 inches of 4-8 ft core. Remaining sample collected from 29-48 inches of 4-8 ft core.
			4-8 ft.	48 in.	0-4 in. 4-39 in. 39-42 in. 42-48 in. PID = 0.0	 Wet, gray, coarse sand. Wet, brown, fine to medium sand. Wet, dark brown, fine to medium sand. Wet, brown, fine to medium sand.	

TABLE 2

SOIL BORING SAMPLE DESCRIPTIONS

SAMPLE LOCATION	LOCATION COORDINATES		SPOON INTERVAL (ft.)	RECOVERY (in.)	UNIT THICKNESS (in.)	LITHOLOGICAL DESCRIPTION WITH PHOTOIONIZATION DETECTOR (PID) READING*	SAMPLE INTERVALS AND COMMENTS
	Northing	Easting					
SB-03	740949.00	318228.18	0-4 ft.	36 in.	0-1 in.	Dry, one inch.	VOA fraction at 30-31 inches of 4-8 ft core. Remaining sample collected from 16-31 inches of 4-8 ft core.
					1-13 in.	Dry, dark rusty brown, chunks of slag up to 1¼ - 3 inches, has small fine roots; moist, small gravel size slag up to 3mm, mostly sand and gravel mix composed of slag fine to medium.	
					13-26 in.	Wet, dark brown sand with chucks of slag. (slag is up ½ inch).	
					26-27 in.	Seam of black coal or burnt wood.	
					27-36 in.	Wet, green sand. PID = 0.0	
			4-8 ft.	48 in.	0-6 in.	Slough.	
					6-31 in.	Wet, dark brown, fine sand with some medium sand.	
					31-32.5 in.	Wet, dark green silt.	
					32.5-48 in.	Wet, dark brown green, fine sand with some medium sand. PID = 0.0	
			8-10 ft.	48 in.	0-24 in.	Slough.	
					24-42 in.	Wet, brown to dark brown, fine to medium sand.	
					42-43 in.	Wet, dark brown/maroon, silt, clay. Pieces of wood 32-34 in.	
					43-48 in.	Wet, brown, sticky, silty sand. PID = 0.0	

TABLE 2

SOIL BORING SAMPLE DESCRIPTIONS

SAMPLE LOCATION	LOCATION COORDINATES		SPOON INTERVAL (ft.)	RECOVERY (in.)	UNIT THICKNESS (in.)	LITHOLOGICAL DESCRIPTION WITH PHOTOIONIZATION DETECTOR (PID) READING*	SAMPLE INTERVALS AND COMMENTS
	Northing	Easting					
SB-04 **SB-04D**	740295.00	317479.53	0-4 ft.	36 in.	0-3 in.	Moist, dark brown sand, fine with silt; trace of grass roots.	VOA fraction at 27-28 inches of 8-12 ft core. Remaining sample collected from 48 inches of 8-12 ft core. Duplicate sample taken.
					3-18 in.	Moist, brown, silty sand with trace medium sand.	
					18-24 in.	Moist, brown, fine, silty sand; traces of gravel.	
					24-28 in.	Dry, dark brown, fine, silty sand with trace of gravel.	
					28-36 in.	Moist, brown, sandy silt. PID =0.0	
			4-8 ft.	24 in.	0-8 in.	Slough. Dark brown, silty sand.	
					8-24 in.	Wet, brown, sandy silt. PID =0.0	
			8-12 ft.	48 in.	0-28 in.	Wet, brown, fine sand with trace of coarse sand.	
					28-48 in.	Wet, brown silt. PID =0.0	
SB-05	740237.25	317448.25	0-4 ft.	36 in.	0-3 in.	Moist, brown, silty sand.	VOA fraction at 33 inches of 0-4 ft core. Remaining sample not recorded.
					3-14 in.	Fill (concrete, coarse sand, gravel)	
					14-36 in.	Moist, dark brown, fine sand with some silt. PID =0.3	
			4-8 ft.	48 in.	0-18 in.	Saturated, brown, fine to medium sand.	
					18-48 in.	Saturated, brown, sandy silt. PID = 0.0	

TABLE 2

SOIL BORING SAMPLE DESCRIPTIONS

SAMPLE LOCATION	LOCATION COORDINATES		SPOON INTERVAL (ft.)	RECOVERY (in.)	UNIT THICKNESS (in.)	LITHOLOGICAL DESCRIPTION WITH PHOTOIONIZATION DETECTOR (PID) READING*	SAMPLE INTERVALS AND COMMENTS
	Northing	Easting					
SB-06	740227.46	317443.74	0-4 ft.	33 in.	0-6 in.	Top soil with roots. Moist, green organic, rich silty sand with lots of roots.	VOA fraction at 18-19 inches of 0-4 ft core. Remaining sample collected from 18-33 inches of 0-4 ft core.
					6-11 in.	Moist, brown/dark brown, fine sand with silt; some medium sand.	
					11-18 in.	Moist, brown/dark-brown, fine sand with silt; some medium sand with mostly fine gravel (some up to ¾ in.).	
					18-28 in.	Moist, brown, fine grain sand, some fine gravel.	
					28-33 in.	Moist, gray/brown with fine sandy silt with a few stones. PID = 0.0	
			4-8 ft.	48 in.	0-5 in.	Slough.	
					5-34 in.	Wet, reddish-brown, fine very sand with silt dilatants.	
					34-40 in.	Wet, brown, fine sand with silt bone.	
					40-48 in.	Wet, red-brown, fine to coarse sand with some silt. PID = 0.0	

TABLE 2

SOIL BORING SAMPLE DESCRIPTIONS

SAMPLE LOCATION	LOCATION COORDINATES		SPOON INTERVAL (ft.)	RECOVERY (in.)	UNIT THICKNESS (in.)	LITHOLOGICAL DESCRIPTION WITH PHOTOIONIZATION DETECTOR (PID) READING*	SAMPLE INTERVALS AND COMMENTS
	Northing	Easting					
SB-07	740161.49	317419.11	0-4 ft.	42 in.	0-8 in. 8-33 in. 33-42 in. 4-8 ft.	Moist, orange, silty sand with grass. Moist, brown, fine sand with trace of gravel. Moist, brown, fine to medium sand; (all sands - stamp sands). PID = 0.0 38 in. 0-6 in. Moist, brown, fine sand. 6-38 in. Wet, brown, fine to medium sand. PID = 0.0	VOA fraction at 30 inches of 0-4 ft. core. Remaining sample collected from 30-42 inches of 0-4 ft. core.
SB-08	740135.26	317428.12	0-4 ft.	44 in.	0-9 in. 9-19 in. 19-44 in. 4-8 ft.	Roots, grass, moist, orange, fine sand with some silt; trace coarse gravel. Moist, brown, fine sand with silt soil; coarse with some fine gravel. Moist, brown, fine to medium sand with fines. PID = 0.0 40 in. 0-6 in. Slough. Moist, brown, fine sand. 6-12 in. Moist, brown, silty sand. 12-40 in. Wet, brown, medium sand with some fine sand and silt. PID = 0.0	VOA fraction at 11-12 inches of 4-8 ft. core. Remaining sample collected from 22-36 inches of 0-4 ft. core.

TABLE 2

SOIL BORING SAMPLE DESCRIPTIONS

SAMPLE LOCATION	LOCATION COORDINATES		SPOON INTERVAL (ft.)	RECOVERY (in.)	UNIT THICKNESS (in.)	LITHOLOGICAL DESCRIPTION WITH PHOTOIONIZATION DETECTOR (PID) READING*	SAMPLE INTERVALS AND COMMENTS
	Northing	Easting					
SB-09	740108.36	317373.73	0-4 ft.	44 in.	0-10 in.	Roots, grass, soil. Moist, brown, fine sand with silt.	VOA fraction at 33-34 inches of 0-4 ft core. Remaining sample collected from 33 inches of 0-4 ft core.
					10-13 in.	Moist, dark brown, fine to medium with trace of coarse sand.	
					13-44 in.	Very moist, brown, fine to medium sand, with trace of coarse sand from 36-44 in. PID = 0.0	
			4-8 ft.	48 in.	0-5 in.	Slough. Moist, brown, fine to medium sand.	
					5-11 in.	Wet, fine to medium sand.	
					11-48 in.	Wet, fine, sandy silt with trace of clay. PID = 0.0	

TABLE 2

SOIL BORING SAMPLE DESCRIPTIONS

SAMPLE LOCATION	LOCATION COORDINATES		SPOON INTERVAL (ft.)	RECOVERY (in.)	UNIT THICKNESS (in.)	LITHOLOGICAL DESCRIPTION WITH PHOTOIONIZATION DETECTOR (PID) READING*	SAMPLE INTERVALS AND COMMENTS
	Northing	Easting					
SB-10	740229.10	317399.44	0-4 ft.	21 in.	0-7 in.	Moist, brown, fine to medium sand.	VOA fraction at 21 inches of 4-8 ft core. Remaining sample collected from 10-24 inches of 4-8 ft core.
					7-12 in.	Moist, dark brown, fine to medium sand.	
					12-21 in.	Moist, brown, fine sand.	
						PID = 0.0	
			4-8 ft.	32 in.	0-5 in.	Moist, brown, fine to medium sand with fine to medium gravel.	
					5-7 in.	Moist, dark brown, fine sand with fines.	
					7-11 in.	Moist, brown-gray, fine material with some coarse sand size parts.	
					11-13 in.	Moist, black stained, fine gravel.	
					13-16 in.	Moist, dark red gravel.	
					16-23 in.	Moist, black stained, fine sand with fines.	
					23-32 in.	Moist, dark brown, sandy silt with trace coarse sand and gravel.	
						PID = 0.0	
			8-12 ft.	48 in.	0-5 in.	Wet, dark brown with tan coloring, fine sand with silt.	
					5-20 in.	Wet, dark brown, sandy silt.	
					20-48 in.	Wet, brown, fine to medium sand.	
						PID = 0.0	

TABLE 2

SOIL BORING SAMPLE DESCRIPTIONS

SAMPLE LOCATION	LOCATION COORDINATES		SPOON INTERVAL (ft.)	RECOVERY (in.)	UNIT THICKNESS (in.)	LITHOLOGICAL DESCRIPTION WITH PHOTOIONIZATION DETECTOR (PID) READING*	SAMPLE INTERVALS AND COMMENTS
	Northing	Easting					
SB-11	738959.35	316389.90	0-4 ft.	39 in.	0-3 in.	Dry, dark gray, fine sand with silt.	VOA fraction at 6-7 inches of 0-4 ft core. Remaining sample collected from 0-16 inches of 0-4 ft core.
					3-15 in.	Moist, brown, fine sand with silt; some black streaking at 9 in.; trace of coarse sand.	
					15-19 in.	Moist, rocks, broken, dark red sandstone.	
					19-30 in.	Moist, brown, fine to medium sand; with trace of coarse sand some fine.	
					30-39 in.	Moist, brown, fine to medium sand; with trace of coarse sand. PID =0.0	
			4-8 ft.	48 in.	0-4 in.	Moist, brown, fine to medium sand; with trace coarse sand.	
					4-7 in.	Moist, dark gray, fine sand with silt; staining black.	
					7-48 in.	Wet, brown, fine sand with silt. PID =0.0	

TABLE 2

SOIL BORING SAMPLE DESCRIPTIONS

SAMPLE LOCATION	LOCATION COORDINATES		SPOON INTERVAL (ft.)	RECOVERY (in.)	UNIT THICKNESS (in.)	LITHOLOGICAL DESCRIPTION WITH PHOTOIONIZATION DETECTOR (PID) READING*	SAMPLE INTERVALS AND COMMENTS
	Northing	Easting					
SB-12	738966.03	316449.25	0-4 ft.	42 in.	0-3 in.	Dry, dark gray, fine sand with wood debris.	VOA fraction at 20-21 inches of 4-8 ft core. Remaining sample collected from 6 inches of 0-4 ft core.
					3-13 in.	Moist, dark black, fine sand with gravel.	
					13-17 in.	Moist, brown, fine sand; some coarse sand.	
					17-20 in.	Moist, brown/orange mottled, fine sand; some dark brown staining with trace of rocks.	
					20-25 in.	Moist, tan, medium sand with some dark brown staining.	
					25-42 in.	Moist, tan, fine to medium sand; with trace of course. PID = 0	
			4-8 ft.	48 in.	0-8 in.	Slough. Brown/tan, fine to medium sand, black staining sand 5-9 in.	
					8-20 in.	Moist, tan, fine to medium sand, some broken rock fragment.	
					20-29 in.	Moist, dark gray silt.	
					29-48 in.	Wet, brown silty sand, fine to medium with trace coarse sand. PID =0	

TABLE 2

SOIL BORING SAMPLE DESCRIPTIONS

SAMPLE LOCATION	LOCATION COORDINATES		SPOON INTERVAL (ft.)	RECOVERY (in.)	UNIT THICKNESS (in.)	LITHOLOGICAL DESCRIPTION WITH PHOTOIONIZATION DETECTOR (PID) READING*	SAMPLE INTERVALS AND COMMENTS
	Northing	Easting					
SB-13	740196.47	317376.90	0-4 ft.	30 in.	0-10 in.	Moist, dark brown, fine sand with silt.	VOA fraction at 21 inches of 0-4 ft core. Remaining sample collected from 21-30 inches of 0-4 ft core.
					11-15 in.	Moist, dark gray, fine sand. PID =0.0	
					15-19 in.	Gray sludge; clayey. PID = 2.0	
					19-20 in.	Wood fragments.	
					21-30 in.	Moist, dark brown with black staining, fine sand with fines; some gray matter. PID = 0.0	
			4-8 ft.	30 in.	0-10 in.	Moist, dark brown, fine to medium sand with gravel some dark gray staining.	
					10-13 in.	Moist, brown sandy silt; brick fragments at 13”.	
					14-30 in.	Dark brown, fine to medium sand with trace fine gravel. PID = 0.0	
			8-12 ft.	42 in.	0-10 in.	Moist, dark brown, fine to medium sand.	
					10-19 in.	Wet, dark brown sandy silt.	
					19-42 in.	Wet, dark brown, fine to medium sand. PID = 0.0	

TABLE 2

SOIL BORING SAMPLE DESCRIPTIONS

SAMPLE LOCATION	LOCATION COORDINATES		SPOON INTERVAL (ft.)	RECOVERY (in.)	UNIT THICKNESS (in.)	LITHOLOGICAL DESCRIPTION WITH PHOTOIONIZATION DETECTOR (PID) READING*	SAMPLE INTERVALS AND COMMENTS
	Northing	Easting					
SB-14	739007.70	316372.07	0-4 ft.	42 in.	0-6 in.	Dry, dark gray, fine sand with silt and clay.	VOA fraction at 35-36 inches of 0-4 ft core. Remaining sample collected from 0-14 inches of 0-4 ft core.
					6-33 in.	Moist, brown, fine sand with some fines.	
					33-42 in.	Moist, brown sandy silt. PID = 0.0	
			4-8 ft.	48 in.	0-32 in.	Wet, brown, fine sand with trace medium sand.	
					32-38 in.	Wet, brown, medium sand with trace of fine sand; trace coarse sand.	
					38-48 in.	Wet, brown, medium sand with some fines. PID = 0.0	

Location Coordinates: Michigan Georef NAD 1983 meters

* PID reading units are parts per million (ppm).

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Lake Linden, Michigan
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TABLE 3

GROUNDWATER MONITORING WELL SAMPLE DESCRIPTIONS

SAMPLE LOCATION	LOCATION COORDINATES		SAMPLE DESCRIPTION	PHYSICAL PARAMETERS	WELL CONSTRUCTION	COMMENTS
	Northing	Easting				
MW-01	741041.64	318230.62	Light reddish/tan, clearing somewhat	Cond = 399 pH = 6.42 T = 13.7 ORP = -69 TDS = 265	1-inch diameter polyvinyl chloride (PVC) riser with 5 ft. long screen.	473 liters per minute purge and pump rate.
MW-02	740953.43	318138.31	Slightly cloudy, gray	Cond = 345 pH = 6.37 T = 10.9 ORP = -60 TDS = 229	1-inch diameter PVC riser with 5 ft. long screen.	473 liters per minute purge and pump rate.
MW-03	740948.92	318228.20	Light brown - sulfur odor	Cond = 295.2 pH = 6.47 T = 13.6 ORP = -84 TDS = 192.1	1-inch diameter PVC riser with 5 ft. long screen.	473 liters per minute purge and pump rate.
MW-04	740295.80	317480.32	Clear	Cond = 687 pH = 7.0 T = 15.0 ORP = -83 TDS = 482	1-inch diameter PVC riser with 5 ft. long screen.	473 liters per minute purge and pump rate.
MW-05 MW-05D	740237.28	317448.23	Clear	Cond = 599 pH = 7.02 T = 15.9 ORP = -2 TDS = 406	1-inch diameter PVC riser with 5 ft. long screen.	336 liters per minute purge and pump rate.

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TABLE 3

GROUNDWATER MONITORING WELL SAMPLE DESCRIPTIONS

SAMPLE LOCATION	LOCATION COORDINATES		SAMPLE DESCRIPTION	PHYSICAL PARAMETERS	WELL CONSTRUCTION	COMMENTS
	Northing	Easting				
MW-06	740185.30	317426.41	Clear	Cond = 588 pH = 7.25 T = 14.6 ORP = 50 TDS = 399	1-inch diameter PVC riser with 5 ft. long screen.	285 liters per minute purge and pump rate.
MW-07	740108.43	317373.72	Cloudy	Cond = 838 pH = 7.01 T = 15.0 ORP = 8 TDS = 574	1-inch diameter PVC riser with 5 ft. long screen.	341 liters per minute purge and pump rate.
MW-08	740226.15	317413.23	Clear	Cond = 724 pH = 6.84 T = 14.3 ORP = -22 TDS = 512	1-inch diameter PVC riser with 5 ft. long screen.	364 liters per minute purge and pump rate.
MW-09	740325.91	317318.23	Slightly cloudy	Cond = 1169 pH = 6.56 T = 11.7 ORP = 37 TDS = 852	1-inch diameter PVC riser with 5 ft. long screen.	324 liters per minute purge and pump rate.
MW-10	739099.58	316358.33	Slightly cloudy	Cond = 191.9 pH = 6.00 T = 11.4 ORP = -51 TDS = 129.0	1-inch diameter PVC riser with 5 ft. long screen.	390 liters per minute purge and pump rate.

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TABLE 3

GROUNDWATER MONITORING WELL SAMPLE DESCRIPTIONS

SAMPLE LOCATION	LOCATION COORDINATES		SAMPLE DESCRIPTION	PHYSICAL PARAMETERS	WELL CONSTRUCTION	COMMENTS
	Northing	Easting				
MW-11	738966.03	316449.26	Cloudy, light brown	Cond = 659.8 pH = 6.67 T = 14.7 ORP = 25 TDS = 445.4	1-inch diameter PVC riser with 5 ft. long screen.	412 liters per minute purge and pump rate.
MW-12	740196.39	317376.85	Slightly cloudy	Cond = 779.4 pH = 7.06 T = 13.8 ORP = 46 TDS = 527.7	1-inch diameter PVC riser with 5 ft .long screen.	379 liters per minute purge and pump rate.

Location Coordinates: Michigan Georef NAD 1983 meters

Cond = Conductivity (μs/cm)
pH = Hydrogen Ionization Potential
T = Temperature (°C)
ORP = Oxidation Reduction Potential (millivolts)
TDS = Total Dissolved Solids (ppm – parts per million)

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TABLE 4

GROUNDWATER MONITORING WELL DATA

MONITORING WELL LOCATION	MEASURED TOP-OF-CASING ELEVATION	CALCULATED GROUND ELEVATION	WELL CASING STICK-UP MEASURED DURING WELL SURVEY	DEPTH TO WATER TABLE MEASURED DURING WELL SURVEY	CALCULATED STATIC WATER LEVEL ELEVATION	DEPTH TO WELL BOTTOM MEASURED DURING SAMPLING	CALCULATED SCREENED INTERVAL ELEVATIONS (TOP OF SCREEN TO BOTTOM OF SCREEN)*
MW-04	606.82	605.57	1.25	5.60	601.22	10.89	600.93 - 595.93
MW-05	606.82	605.32	1.50	5.54	601.28	9.30	602.52 - 597.52
MW-06	607.16	605.38	1.78	6.09	601.07	9.15	603.02 - 598.02
MW-07	606.09	604.74	1.35	5.18	600.91	8.50	602.59 - 597.59
MW-08	609.55	608.56	0.99	8.06	601.49	13.16	601.39 - 596.39
MW-09	621.87	620.17	1.70	13.61	608.26	18.94	607.93 - 602.93
MW-12	613.33	611.49	1.84	10.77	602.56	14.41	603.92 - 598.92
LAKE	613.33	NA	NA	13.05	600.28	NA	

All measurements are in feet, unless otherwise noted.
Depth measurements are from top-of-casing.
All measurements were taken October 15, 2011.
All well screens were five feet long, 1-inch polyvinyl chloride.
Elevations are in feet, referenced to an elevation of 611.32 feet marked on a utility pole located in the village park.
The top-of-casing elevation for LAKE is a wooden stake.

NA = not available or not applicable
*Assumes no sediment in bottom of screen

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TABLE 5

SURFACE WATER SAMPLE DESCRIPTIONS

SAMPLE LOCATION	LOCATION COORDINATES		SAMPLE DESCRIPTION	DEPTH OF WATER AT SAMPLE LOCATION	PHYSICAL PARAMETERS	COMMENTS
	Northing	Easting				
SW-01	738699.12	318271.38	Clear	4.5 feet	Cond = 177 pH = 6.22 T = 18 ORP = 184 TDS = 112	Boat provided by the Michigan Department of Natural Resources (MDNR).
SW-02	740920.97	318074.43	Clear	8 feet	Cond = 536 pH = 6.21 T = 18.6 ORP = 84 TDS = 350	Sample collected without the aid of a boat.
SW-03	740224.99	317509.74	Clear	7 feet	Cond = 181 pH = 6.88 T =19.3 ORP = 168 TDS = 115	Boat provided by the MDNR.
SW-04	739165.91	316755.40	Clear	20 feet	Cond = 177 pH = 6.51 T = 18.1 ORP = 168 TDS = 112	Boat provided by the MDNR.
SW-05	738883.83	316535.57	Clear	28 feet	Cond = 177 pH = 6.83 T = 17.9 ORP = 151 TDS = 112	Boat provided by the MDNR.

TABLE 5

SURFACE WATER SAMPLE DESCRIPTIONS

Location Coordinates: Michigan Georef NAD 1983 meters

Cond = Conductivity (μs/cm)
pH = Hydrogen Ionization Potential
T = Temperature (°C)
ORP = Oxidation Reduction Potential (millivolts)
TDS = Total Dissolved Solids (ppm – parts per million)

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TABLE 6

SEDIMENT SAMPLE DESCRIPTIONS

SAMPLE LOCATION	LOCATION COORDINATES		DEPTH OF WATER AT SAMPLE LOCATION	DEPTH OF SAMPLE	DESCRIPTION	COMMENTS
	Northing	Easting				
SD-01	738699.12	318271.38	4.5 feet	0-3 inches	Wet, dark tan, medium sand.	Boat provided by the Michigan Department of Natural Resources (MDNR).
SD-02	740920.97	318074.43	8 feet	0-2 inches 2-4 inches	Wet, black, organic muck, some glass. Wet dark brown/black, medium sand with black streaks.	Sample collected without the aid of a boat.
SD-03 **SD-03D**	740224.99	317509.74	7 feet	0-3 inches	Wet, brown, fine to medium sand with dead leaf debris, twigs, and weeds.	Boat provided by the MDNR.
SD-04	739165.91	316755.40	20 feet	0-3 inches	Wet, black to dark brown muck; some wood pieces, some coal pieces, few dead leaves.	Boat provided by the MDNR.
SD-05	738883.83	316535.57	28 feet	0-3 inches	Wet, medium brown muck (pudding like consistency).	Boat provided by the MDNR.

Location Coordinates: Michigan Georef NAD 1983 meters
All samples, except SD-02, collected with a ponar sampler.

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TABLE 7

KEY SURFICIAL SOIL SAMPLE ANALYTICAL RESULTS

SAMPLE #	CONTAMINANT	RELEASE SAMPLE CONCENTRATION (ADJUSTED) AND QUALIFIER		BACKGROUND SAMPLE CONCENTRATION (ADJUSTED) AND QUALIFIER		SQL/CRDL
SS-01	Designated background surficial soil sample.					
SS-02	***no observed release found***					
SS-02D	***no observed release found***					
SS-03	**Inorganics**	**mg/kg**	**Flag**	**mg/kg**	**Flag**	**mg/kg**
	Lead	506		82.3		1
	Manganese	2,920 (2350)	J	468 (580)	J	1.5
SS-04	***no observed release found***					
SS-05	***no observed release found***					
SS-06	**Inorganics**	**mg/kg**	**Flag**	**mg/kg**	**Flag**	**mg/kg**
	Arsenic	46.8		7.2		1
	Cadmium	8.9		2.5		0.5
	Copper	53,700 (44,000)	J	995 (1,210)	J	2.5
	Silver	40.9		0.62 (1.1)	J	1
SS-07	**Inorganics**	**mg/kg**	**Flag**	**mg/kg**	**Flag**	**mg/kg**
	Copper	16,500 (13,500)	J	995 (1210)	J	2.5
	Silver	8.1		0.62 (1.1)	J	1
SS-08	**Inorganics**	**mg/kg**	**Flag**	**mg/kg**	**Flag**	**mg/kg**
	Antimony	45.4		1.1 (2.2)	J	6
	Lead	6,940		82.3		1
SS-09	***no observed release found***					
SS-10	**Inorganics**	**mg/kg**	**Flag**	**mg/kg**	**Flag**	**mg/kg**
	Lead	322		82.3		1
SS-11	***no observed release found***					
SS-12	**Inorganics**	**mg/kg**	**Flag**	**mg/kg**	**Flag**	**mg/kg**
	Antimony	7.8		1.1 (2.2)	J	6
	Cadmium	12.0		2.5		0.5
	Chromium	416		38.7		1
	Copper	7,010 (5,750)	J	995 (1210)	J	2.5
	Lead	838		82.3		1
	Silver	14.9		0.62 (1.1)	J	1
SS-12D	**Inorganics**	**mg/kg**	**Flag**	**mg/kg**	**Flag**	**mg/kg**
	Antimony	11.0		1.1 (2.2)	J	6
	Arsenic	312		7.2		1
	Cadmium	11.1		2.5		0.5
	Chromium	463		38.7		1
	Copper	7,540 (6180)	J	995 (1210)	J	2.5
	Lead	1130		82.3		1
	Silver	18.0		0.62 (1.1)	J	1

µg/kg = microgram/kilogram
mg/kg = milligram/kilogram
Qualifier definitions in Appendix F.

C & H Lake Linden Operations
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TABLE 7

KEY SURFICIAL SOIL SAMPLE ANALYTICAL RESULTS

SAMPLE #	CONTAMINANT	RELEASE SAMPLE CONCENTRATION (ADJUSTED) AND QUALIFIER		BACKGROUND SAMPLE CONCENTRATION (ADJUSTED) AND QUALIFIER		SQL/CRDL
SS-13	**Volatiles**	**µg/kg**	**Flag**	**µg/kg**	**Flag**	**µg/kg**
	2-methylnaphthalene	730		550	U	360
	Cyclohexane	380		410	U	270
	Ethylbenzene	150		83	U	54
	Toluene	580		170	U	110
	Xylenes (total)	1,540		170	U	110
	Inorganics	**mg/kg**	**Flag**	**mg/kg**	**Flag**	**mg/kg**
	Copper	10,400 (8520)	J	995 (1210)	J	2.5
SS-14	**Volatiles**	**µg/kg**	**Flag**	**µg/kg**	**Flag**	**µg/kg**
	1,2,4-trimethylbenzene	840		170	U	120
	2-methylnaphthalene	910		550	U	400
	Benzene	250		83	U	61
	Cyclohexane	610		410	U	300
	Ethylbenzene	480		83	U	61
	n-butylbenzene	91		83	U	61
	n-propylbenzene	230		170	U	120
	Toluene	1,700		170	U	120
	Xylenes (total)	3,200		170	U	120
	Semi-volatiles	**µg/kg**	**Flag**	**µg/kg**	**Flag**	**µg/kg**
	2-methylnaphthalene	820		360	U	170
	Dibenzofuran	230		360	U	170
	Naphthalene	600		360	U	170
	Inorganics	**mg/kg**	**Flag**	**mg/kg**	**Flag**	**mg/kg**
	Antimony	9.5		1.1 (2.2)	J	6
	Arsenic	31.4		7.2		1
	Copper	5,080 (4,160)	J	995 (1,210)	J	2.5
	Lead	578		82.3		1
SS-15	**Volatiles**	**µg/kg**	**Flag**	**µg/kg**	**Flag**	**µg/kg**
	1,2,4-trimethylbenzene	230		170	U	100
	2-methylnaphthalene	620		550	U	330
	Toluene	300		170	U	100
	Xylenes (total)	750		170	U	100
	Inorganics	**mg/kg**	**Flag**	**mg/kg**	**Flag**	**mg/kg**
	Arsenic	40.9		7.2		1

µg/kg = microgram/kilogram
mg/kg = milligram/kilogram
Qualifier definitions in Appendix F.

C & H Lake Linden Operations
Lake Linden, Michigan
October 10-13, 2011

TABLE 7

KEY SURFICIAL SOIL SAMPLE ANALYTICAL RESULTS

SAMPLE #	CONTAMINANT	RELEASE SAMPLE CONCENTRATION (ADJUSTED) AND QUALIFIER		BACKGROUND SAMPLE CONCENTRATION (ADJUSTED) AND QUALIFIER		SQL/CRDL
SS-16	**Volatiles**	**µg/kg**	**Flag**	**µg/kg**	**Flag**	**µg/kg**
	1,2,4-trimethylbenzene	290		170	U	110
	2-methylnaphthalene	570		550	U	360
	Benzene	86		83	U	54
	Ethylbenzene	100		83	U	54
	Toluene	500		170	U	110
	Xylenes (total)	1,000		170	U	110
	Semi-volatiles	**µg/kg**	**Flag**	**µg/kg**	**Flag**	**µg/kg**
	1,2,4,5-tetrachlorobenzene	330		360	U	170
	Bis(2-ethylhexyl)phthalate	200		360	U	170
	Hexachlorobenzene	380		360	U	170
	Naphthalene	200		360	U	170
	Pesticide/PCBs	**µg/kg**	**Flag**	**µg/kg**	**Flag**	**µg/kg**
	Aroclor-1254	330		70	U	33
	Aroclor-1260	490		70	U	33
	Total PCBs	820		70	U	33
	Inorganics	**mg/kg**	**Flag**	**mg/kg**	**Flag**	**mg/kg**
	Antimony	26.0		1.1 (2.2)	J	6
	Arsenic	48.8		7.2		1
	Copper	37,300 (30,600)	J	995 (1210)	J	2.5
	Lead	3680		82.3		1
	Silver	5.7		0.62 (1.1)	J	1
	Zinc	19,100 (12,700)	J	141 (212)	J	6
SS-17	**Inorganics**	**mg/kg**	**Flag**	**mg/kg**	**Flag**	**mg/kg**
	Arsenic	134		7.2		1
	Copper	24,500 (20,100)	J	995 (1,210)	J	2.5
	Lead	267		82.3		1
	Zinc	2,310 (1540)	J	141 (212)	J	6

µg/kg = microgram/kilogram
mg/kg = milligram/kilogram
Qualifier definitions in Appendix F.

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TABLE 7

KEY SURFICIAL SOIL SAMPLE ANALYTICAL RESULTS

SAMPLE #	CONTAMINANT	RELEASE SAMPLE CONCENTRATION (ADJUSTED) AND QUALIFIER		BACKGROUND SAMPLE CONCENTRATION (ADJUSTED) AND QUALIFIER		SQL/CRDL
SS-18	**Volatiles**	**µg/kg**	**Flag**	**µg/kg**	**Flag**	**µg/kg**
	1,2,4-trimethylbenzene	170		170	U	110
	2-methylnaphthalene	520		550	U	350
	Styrene	120		83	U	53
	Toluene	120		170	U	110
	Xylenes (total)	390		170	U	110
	Semi-volatiles	**µg/kg**	**Flag**	**µg/kg**	**Flag**	**µg/kg**
	Acenaphthene	380		360	U	170
	Phenanthrene	4,400		940		170
	Pesticide/PCBs	**µg/kg**	**Flag**	**µg/kg**	**Flag**	**µg/kg**
	Aroclor-1254	490		70	U	33
	Aroclor-1260	540		70	U	33
	Total PCBs	1030	J	70	U	33
	Inorganics	**mg/kg**	**Flag**	**mg/kg**	**Flag**	**mg/kg**
	Antimony	80.2		1.1 (2.2)	J	6
	Arsenic	1,220		7.2		1
	Chromium	244		38.7		1
	Copper	26,900 (22,000)	J	995 (1,210)	J	2.5
	Lead	715		82.3		1
	Silver	9.5		0.62 (1.1)	J	1
	Zinc	1,310 (873)	J	141 (212)	J	6
SS-19	***waste sample - observed release not applicable***					

µg/kg = microgram/kilogram
mg/kg = milligram/kilogram
Qualifier definitions in Appendix F.

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TABLE 7

KEY SURFICIAL SOIL SAMPLE ANALYTICAL RESULTS

SAMPLE #	CONTAMINANT	RELEASE SAMPLE CONCENTRATION (ADJUSTED) AND QUALIFIER		BACKGROUND SAMPLE CONCENTRATION (ADJUSTED) AND QUALIFIER		SQL/CRDL
SS-20	**Volatiles**	**µg/kg**	**Flag**	**µg/kg**	**Flag**	**µg/kg**
	2-methylnaphthalene	410		550	U	400
	Inorganics	**mg/kg**	**Flag**	**mg/kg**	**Flag**	**mg/kg**
	Arsenic	66.9 (38)	J	7.2		1
	Cadmium	11.4		2.5		0.5
	Copper	20,300 (16,600)	J	995 (1,210)	J	2.5
	Lead	1,010		82.3		1
	Silver	11.8		0.62 (1.1)	J	1
	Zinc	3,050		141 (212)	J	6

Data validation qualifiers (flags):
J = The analyte was positively identified; the associated numerical value is an approximate concentration of the analyte in the sample.
U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

SQL/CRQL:
* The SQL is the Sample Quantitation Limit, and is used for the organic fractions.
* The CRQL is the Contract Required Quantitation Limit, based on ISMO1.2 (1/10), Exhibit C, pages C-3 and C-5, and is used for the inorganic fractions.

The laboratory needed to dilute sample SS-18 in order for phenenthrene and the two PCB Aroclors to meet instrument calibration standards. The results for these organic compounds are to be taken from the diluted sample, as presented in this table. See the laboratory's narrative for sample set SDG E3NW9, page 16.

Samples qualified with a J have been adjusted in accordance with the USEPA fact sheet, *Using Qualified Data to Document an Observed Release and Observed Contamination* , November 1996. The following compounds did not have adjustment factors: cyclohexane and 1,2,4,5-tetrachlorobenzene.

A total of twenty (20) surficial soil samples were collected during the SI from October 10 - 12, 2011, along with two duplicates.

µg/kg = microgram/kilogram
mg/kg = milligram/kilogram
Qualifier definitions in Appendix F.

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October 10-13, 2011

TABLE 8

KEY SOIL BORING SAMPLE ANALYTICAL RESULTS

SAMPLE #	CONTAMINANT	RELEASE SAMPLE CONCENTRATION (ADJUSTED) AND QUALIFIER		BACKGROUND SAMPLE CONCENTRATION (ADJUSTED) AND QUALIFIER		SQL/CRQL
SB-02	Designated background soil boring sample.					
SB-01	**Semi-volatiles**	**µg/kg**	**Flag**	**µg/kg**	**Flag**	**µg/kg**
	Acetophenone	470		220	U	170
	Benzaldehyde	250	J	220	U	170
	Inorganics	**mg/kg**	**Flag**	**mg/kg**	**Flag**	**mg/kg**
	Lead	1.9		0.90	U	0.6
	Vanadium	45.4		12.4		10
SB-03	**Inorganics**	**mg/kg**	**Flag**	**mg/kg**	**Flag**	**mg/kg**
	Copper	34.5		8.8		5
SB-04	**Semi-volatiles**	**µg/kg**	**Flag**	**µg/kg**	**Flag**	**µg/kg**
	Acetophenone	410		220	U	170
	Benzo(a)anthracene	340		220	U	170
	Benzo(a)pyrene	240		220	U	170
	Benzo(b)fluoranthene	250		220	U	170
	Benzo(k)fluoranthene	230		220	U	170
	Chrysene	350		220	U	170
	Phenanthrene	730		220	U	170
	Pyrene	610		220	U	170
	Inorganics	**mg/kg**	**Flag**	**mg/kg**	**Flag**	**mg/kg**
	Cadmium	1.2		0.24 (0.34)	J	1
	Chromium	29.1		5.3		2
	Cobalt	10.3		2.3 (2.9)	J	10
	Copper	1,190		8.8		5
	Lead	10.6		0.90	U	0.6
	Manganese	269		49.7		3
	Nickel	31.7		6.3		8
	Silver	2.3		0.90	U	2
	Vanadium	46.5		12.4		10

µg/kg = microgram/kilogram
mg/kg = milligram/kilogram
Qualifier definitions in Appendix F.

C & H Lake Linden Operations
Lake Linden, Michigan
October 10-13, 2011

TABLE 8

KEY SOIL BORING SAMPLE ANALYTICAL RESULTS

SAMPLE #	CONTAMINANT	RELEASE SAMPLE CONCENTRATION (ADJUSTED) AND QUALIFIER		BACKGROUND SAMPLE CONCENTRATION (ADJUSTED) AND QUALIFIER		SQL/CRQL
SB-04D	**Semi-volatiles**	**µg/kg**	**Flag**	**µg/kg**	**Flag**	**µg/kg**
	Acetophenone	460		220	U	170
	Inorganics	**mg/kg**	**Flag**	**mg/kg**	**Flag**	**mg/kg**
	Cadmium	1.2		0.24 (0.34)	J	1
	Chromium	28.7		5.3		2
	Cobalt	9.8		2.3 (2.9)	J	10
	Copper	1,220		8.8		5
	Lead	14.9		0.90	U	0.6
	Manganese	280		49.7		3
	Nickel	31.4		6.3		8
	Silver	2.4		0.90	U	2
	Vanadium	48.4		12.4		10
	Zinc	65.6		11.9		4
SB-05	**Semi-volatiles**	**µg/kg**	**Flag**	**µg/kg**	**Flag**	**µg/kg**
	Anthracene	240		220	U	170
	Fluoranthene	1,800 (180)	J	220	UJ	170
	Phenanthrene	1,400		220	U	170
	Inorganics	**mg/kg**	**Flag**	**mg/kg**	**Flag**	**mg/kg**
	Chromium	16.2		5.3		2
	Copper	5,130		8.8		5
	Lead	83.4		0.90	U	0.6
	Manganese	170		49.7		3
	Silver	7.0		0.90	U	2
	Zinc	79.3		11.9		4
SB-06	**Inorganics**	**mg/kg**	**Flag**	**mg/kg**	**Flag**	**mg/kg**
	Chromium	19.0		5.3		2
	Copper	411		8.8		5
	Lead	13.3		0.90	U	0.6
	Manganese	196		49.7		3
	Nickel	21.3		6.3		8
	Zinc	50.6		11.9		4

µg/kg = microgram/kilogram
mg/kg = milligram/kilogram
Qualifier definitions in Appendix F.

C & H Lake Linden Operations
Lake Linden, Michigan
October 10-13, 2011

TABLE 8

KEY SOIL BORING SAMPLE ANALYTICAL RESULTS

SAMPLE #	CONTAMINANT	RELEASE SAMPLE CONCENTRATION (ADJUSTED) AND QUALIFIER		BACKGROUND SAMPLE CONCENTRATION (ADJUSTED) AND QUALIFIER		SQL/CRQL
SB-07	**Inorganics**	**mg/kg**	**Flag**	**mg/kg**	**Flag**	**mg/kg**
	Chromium	21.2		5.3		2
	Copper	1,170		8.8		5
	Lead	43		0.90	U	0.6
	Manganese	226		49.7		3
	Mercury	0.58		0.12	U	0.04
	Nickel	26.7		6.3		8
	Silver	3.2		0.90	U	2
	Zinc	68.1		11.9		4
SB-08	**Inorganics**	**mg/kg**	**Flag**	**mg/kg**	**Flag**	**mg/kg**
	Chromium	24.1		5.3		2
	Cobalt	9.3		2.3 (2.9)	J	10
	Copper	1,460		8.8		5
	Lead	111		0.90	U	0.6
	Manganese	248		49.7		3
	Nickel	27.5		6.3		8
	Silver	4.3		0.90	U	2
	Vanadium	39.3		12.4		10
	Zinc	147		11.9		4
SB-09	**Inorganics**	**mg/kg**	**Flag**	**mg/kg**	**Flag**	**mg/kg**
	Chromium	23.4		5.3		2
	Cobalt	10.4		2.3 (2.9)	J	10
	Copper	877		8.8		5
	Lead	15.8		0.90	U	0.6
	Manganese	267		49.7		3
	Nickel	30.3		6.3		8
	Silver	2.2		0.90	U	2
	Zinc	61.5		11.9		4

µg/kg = microgram/kilogram
mg/kg = milligram/kilogram
Qualifier definitions in Appendix F.

C & H Lake Linden Operations
Lake Linden, Michigan
October 10-13, 2011

TABLE 8

KEY SOIL BORING SAMPLE ANALYTICAL RESULTS

SAMPLE #	CONTAMINANT	RELEASE SAMPLE CONCENTRATION (ADJUSTED) AND QUALIFIER		BACKGROUND SAMPLE CONCENTRATION (ADJUSTED) AND QUALIFIER		SQL/CRQL
SB-10	**Semi-volatiles**	**µg/kg**	**Flag**	**µg/kg**	**Flag**	**µg/kg**
	Pyrene	340		220	U	170
	Inorganics	**mg/kg**	**Flag**	**mg/kg**	**Flag**	**mg/kg**
	Copper	1,030		8.8		5
	Lead	41.2		0.90	U	0.6
	Zinc	37.4		11.9		4
SB-11	**Inorganics**	**mg/kg**	**Flag**	**mg/kg**	**Flag**	**mg/kg**
	Arsenic	27.1	J-	1.0 (1.7)	J	2
	Copper	6,600		8.8		5
	Lead	54.7		0.90	U	0.6
	Zinc	78.7		11.9		4
SB-12	**Semi-volatiles**	**µg/kg**	**Flag**	**µg/kg**	**Flag**	**µg/kg**
	2-methylnaphthalene	250		220	U	170
	Inorganics	**mg/kg**	**Flag**	**mg/kg**	**Flag**	**mg/kg**
	Arsenic	8.6	J-	1.0 (1.7)	J	2
	Copper	3,660		8.8		5
	Lead	16.6		0.90	U	0.6
	Manganese	246		49.7		3
SB-13	**Inorganics**	**mg/kg**	**Flag**	**mg/kg**	**Flag**	**mg/kg**
	Arsenic	17.5	J-	1.0 (1.7)	J	2
	Cadmium	8.4		0.24 (0.34)	J	1
	Copper	9,940		8.8		5
	Lead	16,100		0.90	U	0.6
	Manganese	229		49.7		3
	Mercury	0.10		0.12	U	0.04
	Nickel	24.3		6.3		8
	Silver	3.2		0.90	U	2
	Zinc	607		11.9		4

µg/kg = microgram/kilogram
mg/kg = milligram/kilogram
Qualifier definitions in Appendix F.

TABLE 8

KEY SOIL BORING SAMPLE ANALYTICAL RESULTS

SAMPLE #	CONTAMINANT	RELEASE SAMPLE CONCENTRATION (ADJUSTED) AND QUALIFIER		BACKGROUND SAMPLE CONCENTRATION (ADJUSTED) AND QUALIFIER		SQL/CRQL
SB-14	**Inorganics**	**mg/kg**	**Flag**	**mg/kg**	**Flag**	**mg/kg**
	Arsenic	41.5 (23.9)	J	1.0 (1.7)	J	2
	Copper	14,300 (11,700)	J	8.8		5
	Lead	83.0		0.90	U	0.6
	Silver	3.9		0.90	U	2
	Zinc	181		11.9		4

Data validation qualifiers (flags):
J = The analyte was positively identified; the associated numerical value is an approximate concentration of the analyte in the sample.
J- = The result is an estimated quantity, but the result may be biased low.
U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
UJ = The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the action limit of quantitation necessary to accurately and precisely measure the analyte.

SQL/CRQL:
* The SQL is the Sample Quantitation Limit, and is used for the organic fractions.
* The CRQL is the Contract Required Quantitation Limit, based on ISMO1.2 (1/10), Exhibit C, pages C-3 and C-5, and is used for the inorganic fractions.

Samples qualified with a J or J- have been adjusted in accordance with the USEPA fact sheet, *Using Qualified Data to Document an Observed Release and Observed Contamination* , November 1996.

A total of fourteen (14) surficial soil samples were collected during the SI, along with one duplicate.

µg/kg = microgram/kilogram
mg/kg = milligram/kilogram
Qualifier definitions in Appendix F.

C & H Lake Linden Operations
Lake Linden, Michigan
October 10-13, 2011

TABLE 9

KEY GROUNDWATER MONITORING
WELL SAMPLE ANALYTICAL RESULTS

SAMPLE #	CONTAMINANT	RELEASE SAMPLE CONCENTRATION (ADJUSTED) AND QUALIFIER		BACKGROUND SAMPLE CONCENTRATION (ADJUSTED) AND QUALIFIER		SQL/CRQL
MW-01	Designated background monitoring well sample in subarea A (slag dump area in the north).					
MW-02	***no observed release found***					
MW-03	***no observed release found***					
MW-04	**Inorganics**	**µg/l**	**Flag**	**µg/l**	**Flag**	**µg/l**
	Arsenic	15.3		10.0	U	10
	Copper	415		71.7		25
	Lead	51.3		2.7 (3.5)	J	10
MW-05	**Inorganics**	**µg/l**	**Flag**	**µg/l**	**Flag**	**µg/l**
	Copper	614		71.7		25
	Lead	60.8		2.7 (3.5)	J	10
MW-05D	**Inorganics**	**µg/l**	**Flag**	**µg/l**	**Flag**	**µg/l**
	Copper	457		71.7		25
	Lead	32.0		2.7 (3.5)	J	10
MW-06	***no observed release found***					
MW-07	**Inorganics**	**µg/l**	**Flag**	**µg/l**	**Flag**	**µg/l**
	Arsenic	136		10.0	U	10
	Chromium	46.1 (35.5)	J+	10.0	U	10
	Copper	24,700		71.7		25
	Lead	282		2.7 (3.5)	J	10
	Mercury	0.70		0.20	U	0.2
	Nickel	65.1		5.4 (7.0)	J	40
	Silver	75.4		10.0	U	10
	Zinc	404		60.0	U	60
MW-08	**Inorganics**	**µg/l**	**Flag**	**µg/l**	**Flag**	**µg/l**
	Copper	480		71.7		25
	Lead	21.9		2.7 (3.5)	J	10
MW-09	Designated background monitoring well sample in subarea C (village park and county historical society).					
MW-10	Designated background monitoring well sample in subarea E (mineral building area in south).					
MW-11	**Inorganics**	**µg/l**	**Flag**	**µg/l**	**Flag**	**µg/l**
	Copper	143		11.9 (15)	J	25
	Lead	11.8		2.4 (3.1)	J	10

µg/l = microgram/liter
Qualifier definitions in Appendix F.

TABLE 9

KEY GROUNDWATER MONITORING
WELL SAMPLE ANALYTICAL RESULTS

SAMPLE #	CONTAMINANT	RELEASE SAMPLE CONCENTRATION (ADJUSTED) AND QUALIFIER		BACKGROUND SAMPLE CONCENTRATION (ADJUSTED) AND QUALIFIER		SQL/CRQL
MW-12	**Inorganics**	**µg/l**	**Flag**	**µg/l**	**Flag**	**µg/l**
	Arsenic - Total	220		10.0	U	10
	Copper - Total	1,200	D	71.7		25
	Lead - Total	310		2.7 (3.5)	J	10

J - The analyte was positively identified; the associated numerical value is an approximate concentration of the analyte in the sample.
J+ - The result is an estimated quantity, but the result may be biased high.
U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
D - Analyte value quantified from a dilution(s); reporting limit (RL) raised (MDEQ environmental laboratory qualifier description).

A total of twelve (12) groundwater samples plus a duplicate were collected from October 11 - 13, 2011 during the SI. Monitoring well MW-12 was installed and sampled for inorganic parameters only, and analyzed by the MDEQ environmental laboratory.

SQL/CRQL:
* The SQL is the Sample Quantitation Limit, and is used for the organic fraction analyses.
* The CRQL is the Contract Required Quantitation Limit, based on ISMO1.2 (1/10), Exhibit C, pages C-3 and C-5, and is used for the inorganic fraction analyses.

Samples qualified with a J or J+ have been adjusted in accordance with the USEPA fact sheet, *Using Qualified Data to Document an Observed Release and Observed Contamination* , November 1996.

µg/l = microgram/liter
Qualifier definitions in Appendix F.

C & H Lake Linden Operations
Lake Linden, Michigan
October 10-13, 2011

TABLE 10

SURFACE WATER SAMPLE KEY ANALYTICAL RESULTS

SAMPLE #	CONTAMINANT	RELEASE SAMPLE CONCENTRATION (ADJUSTED) AND QUALIFIER		BACKGROUND SAMPLE CONCENTRATION (ADJUSTED) AND QUALIFIER		SQL/CRDL
SW-01	Designated background surface water sample.					
SW-02	**Inorganics**	**µg/l**	**Flag**	**µg/l**	**Flag**	**µg/l**
	Manganese	46.1		5.4 (6.7)	J	15
SW-03	**Inorganics**	**µg/l**	**Flag**	**µg/l**	**Flag**	**µg/l**
	Cyanide	20.7 (15.2)	J	10.0	UJ	10
SW-03D	***no observed release found***					
SW-04	***no observed release found***					
SW-05	***no observed release found***					

Data validation qualifiers (flags):

J = The analyte was positively identified; the associated numerical value is an approximate concentration of the analyte in the sample.
UJ = The analyte was analyzed for, but not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.

SQL/CRQL:
* The SQL is the Sample Quantitation Limit, and is used for the organic fractions.
* The CRQL is the Contract Required Quantitation Limit, based on ISMO1.2 (1/10), Exhibit C, pages C-3 and C-5, and is used for the inorganic fraction analyses.

Samples qualified with a J have been adjusted in accordance with the USEPA fact sheet, *Using Qualified Data to Document an Observed Release and Observed Contamination* , November 1996.

A total of five (5) surface water samples were collected during the SI, along with one duplicate.

µg/L = microgram/liter
Qualifier definitions in Appendix F.

C & H Lake Linden Operations
Lake Linden, Michigan
October 10-13, 2011

TABLE 11

KEY SEDIMENT SAMPLE ANALYTICAL RESULTS

SAMPLE #	CONTAMINANT	RELEASE SAMPLE CONCENTRATION (ADJUSTED) AND QUALIFIER		BACKGROUND SAMPLE CONCENTRATION (ADJUSTED) AND QUALIFIER		SQL/CRQL
SD-01	Designated background sediment sample.					
SD-02	**Semi-volatiles**	**µg/kg**	**Flag**	**µg/kg**	**Flag**	**µg/kg**
	Phenanthrene	310		210	U	170
	Pyrene	370		210	U	170
	Inorganics	**mg/kg**	**Flag**	**mg/kg**	**Flag**	**mg/kg**
	Arsenic	5.8	J-	1.2	UJ	1
	Beryllium	0.57		0.081 (0.10)	J	0.5
	Cadmium	1.9		0.12 (0.17)	J	0.5
	Chromium	12.9		1.9	J+	1
	Copper	131		25.0		2.5
	Lead	137		1.3		1
	Manganese	154		27.3		1.5
	Nickel	13.9		1.2 (1.6)	J	4
	Vanadium	12.6		5.8	U	5
	Zinc	108		9.4		6
SD-03	**Inorganics**	**mg/kg**	**Flag**	**mg/kg**	**Flag**	**mg/kg**
	Chromium	8.4		1.9	J+	1
	Copper	164		25.0		2.5
	Lead	7.6		1.3		1
	Manganese	101		27.3		1.5
	Nickel	8.6		1.2 (1.6)	J	4
	Vanadium	15.6		5.8	U	5
	Zinc	28.4		9.4		6
SD-03D	**Inorganics**	**mg/kg**	**Flag**	**mg/kg**	**Flag**	**mg/kg**
	Arsenic	1.4	J-	1.2	UJ	1
	Cadmium	0.56		0.12 (0.17)	J	0.5
	Chromium	7.9		1.9	J+	1
	Copper	97.7		25.0		2.5
	Lead	8.5		1.3		1
	Manganese	107		27.3		1.5
	Nickel	7.3		1.2 (1.6)	J	4
	Vanadium	18.4		5.8	U	5
	Zinc	26		9.4		6

µg/kg = microgram/kilogram mg/kg = milligram/kilogram
Qualifier definitions in Appendix F.

C & H Lake Linden Operations
Lake Linden, Michigan
October 10-13, 2011

TABLE 11

KEY SEDIMENT SAMPLE ANALYTICAL RESULTS

SAMPLE #	CONTAMINANT	RELEASE SAMPLE CONCENTRATION (ADJUSTED) AND QUALIFIER		BACKGROUND SAMPLE CONCENTRATION (ADJUSTED) AND QUALIFIER		SQL/CRQL
SD-04	**Semi-volatiles**	**µg/kg**	**Flag**	**µg/kg**	**Flag**	**µg/kg**
	1,1'-biphenyl	340	J	210	U	170
	Acenaphthene	3,900 (830)	J	210	U	170
	Anthracene	3,800 (380)	J	210	U	170
	Benzo(a)anthracene	11,000 (1100)	J	210	U	170
	Benzo(a)pyrene	8,800 (880)	J	210	U	170
	Benzo(b)fluoranthene	9,500 (950)	J	210	U	170
	Benzo(g,h,i)perylene	4,300 (430)	J	210	U	170
	Benzo(k)fluoranthene	9,100 (910)	J	210	U	170
	Chrysene	11,000 (1100)	J	210	U	170
	Fluoranthene	43,000 (4300)	J	210	UJ	170
	Indeno(1,2,3-cd)pyrene	4,100 (410)	J	210	U	170
	Phenanthrene	11,000 (1100)	J	210	U	170
	Pyrene	30,000 (2500)	J	210	U	170
	Inorganics	**mg/kg**	**Flag**	**mg/kg**	**Flag**	**mg/kg**
	Arsenic	27.3	J-	1.2	UJ	1
	Beryllium	1.6		0.081 (0.10)	J	0.5
	Cadmium	3.2		0.12 (0.17)	J	0.5
	Chromium	33.8		1.9	J+	1
	Cobalt	14.8 (11.8)	J	0.41 (0.51)	J	5
	Copper	2,340		25.0		2.5
	Lead	223		1.3		1
	Manganese	233		27.3		1.5
	Nickel	42.1		1.2 (1.6)	J	4
	Vanadium	52.6		5.8	U	5
	Zinc	210		9.4		6
SD-05	**Volatiles**	**µg/kg**	**Flag**	**µg/kg**	**Flag**	**µg/kg**
	Iodomethane	440		82	J	380
	Semi-volatiles	**µg/kg**	**Flag**	**µg/kg**	**Flag**	**µg/kg**
	Acetophenone	300	J	210	U	170
	Pesticide/PCBs	**µg/kg**	**Flag**	**µg/kg**	**Flag**	**µg/kg**
	Aroclor-1254	480 (48)	J	41	U	33
	Aroclor-1260	410 (41)	J	41	U	33
	Total PCBs	890 (89)	J	41	U	33

µg/kg = microgram/kilogram mg/kg = milligram/kilogram
Qualifier definitions in Appendix F.

C & H Lake Linden Operations
Lake Linden, Michigan
October 10-13, 2011

TABLE 11

KEY SEDIMENT SAMPLE ANALYTICAL RESULTS

SAMPLE #	CONTAMINANT	RELEASE SAMPLE CONCENTRATION (ADJUSTED) AND QUALIFIER		BACKGROUND SAMPLE CONCENTRATION (ADJUSTED) AND QUALIFIER		SQL/CRQL
SD-05	**Inorganics**	**mg/kg**	**Flag**	**mg/kg**	**Flag**	**mg/kg**
	Arsenic	96.6	J-	1.2	UJ	1
	Beryllium	1.2 (0.94)	J	0.081 (0.10)	J	0.5
	Cadmium	2.8		0.12 (0.17)	J	0.5
	Chromium	60.2		1.9	J+	1
	Cobalt	11.7 (9.36)	J	0.41 (0.51)	J	5
	Copper	14,800		25.0		2.5
	Lead	963		1.3		1
	Manganese	285		27.3		1.5
	Mercury	0.28 (0.15)	J	0.12	U	0.1
	Nickel	50.5		1.2 (1.6)	J	4
	Silver	4.2		1.2	U	1
	Vanadium	52.8		5.8	U	5
	Zinc	2,170		9.4		6

J - The analyte was positively identified; the associated numerical value is an approximate concentration of the analyte in the sample.
J+ - The result is an estimated quantity, but the result may be biased high.
J- - The result is an estimated quantity, but the result may be biased low.
U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the action limit of quantitation necessary to accurately and precisely measure the analyte.

A total of five (five) sediment samples plus a duplicate were collected on October 12, 2011, during the SI.
SQL/CRQL:
* The SQL is the Sample Quantitation Limit, and is used for the organic fraction analyses.
* The CRQL is the Contract Required Quantitation Limit, based on ISMO1.2 (1/10), Exhibit C, pages C-3 and C-5, and is used for the inorganic fraction analyses.

Samples qualified with a J, J+ or J- have been adjusted in accordance with the USEPA fact sheet, *Using Qualified Data to Document an Observed Release and Observed Contamination* , November 1996.

µg/kg = microgram/kilogram mg/kg = milligram/kilogram
Qualifier definitions in Appendix F.

C & H Lake Linden Operations
Lake Linden, Michigan
October 10-13, 2011

TABLE 12

KEY GROUNDWATER MONITORING WELL SAMPLE SUMMARY

CONTAMINANT	KEY SAMPLE CONCENTRATIONS		BACKGROUND CONC.	PART 201 CLEANUP CRITERIA & SCREENING LEVEL EXCEEDANCE	# OF KEY SAMPLES
	LOWEST	HIGHEST			
Inorganics	µg/l	µg/l	µg/l	Criteria[a]	
Arsenic	15.3	136	10.0 U	1,2,3 (10 µg/l)	2
Chromium		35.5 J+	10.0 U	3 (11 µg/l)	1
Copper		143	15 J	3 (4.7 µg/l)	1
Copper	415	24,700	71.7	3 (4.7 µg/l)	5
Lead		11.8	3.1 J	1,2 (4.0 ug/l), 3 (4.7 µg/l)	1
Lead	21.9	282	3.5 J	1,2 (4.0 ug/l), 3 (4.7 µg/l)	5
Mercury		0.7	0.20 U	3 (0.0013 µg/l)	1
Nickel		65.1	7.0 J	3 (28 µg/l)	1
Silver		75.4	10.0 U	1 (34 ugl), 3 (0.2 µg/l)	1
Zinc		0.7	0.20 U	---	1

µg/l - microgram per liter [parts per billion (ppb)].

J - The analyte was positively identified; the associated numerical value is an approximateconcentration of the analyte in the sample.

J+ - The result is an estimated quantity, but the result may be biased high.

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J qualified data use adjusted values as reported in the associated key results table.

[a] - Criteria Categories

1 - Residential Drinking Water Criteria (if asterisked *, means the associated value is the aesthetic criterion)

2 - Nonresidential Drinking Water Criteria (if asterisked *, means the associated value is the aesthetic criterion)

3 - Groundwater Surface Water Interface Criteria

--- - No criteria exceedance.

NA - Not applicable or not available.

Part 201 Cleanup Criteria and Screening Levels dated March 25, 2011.

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TABLE 13

KEY SURFACE WATER SAMPLE SUMMARY

CONTAMINANT	KEY SAMPLE CONCENTRATIONS		BACKGROUND CONC.	PART 201 CLEANUP CRITERIA & SCREENING LEVEL EXCEEDANCE	# OF KEY SAMPLES
	LOWEST	HIGHEST			
Inorganics	µg/l	µg/l	µg/l	Criteria[a]	
Cyanide		15.2 J	10.0 UJ	3 (5.2 µg/l)	1
Manganese		46.1	6.7 J	---	1

µg/l - microgram per liter [parts per billion (ppb)].

J - The analyte was positively identified; the associated numerical value is an approximateconcentration of the analyte in the sample.
U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the action limit of quantitation necessary to accurately and precisely measure the analyte.

J qualified data use adjusted values as reported in the associated key results table.

[a] - Criteria Categories
1 - Residential Drinking Water Criteria (if asterisked *, means the associated value is the aesthetic criterion)
2 - Nonresidential Drinking Water Criteria (if asterisked *, means the associated value is the aesthetic criterion)
3 - Groundwater Surface Water Interface Criteria
--- - No criteria exceedance.
NA - Not applicable or not available.

Part 201 Cleanup Criteria and Screening Levels dated March 25, 2011.

C & H Lake Linden Operations
Lake Linden, Michigan
October 10-13, 2011

TABLE 14

KEY SEDIMENT SAMPLE SUMMARY

CONTAMINANT	KEY SAMPLE CONCENTRATIONS		BACKGROUND CONC.	PART 201 CLEANUP CRITERIA & SCREENING LEVEL EXCEEDANCE	# OF KEY SAMPLES
	LOWEST	HIGHEST			
Volatiles	µg/kg	µg/kg	µg/kg	Criteria[a]	
Iodomethane		440	82 J	NA	1
Semi-volatiles	µg/kg	µg/kg	µg/kg	Criteria[a]	
1,1'-biphenyl		340 J	210 U	NA	1
Acenaphthene		830 J	210 U	---	1
Acetophenone		300 J	210 U	---	1
Anthracene		380 J	210 U	---	1
Benzo(a)anthracene		1,100 J	210 U	---	1
Benzo(a)pyrene		880 J	210 U	---	1
Benzo(b)fluoranthene		950 J	210 U	---	1
Benzo(g,h,i)perylene		430 J	210 U	---	1
Benzo(k)fluoranthene		910 J	210 U	---	1
Chrysene		1,100 J	210 U	---	1
Fluoranthene		4,300 J	210 UJ	---	1
Indeno(1,2,3-cd)pyrene		410 J	210 U	---	1
Phenanthrene	310	1,100 J	210 U	---	2
Pyrene	370	2,500 J	210 U	---	2
PCBs	µg/kg	µg/kg	µg/kg	Criteria[a]	
Aroclor-1254		48 J	41 U	---	1
Aroclor-1260		41 J	41 U	---	1
Total PCBs		89 J	41 U	---	1

C & H Lake Linden Operations
Lake Linden, Michigan
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TABLE 14

KEY SEDIMENT SAMPLE SUMMARY

CONTAMINANT	KEY SAMPLE CONCENTRATIONS		BACKGROUND CONC.	PART 201 CLEANUP CRITERIA & SCREENING LEVEL EXCEEDANCE	# OF KEY SAMPLES
	LOWEST	HIGHEST			
Inorganics	mg/kg	mg/kg	mg/kg	Criteria[a]	
Arsenic	1.4 J-	96.6 J-	1.2 UJ	11,12,21 (5.8 mg/kg)	3 + DUP
Beryllium	0.57	1.6	0.10 J	---	3
Cadmium	0.56	3.2	0.17 J	12 (1.5 mg/kg)	3 + DUP
Chromium	7.9	60.2	1.9 J+	11,21 (30 mg/kg), 12 (18 mg/kg)	4 + DUP
Cobalt	9.36 J	11.8 J	0.51 J	11,12,21 (6.8 mg/kg)	2
Copper	97.7	14,800	25.0	11,21 (5,800 mg/kg), 12 (32 mg/kg)	4 + DUP
Lead	7.6	963	1.3	11,21 (700 mg/kg), 12 (800 mg/kg)	4 + DUP
Manganese	101	285	27.3	---	4 + DUP
Mercury		0.15 J	0.12 U	12 (0.13 mg/kg)	1
Nickel	7.3	50.5	1.6 J	12 (29 mg/kg)	4 + DUP
Silver		4.2	1.2 U	12 (1.0 mg/kg)	1
Vanadium	12.6	52.8	5.8 U	---	4 + DUP
Zinc	26	2,170	9.4	12 (62 mg/kg)	4 + DUP

mg/kg - milligram per kilogram [parts per million (ppm)].
µg/kg - microgram per kilogram [parts per billion (ppb)].

J - The analyte was positively identified; the associated numerical value is an approximateconcentration of the analyte in the sample.

J+ - The result is an estimated quantity, but the result may be biased high.

J- - The result is an estimated quantity, but the result may be biased low.

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the action limit of quantitation necessary to accurately and precisely measure the analyte.

J qualified data use adjusted values as reported in the associated key results table.

[a] - Criteria Categories
11 - Residential Drinking Water Protection Criteria
12 - Groundwater Surface Water Interface Protection Criteria
21 - Nonresidential Drinking Water Protection Criteria
--- - No criteria exceedance
NA - Not applicable or not available.

Part 201 Cleanup Criteria and Screening Levels dated March 25, 2011.

C & H Lake Linden Operations
Lake Linden, Michigan
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TABLE 15

KEY SURFICIAL SOIL SAMPLE SUMMARY

CONTAMINANT	KEY SAMPLE CONCENTRATIONS		BACKGROUND CONC.	PART 201 CLEANUP CRITERIA & SCREENING LEVEL EXCEEDANCE	# OF KEY SAMPLES*
	LOWEST	HIGHEST			
Volatiles	µg/kg	µg/kg	µg/kg	Criteria[a]	
1,2,4-trimethylbenzene	170	840	170U	12	4
2-methylnaphthalene	410	910	550 U	---	6
Benzene	86	258	83 U	11,21	2
Cyclohexane	380	610	410 U	NA	2
Ethylbenzene	100	480	83 U	12	3
n-butylbenzene		91	83 U	---	1
n-propylbenzene		230	170 U	---	1
Styrene		120	83 U	---	1
Toluene	120	1,700	170 U	---	5
Xylenes (total)	390	3,200	170 U	12	5
Semi-volatiles	µg/kg	µg/kg	µg/kg	Criteria[a]	
1,2,4,5-tetrachlorobenzene		330	360 U	---	1 + W
2-methylnaphthalene		820	360 U	---	1
Acenaphthene		380	360 U	---	1
Bis(2-ethylhexyl)phthalate		20	360 U	---	1 + W
Dibenzofuran		230	360 U	---	1
Hexachlorobenzene		380	360 U	12	1 + W
Naphthalene	200	600	360 U	---	2
Phenanthrene		4,400	940	12	1
PCBs	µg/kg	µg/kg	µg/kg	Criteria[a]	
Aroclor-1254	330	490	70 U	---	2
Aroclor-1260	490	540	70 U	---	2
Total PCBs	820	1,030	70 U	19,27 (1,000 ppb, TSCA)	2

C & H Lake Linden Operations
Lake Linden, Michigan
October 10-13, 2011

TABLE 15

KEY SURFICIAL SOIL SAMPLE SUMMARY

CONTAMINANT	KEY SAMPLE CONCENTRATIONS		BACKGROUND CONC.	PART 201 CLEANUP CRITERIA & SCREENING LEVEL EXCEEDANCE	# OF KEY SAMPLES*
	LOWEST	HIGHEST			
Inorganics	mg/kg	mg/kg	mg/kg	Criteria[a]	
Antimony	7.8	80.2	2.2 J	---	5 + D + W
Arsenic	31.4	1,220	7.2	11,12,18,19,21,26,27	7 + D + W
Cadmium	8.9	12	2.5	11,12,21	3 + D + W
Chromium	244	463	38.7	11,12,18,21,26	2 + D + W
Copper	4,160 J	44,000 J	1,210 J	11,12,19,21	9 + D + W
Lead	267	6,940	82.3	11,12,19,21	9 + D + W
Manganese		2,350 J	580 J	11,12,21,26	1 + W
Silver	5.7	40.9	1.1 J	11,12,21	6 + D + W
Zinc	873	12,700 J	212 J	11,12,21	4 + W

mg/kg - milligram per kilogram [parts per million (ppm)].
µg/kg - microgram per kilogram [parts per billion (ppb)].

J - The analyte was positively identified; the associated numerical value is an approximateconcentration of the analyte in the sample.
U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

[a] - Criteria Categories
11 - Residential Drinking Water Protection Criteria
12 - Groundwater Surface Water Interface Protection Criteria
18 - Residential Particulate Soil Inhalation Criteria
19 - Residential Direct Contact Criteria
21 - Nonresidential Drinking Water Protection Criteria
26 - Nonresidential Particulate Soil Inhalation Criteria
27 - Nonresidential Direct Contact Criteria
--- - No criteria exceedance
NA - Not applicable or not available

Part 201 Cleanup Criteria and Screening Levels dated March 25, 2011.
*Number of key samples is shown and whether also found in a duplicate (D) or waste sample SS-19 (W).

C & H Lake Linden Operations
Lake Linden, Michigan
October 10-13, 2011

TABLE 16

KEY SOIL BORING SAMPLE SUMMARY

CONTAMINANT	KEY SAMPLE CONCENTRATIONS		BACKGROUND CONC.	PART 201 CLEANUP CRITERIA & SCREENING LEVEL EXCEEDANCE	NUMBER OF KEY SAMPLES
	LOWEST	HIGHEST			
Semi-volatiles	µg/kg	µg/kg	µg/kg	Criteria[a]	
2-methylnaphthalene		250	220 U	---	1
Acetophenone	410	470	220 U	---	2
Anthracene		240	220 U	---	1
Benzaldehyde		250 J	220 U	NA	1
Benzo(a)anthracene		340	220 U	---	1
Benzo(a)pyrene		240	220 U	---	1
Benzo(b)fluoranthene		250	220 U	---	1
Benzo(k)fluoranthene		230	220 U	---	1
Chrysene		250	220 U	---	1
Fluoranthene		180 J	220 UJ	---	1
Phenanthrene	730	1,400	220 U	---	2
Pyrene	340	610	220 U	---	2

C & H Lake Linden Operations
Lake Linden, Michigan
October 10-13, 2011

TABLE 16

KEY SOIL BORING SAMPLE SUMMARY

CONTAMINANT	KEY SAMPLE CONCENTRATIONS		BACKGROUND CONC.	PART 201 CLEANUP CRITERIA & SCREENING LEVEL EXCEEDANCE	NUMBER OF KEY SAMPLES
	LOWEST	HIGHEST			
Inorganics	mg/kg	mg/kg	mg/kg	Criteria[a]	
Arsenic	8.6 J-	27.1 J-	1.7 J	11,12,19,21	4
Cadmium	1.2	8.4	0.34 J	11,12,21	2
Chromium	16.2	29.1	5.3	12	6
Cobalt	9.3	10.4	2.9 J	11,12,21	3
Copper	34.5	11,700 J	8.8	11,12,21	12
Lead	1.9	16,100	0.90 U	11,12,19,21,27	12
Manganese	170	280	49.7	---	8
Mercury	0.10	0.58	0.12 U	12	2
Nickel	21.3	31.7	6.3	12	6
Silver	2.2	7.0	0.90 U	11,12	7
Vanadium	39.3	48.4	12.4	---	3
Zinc	37.4	607	11.9	12	9

mg/kg - milligram per kilogram [parts per million (ppm)].
µg/kg - microgram per kilogram [parts per billion (ppb)].

J - The analyte was positively identified; the associated numerical value is an approximateconcentration of the analyte in the sample.

J- - The result is an estimated quantity, but the result may be biased high.
U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the action limit of quantitation necessary to accurately and precisely measure the analyte.
NA - Not Applicable.

[a] - Criteria Categories
11 - Residential Drinking Water Protection Criteria
12 - Groundwater Surface Water Interface Protection Criteria
19 - Residential Direct Contact Criteria
21 - Nonresidential Drinking Water Protection Criteria
27 - Nonresidential Direct Contact Criteria
--- - No criteria exceedance
NA - Not applicable.

Part 201 Cleanup Criteria and Screening Levels dated March 25, 2011.

Appendix A

Site 4-Mile Radius Map

APPENDIX A
SITE 4-MILE RADIUS MAP

Sources: USGS topographic map; well points from scanned well logs and Wellogic system (see Appendix G); feature layers from state of Michigan Geographic Data Library website

0 0.5 1 2 Miles

Village of Lake Linden Public Water Supply Wells

Legend

- Groundwater well (35)
- State highway
- Site boundary
- Village

Area Served by Public Water Supply from Groundwater Sources, showing the Supply Owner/Operator

- Village of Lake Linden
- Michigan American Water Co.

(Mich. Am. supply wells are northwest of Calumet on the shore of Lake Superior)

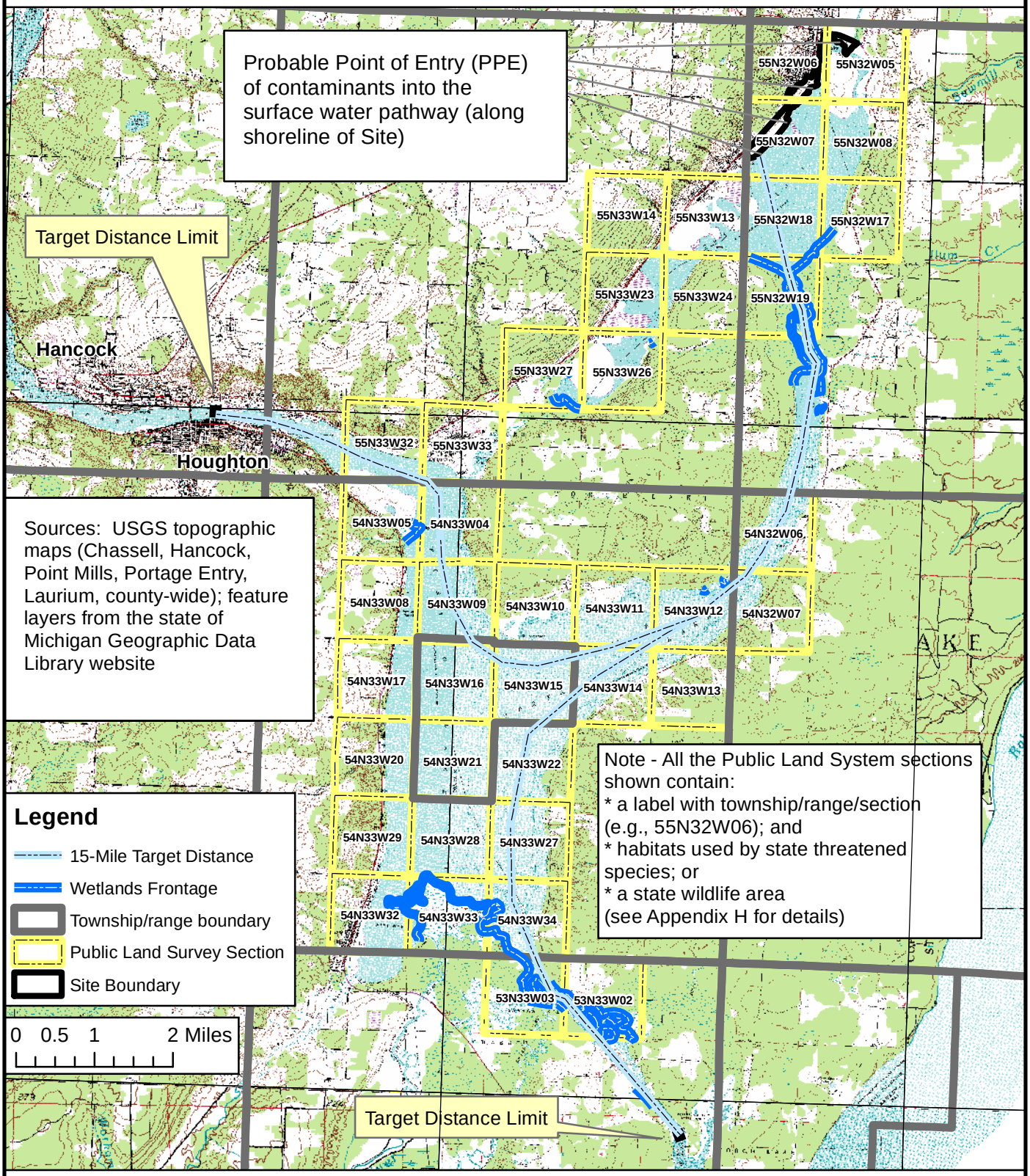
Compiled by JES, 1/25/12
(revised by JES, 4/2/13)
Projected coordinate system:
Michigan GeoRef, NAD-83, meters
Done in ESRI ArcMap 10.1

Site Inspection Report
C & H Lake Linden Operations, MIN000510619
Michigan Department of Environmental Quality
Remediation Division - Superfund Section
Site Assessment and Site Management Unit

Appendix B

Site 15-Mile Surface Water Target Distance Limit Map

APPENDIX B
SITE 15-MILE SURFACE WATER TARGET DISTANCE LIMIT MAP



Site Inspection Report
C & H Lake Linden Operations, MIN000510619
Michigan Department of Environmental Quality
Remediation and Redevelopment Division - Superfund Section
Site Assessment and Site Management Unit

Compiled by JES, 7/29/2011
(revised 4/3/13, JES)
Projected coordinate system:
Michigan GeoRef, NAD-83, meters
Done in ESRI ArcMap 10.1

Appendix C

X-ray Fluorescence Data

C & H Lake Linden Operations
Lake Linden, Michigan
October 10-13, 2011

APPENDIX C

X-RAY FLUORESCENCE DATA

XRF No.	Parcel or Area	Material Description	Comments	Soil or waste	Date / Time	Duration	Units
4	Traprock Slag	Slag, gravel		waste	10/10/2011 11:23	91.56	ppm
5	Traprock Slag	Soil mixed w/ slag		both	10/10/2011 11:30	91.12	ppm
6	Traprock Slag	Dark soil		soil	10/10/2011 11:34	91.63	ppm
7	Traprock Slag	Soil and slag		both	10/10/2011 11:38	91.42	ppm
8	Traprock Slag	Sand. gravel, slag		both	10/10/2011 11:40	91.46	ppm
9	Traprock Slag	Sand, slag		both	10/10/2011 11:43	90.86	ppm
10	Traprock Slag	Blue slag		waste	10/10/2011 11:47	91.34	ppm
11	Traprock Slag	Sand, slag		both	10/10/2011 11:50	91.17	ppm
12	Traprock Slag	Slag, gravel		waste	10/10/2011 11:53	91.12	ppm
13	Traprock Slag	Tan slag		waste	10/10/2011 11:55	91.29	ppm
14	Traprock Slag	Slag, gravel		waste	10/10/2011 11:59	91.03	ppm
15	Traprock Slag	Slag, gravel		waste	10/10/2011 12:03	91.35	ppm
16	Traprock Slag	Sand, slag, gravel		both	10/10/2011 12:08	91.31	ppm
17	Traprock Slag	Gray-blue slag		waste	10/10/2011 12:10	91.2	ppm
18	Traprock Slag	Sand, slag, gravel		both	10/10/2011 12:13	91.35	ppm
19	Traprock Slag	Sand		soil	10/10/2011 12:16	91.72	ppm
20	Traprock Slag	Gray slag w/ tan chunks	Tan chunks look like wood chips.	waste	10/10/2011 12:21	91.05	ppm
21	Traprock Slag	Stamp sand		waste	10/10/2011 12:24	91.34	ppm
22	Traprock Slag	Slag, gravel		waste	10/10/2011 12:28	91.37	ppm
23	Traprock Slag	Slag, gravel pile		waste	10/10/2011 12:31	91.36	ppm
24	Traprock Slag	Slag, gravel	SS-02.	waste	10/10/2011 12:33	91.29	ppm
25	Traprock Slag	Slag	From face of cut in slag disposal area. 10 photos in panoramic view.	waste	10/10/2011 12:55	90.98	ppm
26	Traprock Slag	Sand		soil	10/10/2011 13:05	91.24	ppm
27	Traprock Slag	Sand		soil	10/10/2011 13:09	91.28	ppm
28	Traprock Slag	Sand		soil	10/10/2011 13:13	91.43	ppm
29	Traprock Slag	Sand, debris		both	10/10/2011 13:16	91.31	ppm
30	Traprock Slag	Sand, gravel		soil	10/10/2011 13:19	91.13	ppm
31	Traprock Slag	Sand, debris, slag		both	10/10/2011 13:22	91.36	ppm
32	Traprock Slag	Sand, debris		both	10/10/2011 13:25	90.82	ppm
33	Traprock Slag	Sand	1 photo.	soil	10/10/2011 13:28	91.08	ppm
34	Traprock Slag	Gray silty sand	Soil in roots of fallen tree. S-03.	soil	10/10/2011 13:36	91.15	ppm

C & H Lake Linden Operations
Lake Linden, Michigan
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APPENDIX C

X-RAY FLUORESCENCE DATA

XRF No.	Molybdenum	Mo Error	Strontium	Sr Error	Lead	Pb Error	Selenium	Se Error	Arsenic	As Error	Mercury	Hg Error
4	< LOD	8.74	221.67	10.62	20	9.42	< LOD	6.6	< LOD	11.41	< LOD	12.57
5	12.36	5.22	197.9	9.02	24	8.5	< LOD	4.87	< LOD	9.69	< LOD	10.61
6	14.11	4.64	75.28	5.26	17	6.96	< LOD	4.54	< LOD	8.15	< LOD	8.93
7	< LOD	8.03	113.99	7.32	41	10.33	< LOD	5.64	< LOD	11.37	< LOD	12.18
8	< LOD	7.94	158.76	8.44	27	9.11	< LOD	5.55	< LOD	9.97	< LOD	11.76
9	8.71	5.65	290.04	11.59	27	9.5	< LOD	6.12	< LOD	11.03	< LOD	11.98
10	< LOD	11.86	463.47	20.5	< LOD	15.55	< LOD	9.79	< LOD	12.33	< LOD	22.33
11	12.78	6.05	346.6	13.27	68	13.76	< LOD	7.39	< LOD	15.96	< LOD	12.64
12	12.56	7.84	1082.29	29.05	24	13.01	< LOD	8.81	< LOD	14.58	20.12	12.79
13	< LOD	9.55	627.64	18.45	19	10.1	< LOD	6.5	< LOD	10.83	< LOD	15.45
14	< LOD	10.02	522.06	17.86	< LOD	13.8	< LOD	7.99	< LOD	10.7	< LOD	16.23
15	10.88	6.27	509.66	16.52	< LOD	12.88	< LOD	6.83	< LOD	9.8	< LOD	13.78
16	< LOD	8.35	492.86	15.11	< LOD	11.37	< LOD	6.05	< LOD	8.59	< LOD	12.66
17	< LOD	10.89	938.91	26.13	< LOD	17.03	< LOD	9.01	< LOD	12.75	< LOD	18.72
18	< LOD	8.13	236.41	10.63	21	9.01	< LOD	5.67	< LOD	10.03	< LOD	12.34
19	< LOD	7.17	67.87	5.45	17	7.72	< LOD	5.43	< LOD	8.56	< LOD	10.68
20	< LOD	11.56	570.54	21.6	99	20.16	< LOD	9.65	< LOD	24.03	< LOD	20.54
21	< LOD	8.84	74.29	6.85	19	9.61	< LOD	7.42	< LOD	10.74	< LOD	14.46
22	< LOD	9.37	336.88	13.93	44	12.56	< LOD	7.43	< LOD	14.43	< LOD	14.78
23	< LOD	8.28	505.19	15.11	33	10.26	< LOD	5.77	16.1	8.56	< LOD	11.86
24	9.06	5.75	493.29	14.98	< LOD	12.35	< LOD	5.7	14.5	7.08	< LOD	11.76
25	< LOD	12.22	808.98	26.49	22	13.9	< LOD	12.06	< LOD	16.93	< LOD	22.6
26	15.98	5.18	343.21	11.43	105	13.7	< LOD	5.44	< LOD	16	< LOD	11.03
27	13.14	4.77	220.71	8.78	305	20.72	< LOD	5.2	< LOD	23.95	< LOD	9.85
28	20.26	5.42	361.93	12.18	**406**	26.01	< LOD	6.22	< LOD	29.24	< LOD	11.76
29	< LOD	7.19	129.75	7.2	361	23.52	< LOD	5.82	< LOD	26.88	< LOD	10.57
30	< LOD	8.16	122.1	7.89	106	15.37	< LOD	6.2	< LOD	18.36	< LOD	12.68
31	< LOD	6.49	344.74	10.25	225	17.07	< LOD	4.74	< LOD	19.8	< LOD	8.84
32	11.55	3.87	53.78	3.95	16	5.92	4.73	2.68	< LOD	6.56	< LOD	6.47
33	12.29	4.12	156.94	6.62	209	15.42	< LOD	4.29	< LOD	17.55	< LOD	7.37
34	10.65	5.38	1034.96	20.05	**479**	27.87	< LOD	6.83	< LOD	32.15	< LOD	11.05

C & H Lake Linden Operations
Lake Linden, Michigan
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APPENDIX C

X-RAY FLUORESCENCE DATA

XRF No.	Zinc	Zn Error	Copper	Cu Error	Nickel	Ni Error	Cobalt	Co Error	Manganese	Mn Error
4	27.38	17.1	467.42	47.44	< LOD	79.76	289.27	189.45	532.34	119.6
5	50.39	15.42	240	32.63	< LOD	60.97	210.3	103.76	346.18	84.1
6	109.51	17.3	339	32.83	< LOD	53.76	< LOD	134.6	341.02	74.89
7	30.49	15.41	406	41.82	< LOD	70.25	< LOD	191.59	325.47	89.75
8	38.34	15.29	178	31.35	< LOD	71.41	< LOD	195.33	579.25	107.63
9	61.56	17.88	238	35.59	< LOD	70.04	< LOD	182.83	314.3	90.24
10	< LOD	30.95	341.29	63.54	350.59	111.17	< LOD	885.86	556.68	240.51
11	61.66	19.11	326	42.17	< LOD	77.81	< LOD	217.84	206.48	88.68
12	< LOD	28.47	238.4	51.67	292.91	96.32	< LOD	846.24	574.78	230.12
13	< LOD	20.44	117.3	33.84	< LOD	89.87	< LOD	200.57	< LOD	115.08
14	< LOD	23.07	107.05	35.8	< LOD	99.85	< LOD	302.75	287.63	113.64
15	66.53	20.89	253.74	40.68	< LOD	87.63	< LOD	279.8	306.87	107.76
16	< LOD	20.18	101	28.84	< LOD	80.48	< LOD	260.64	< LOD	125.45
17	< LOD	30.47	336.07	54.71	< LOD	123.06	< LOD	586.05	527.57	180.46
18	53.91	18.77	573	49.77	< LOD	75.83	< LOD	257.44	444.42	108.79
19	35.34	13.27	118	25.6	< LOD	58.26	< LOD	136.59	196.26	69.67
20	< LOD	39.17	271.21	55.1	< LOD	125.09	< LOD	521.96	< LOD	228.75
21	40.15	22.82	1413.66	80.66	< LOD	88.73	520.53	246.65	837.91	152.64
22	< LOD	26.02	129.79	35.23	< LOD	90.82	< LOD	343.73	170.2	105.05
23	< LOD	22.27	154.41	31.2	< LOD	74.26	< LOD	261.59	183.79	88.68
24	< LOD	20.28	115.01	29.17	< LOD	75.85	< LOD	223.63	166.54	82.99
25	< LOD	33.15	115.13	48.21	< LOD	127.02	< LOD	425.87	320.33	150.05
26	371.85	30.26	181	28.99	< LOD	61.99	< LOD	118.55	219.23	68.78
27	392.75	29.56	256	30.33	< LOD	53.44	< LOD	118.42	277.19	71.56
28	472.29	35.08	307	36.18	< LOD	65.07	224.54	96.27	392.62	87.79
29	294.78	27.6	493	41.3	< LOD	61.3	< LOD	133.91	342.12	80.82
30	177.12	27.02	945	62.09	< LOD	78.4	< LOD	275.53	709.4	126.96
31	354.4	27.42	1388	58.03	< LOD	51.28	118.95	73.7	598.43	86.78
32	52.57	10.75	79	16.53	< LOD	36.77	< LOD	49.84	< LOD	54.5
33	240.99	20.73	174	22.54	< LOD	43.33	< LOD	82.52	140.32	50.46
34	534.42	36.63	282	34.4	< LOD	65.17	< LOD	126.79	1099.7	128.04

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APPENDIX C

X-RAY FLUORESCENCE DATA

XRF No.	Chromium	Cr Error	Vanadium	V Error	Antimony	Sb Error	Cadmium	Cd Error	Silver	Ag Error
4	47.2	25.95	143.28	61.16	< LOD	29.21	< LOD	16.19	< LOD	12.01
5	57.53	22.62	< LOD	64.36	< LOD	21.84	< LOD	12.1	< LOD	8.75
6	54.76	24.74	< LOD	65.36	< LOD	18.35	< LOD	10.01	< LOD	7.55
7	74.37	23.77	< LOD	73.92	< LOD	25.64	< LOD	14.15	< LOD	10.65
8	75.63	24.26	< LOD	69.59	< LOD	25.58	< LOD	14.07	< LOD	10.2
9	83.85	23.88	< LOD	69.96	< LOD	21.66	< LOD	12.13	< LOD	8.89
10	< LOD	35.94	< LOD	75.12	< LOD	41.58	< LOD	23.15	< LOD	16.76
11	66.12	22.79	89.22	47.21	< LOD	23.75	< LOD	13.07	< LOD	9.65
12	< LOD	39.46	< LOD	93.56	40.71	24.78	< LOD	21.22	< LOD	15.48
13	90.25	23.29	122.96	58.63	< LOD	27.74	< LOD	15.57	< LOD	11.63
14	70.67	23.25	< LOD	73.35	< LOD	32.27	< LOD	17.97	< LOD	13.29
15	85.75	24.96	135.8	54.5	< LOD	28.21	< LOD	15.91	< LOD	11.38
16	65.87	26.15	109.21	60.61	< LOD	26.77	< LOD	15.1	< LOD	11.02
17	< LOD	44.04	< LOD	95.24	< LOD	33.95	< LOD	19.18	< LOD	13.7
18	72.03	25.8	100.84	56.07	< LOD	26.28	< LOD	14.36	< LOD	10.68
19	73.7	23.47	< LOD	66.61	< LOD	24.63	< LOD	13.86	< LOD	9.98
20	56.28	26	76.97	49.59	< LOD	35.67	< LOD	19.88	< LOD	14.51
21	< LOD	40.7	108.06	64.06	< LOD	30.03	< LOD	15.95	< LOD	11.97
22	65.64	24.69	< LOD	74.5	< LOD	27.77	< LOD	15.1	< LOD	10.97
23	83.42	27.43	109.63	63.63	< LOD	25.95	< LOD	14.36	< LOD	10.6
24	92.13	26.11	179.32	63.99	< LOD	25.2	< LOD	14.21	< LOD	10.4
25	44.83	21.59	< LOD	63.6	< LOD	38.93	< LOD	20.68	< LOD	15.79
26	87.85	23.09	62.73	40.64	< LOD	21.24	< LOD	11.44	< LOD	8.3
27	102.38	25.87	< LOD	76.2	< LOD	17.55	< LOD	9.82	< LOD	6.86
28	105.98	23.89	75.84	43.16	< LOD	19.79	< LOD	11.43	< LOD	7.91
29	93.82	23.7	< LOD	64.84	< LOD	22.05	< LOD	12.25	< LOD	9.03
30	39.73	25.58	96.66	55.28	< LOD	27.56	< LOD	15.42	< LOD	11.41
31	100.88	26.23	103.32	59.7	< LOD	18.96	< LOD	10.45	< LOD	7.92
32	< LOD	32.69	< LOD	46.58	< LOD	13.56	< LOD	7.51	< LOD	5.65
33	64.93	25.88	80.55	48.81	< LOD	15.56	< LOD	8.67	< LOD	6.41
34	131.81	26.64	133.12	67.54	< LOD	21.63	< LOD	12.14	< LOD	8.71

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APPENDIX C

X-RAY FLUORESCENCE DATA

XRF No.	Parcel or Area	Material Description	Comments	Soil or waste	Date / Time	Duration	Units
35	Sub Area C	Dark brown, moist sand		soil	10/10/2011 14:18	91.14	ppm
36	Sub Area C	Stamp sand		waste	10/10/2011 16:03	91.37	ppm
37	Sub Area C	slag, sand	Pile. SS-08.	both	10/10/2011 16:06	90.98	ppm
38	Sub Area C	slag, sand	Pile.	both	10/10/2011 16:08	91.23	ppm
39	Sub Area C	Dark brown sand		soil	10/10/2011 16:11	91.01	ppm
40	Sub Area C	Reddish-brown sand, gravel		soil	10/10/2011 16:15	91.39	ppm
41	Sub Area C	Slag, rock, sand		both	10/10/2011 16:18	91.17	ppm
42	Sub Area C	Stamp sand		waste	10/10/2011 16:20	91.21	ppm
43	Sub Area C	Stamp sand, sand		both	10/10/2011 16:23	91.51	ppm
44	Sub Area C	Silty sand	Photos taken south, east, and west. S-09.	soil	10/10/2011 16:39	91.24	ppm
45	Sub Area C	Stamp sand, gravel		waste	10/10/2011 16:42	91.7	ppm
46	Sub Area C	Brown fine sand, silt		soil	10/10/2011 16:44	91.73	ppm
47	Sub Area C	Stamp sand		waste	10/10/2011 17:01	91.58	ppm
48	Sub Area C	Brown fine sand, silt		soil	10/10/2011 17:03	90.7	ppm
49	Sub Area C	Stamp sand, sand		both	10/10/2011 17:06	91.32	ppm
50	Sub Area C	Fine to medium sand		soil	10/10/2011 17:09	91.59	ppm
51	Sub Area C	Metallic mineral rock		rock	10/10/2011 17:11	120.96	ppm
52	Sub Area C	Fine to medium sand		soil	10/10/2011 17:14	90.78	ppm
53	Sub Area C	Fine to medium sand, gravel		soil	10/10/2011 17:16	91.34	ppm
54	Sub Area C	Dry, reddish-gray silt	On side wall of washout near lakeshore.	soil	10/10/2011 17:20	121.8	ppm
55	Sub Area C	Black coal, orangish silt	On side wall of washout near lakeshore edge of black coal and dry silty material.	both	10/10/2011 17:23	91.95	ppm
56	Sub Area C	Brown silty fine sand		soil	10/10/2011 17:26	90.88	ppm
57	Sub Area C	Silty fine sand		soil	10/10/2011 17:28	90.84	ppm
58	Sub Area C	Piece of metal, lead?	Photos taken north then south along shore, then north and south on road. SS-07.	waste	10/10/2011 17:41	31.57	ppm
59	Sub Area C	Stamp sand, sand		soil	10/10/2011 17:57	91.09	ppm
60	Sub Area C	Stamp sand, sand		soil	10/10/2011 18:02	92.49	ppm
61	Sub Area C	Stamp sand, fine sand		both	10/10/2011 18:06	91.2	ppm
62	Sub Area C	Moist, brown silty fine sand		soil	10/10/2011 18:09	90.69	ppm

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APPENDIX C

X-RAY FLUORESCENCE DATA

XRF No.	Molybdenum	Mo Error	Strontium	Sr Error	Lead	Pb Error	Selenium	Se Error	Arsenic	As Error	Mercury	Hg Error
35	17.66	4.19	28.91	3.26	10	5.6	< LOD	3.93	< LOD	6.06	< LOD	7.39
36	< LOD	7.99	115.86	7.35	29	9.29	< LOD	5.37	< LOD	11.04	< LOD	11.66
37	13.74	4.94	155.22	7.63	271	20.16	< LOD	5.47	< LOD	23.42	< LOD	9.84
38	< LOD	8.44	185	9.43	224	21.08	< LOD	6.68	< LOD	24.37	< LOD	13.05
39	8.6	4.82	74.85	5.48	57	10.34	< LOD	4.77	< LOD	12.03	< LOD	9.95
40	9.14	5.51	66.04	5.83	28	9.41	< LOD	6.11	< LOD	10.76	< LOD	11.58
41	< LOD	8.19	86.46	6.48	305	23.36	< LOD	5.57	< LOD	26.5	< LOD	11.06
42	< LOD	9.68	103.38	8.35	< LOD	13.97	< LOD	7.35	< LOD	11.49	< LOD	14.51
43	10.08	6	105.88	7.71	< LOD	11.4	< LOD	6.54	< LOD	9.42	< LOD	13.97
44	< LOD	8.52	79.84	6.55	319	25.02	< LOD	6.87	**34.2**	19.72	< LOD	13.4
45	< LOD	8.22	117.77	7.63	24	9.05	< LOD	5.79	< LOD	10.62	< LOD	12.46
46	< LOD	8.13	42.9	4.85	31	9.46	< LOD	5.43	< LOD	10.73	< LOD	10.96
47	< LOD	9.32	150.46	9.63	< LOD	13.07	< LOD	7.12	< LOD	9.67	< LOD	16.08
48	< LOD	7.49	43.23	4.66	29	9.01	< LOD	5.64	< LOD	10.41	< LOD	10.39
49	< LOD	7.62	80.88	6.09	26	8.78	< LOD	5.37	< LOD	9.8	< LOD	11.1
50	< LOD	8.11	82.85	6.21	43	10.34	< LOD	5.52	**13.6**	8.47	< LOD	11.31
51	27.2	5.57	67.51	5.35	38	9.53	< LOD	5.6	< LOD	11.62	< LOD	12.72
52	< LOD	7.81	46.41	4.84	29	9.12	< LOD	5.46	< LOD	9.95	< LOD	10.75
53	< LOD	8.59	53.95	5.5	24	9.14	< LOD	5.23	< LOD	10.58	< LOD	12.37
54	< LOD	6.41	107.44	5.5	20	6.84	< LOD	5.04	< LOD	7.52	< LOD	11.13
55	< LOD	9.07	59.35	6.15	17	9.48	< LOD	6.73	**47.2**	10.39	< LOD	16.19
56	< LOD	7.45	44	4.6	36	9.29	< LOD	4.99	< LOD	11.01	< LOD	10.21
57	< LOD	8.01	34.64	4.35	< LOD	11.09	< LOD	5.42	< LOD	8.84	< LOD	11.05
58	67.63	26.79	< LOD	84.72	393731	2918.41	< LOD	317.88	28161.8	2277.72	< LOD	249.87
59	< LOD	8.76	103.08	7.59	34	10.7	< LOD	6.75	**14.6**	8.97	< LOD	13.53
60	< LOD	7.35	70.96	5.49	83	12.29	< LOD	5.25	**16.5**	9.9	< LOD	10.82
61	< LOD	9.26	116.16	8.43	129	18.22	< LOD	6.48	< LOD	21.9	< LOD	15.15
62	< LOD	8.2	50.15	5.25	26	9.21	< LOD	5.39	< LOD	9.87	< LOD	11.55

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X-RAY FLUORESCENCE DATA

XRF No.	Zinc	Zn Error	Copper	Cu Error	Nickel	Ni Error	Cobalt	Co Error	Manganese	Mn Error
35	50.47	11.58	244	25.54	< LOD	40.07	88.73	51.17	230.14	56.63
36	45.2	17.25	830.42	55.64	< LOD	70.44	234.27	140.18	418.04	97.84
37	167.78	24.35	2682	86.4	< LOD	59.02	< LOD	170.46	234.97	74.04
38	150.53	28.36	3135	106.44	< LOD	76.58	281.29	173.05	429.91	106.74
39	292.67	27.16	786	48.64	< LOD	57.22	221.17	113.96	274.25	76.11
40	61.98	18.04	611	49.66	< LOD	71.1	< LOD	180.91	217.04	81.88
41	42.68	16.59	766	53.59	< LOD	65.95	< LOD	191.35	297.98	86.48
42	45.58	22.66	963.37	72.46	< LOD	98.87	< LOD	337.73	703.09	148.18
43	54.17	21.15	1112	69.86	< LOD	85.11	< LOD	286.7	717.26	133.01
44	297	33.99	2713	100.24	< LOD	74.24	< LOD	219.09	361.75	99.49
45	40.04	18.53	952.69	61.17	< LOD	76.35	< LOD	261.35	592.6	117.1
46	130.97	21.52	315	37.88	< LOD	64.89	< LOD	173.92	432.89	95.5
47	< LOD	32.74	1991.87	97.22	< LOD	90.67	< LOD	346.47	675.84	144.4
48	40.22	15.13	536	44.13	< LOD	60.81	< LOD	157.62	278.79	80.1
49	58.37	17.94	991	58.29	< LOD	66.83	< LOD	191.22	522.06	100.58
50	70.01	19.57	1365	67.86	< LOD	66.38	< LOD	207.51	472.55	100.66
51	82.03	19.41	1408.38	66.7	< LOD	76.03	< LOD	156.98	219.27	74.89
52	38.1	14.51	306	35.87	< LOD	61.81	< LOD	148.11	347.12	84.63
53	35.98	16.44	567	49.49	< LOD	73.62	< LOD	190.83	379.43	97.14
54	109.72	27.1	11664	150.94	< LOD	57.69	< LOD	173.21	416.06	78.71
55	189.44	41.17	10487	206.23	< LOD	85.84	< LOD	303.85	360.67	115.31
56	69.36	17.69	987	56.23	< LOD	59.53	< LOD	166.72	322.28	82.22
57	33.6	13.61	122	26.83	< LOD	59.53	< LOD	145.5	346.01	84.62
58	9862.86	595.69	11454.11	739.04	< LOD	777.54	< LOD	982.74	1210.14	737.42
59	65.43	20.81	881	62.65	< LOD	80.64	< LOD	248.73	527.86	117.63
60	< LOD	31.18	4993	118.87	< LOD	59.99	< LOD	157.19	304.55	80.08
61	168.47	30.54	1741	89.68	< LOD	86.91	< LOD	305.49	1133.2	164.26
62	36.86	15.06	85	26.57	< LOD	64.48	< LOD	180.79	435.2	98.41

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X-RAY FLUORESCENCE DATA

XRF No.	Chromium	Cr Error	Vanadium	V Error	Antimony	Sb Error	Cadmium	Cd Error	Silver	Ag Error
35	67	25.26	< LOD	53.19	< LOD	13.58	< LOD	7.5	< LOD	5.34
36	38.51	23.02	< LOD	74.08	< LOD	27.34	< LOD	15.19	< LOD	11.41
37	69.81	26.34	< LOD	71.79	< LOD	19.24	< LOD	10.65	< LOD	7.89
38	< LOD	37.61	95.48	52.99	< LOD	25.26	< LOD	14.16	< LOD	10.35
39	52.69	25.78	79.58	51.31	< LOD	20.83	< LOD	11.85	< LOD	8.81
40	58.42	22.49	< LOD	67.3	< LOD	23.64	< LOD	13.19	< LOD	9.83
41	54.63	23.31	80.01	48.15	< LOD	25.14	< LOD	13.73	< LOD	10.57
42	47.58	23.99	90.98	53.03	< LOD	32.83	< LOD	18.41	< LOD	13.49
43	72.36	25.66	104.44	53.96	< LOD	29.21	< LOD	15.96	< LOD	11.81
44	102.44	25.67	78.73	51.76	< LOD	26.61	< LOD	14.45	< LOD	10.84
45	< LOD	39.09	138.03	61.56	< LOD	27.94	< LOD	15.46	< LOD	11.82
46	75.25	23.83	< LOD	73.43	< LOD	25.29	< LOD	14.11	< LOD	10.33
47	< LOD	36.53	145.87	56.49	< LOD	32.62	< LOD	18.06	< LOD	13.93
48	65.43	23.7	< LOD	68.13	< LOD	24.93	< LOD	14.07	< LOD	9.96
49	< LOD	34.93	121.67	53.18	< LOD	26.02	< LOD	14.75	< LOD	10.83
50	52.15	25.45	< LOD	84.77	< LOD	25.46	< LOD	14.44	< LOD	10.46
51	104.47	24.46	< LOD	54.27	< LOD	25.31	< LOD	14.34	< LOD	10.01
52	67.85	22.79	< LOD	64.45	< LOD	25.47	< LOD	13.94	< LOD	10.02
53	70.54	22.82	< LOD	69.56	< LOD	28.46	< LOD	16.02	< LOD	11.25
54	66.55	28.54	< LOD	90.79	< LOD	29.59	< LOD	16.85	< LOD	12.51
55	45.88	25.58	< LOD	75.4	< LOD	29.67	< LOD	16.22	< LOD	12.51
56	65.64	24.56	< LOD	77.69	< LOD	24.07	< LOD	13.84	< LOD	9.69
57	50.76	22.4	< LOD	74.48	< LOD	25.27	< LOD	14.31	< LOD	10.52
58	< LOD	25.12	< LOD	66.53						
59	57.76	24.23	104.04	51.69	< LOD	29.01	< LOD	16.29	< LOD	11.9
60	59.91	23.69	< LOD	69.41	< LOD	24.01	< LOD	13.22	< LOD	10.02
61	47.07	24.71	111.45	53.83	< LOD	29.75	< LOD	16.85	< LOD	12.19
62	80.3	23.76	< LOD	71.57	< LOD	27.44	< LOD	15.11	< LOD	11.59

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APPENDIX C

X-RAY FLUORESCENCE DATA

XRF No.	Parcel or Area	Material Description	Comments	Soil or waste	Date / Time	Duration	Units
63	Sub Area C	Moist, brown silty fine sand		soil	10/10/2011 18:12	90.78	ppm
64	Sub Area C	Moist, brown silty fine sand		soil	10/10/2011 18:16	92.16	ppm
65	Sub Area C	Fine stamp sand		waste	10/10/2011 18:20	91.42	ppm
66	Sub Area C	Stamp sand	On side wall of washout on lakeshore.	waste	10/10/2011 18:23	91.02	ppm
67	Sub Area C	Brown silty fine sand		soil	10/10/2011 18:26	91.33	ppm
71	Sub Area C	Reddish stamp sand		waste	10/11/2011 9:19	91.76	ppm
72	Sub Area C	Fine red stamp sand	On shoreline.	waste	10/11/2011 9:23	91.37	ppm
73	Sub Area C	Fine red stamp sand	On shoreline.	waste	10/11/2011 9:26	91.34	ppm
74	Sub Area C	Fine red stamp sand	On shoreline.	waste	10/11/2011 9:28	91.19	ppm
75	Sub Area C	Red silty fine sand		soil	10/11/2011 9:32	91.29	ppm
76	Sub Area C	Red silty fine sand		soil	10/11/2011 9:34	91.36	ppm
77	Sub Area C	Red silty fine sand	Park area.	soil	10/11/2011 9:37	91.33	ppm
78	Sub Area C	Sand, gravel, slag		both	10/11/2011 9:40	91.43	ppm
79	Sub Area C	Scale, sand	SS-06.	both	10/11/2011 9:42	91.86	ppm
80	Sub Area C	Fine red silty sand		soil	10/11/2011 9:56	91.68	ppm
81	Sub Area C	Fine red silty sand	Photos taken facing S, W, N, S, N, E.	soil	10/11/2011 9:59	91.17	ppm
82	Sub Area C	Fine red silty sand		soil	10/11/2011 10:15	91.15	ppm
83	Sub Area C	Red sand, gravel		soil	10/11/2011 10:18	91.19	ppm
84	Sub Area C	Sand, gravel		soil	10/11/2011 10:21	91.6	ppm
85	Sub Area C	Brown sand, gravel		soil	10/11/2011 10:23	91.72	ppm
86	Sub Area C	Brown silty sand		soil	10/11/2011 10:26	91.6	ppm
87	Sub Area C	Red sand, gravel		soil	10/11/2011 10:28	91.38	ppm
88	Sub Area C	Fine sand		soil	10/11/2011 10:31	91.64	ppm
89	Sub Area C	Brown silty sand, gravel		soil	10/11/2011 10:34	91.13	ppm
90	Sub Area C	Gray sludge	From soil boring SB-13.	waste	10/11/2011 10:36	91.8	ppm
91	Sub Area C	Red silty sand		soil	10/11/2011 10:43	91.23	ppm
92	Sub Area C	Moist, dark brown silty sand		soil	10/11/2011 10:46	91.41	ppm
93	Sub Area C	Red silty sand		soil	10/11/2011 10:49	91.89	ppm
94	Sub Area C	Moist, dark brown silty sand		soil	10/11/2011 10:57	94.47	ppm
95	Sub Area C	Ash	Fire pit where wood debris was burned. Photo to the west.	waste	10/11/2011 11:01	91.29	ppm
96	Sub Area C	Sand, gravel		soil	10/11/2011 11:07	91.14	ppm
97	Sub Area C	Sand, gravel	SS-04.	soil	10/11/2011 11:10	91.4	ppm

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X-RAY FLUORESCENCE DATA

XRF No.	Molybdenum	Mo Error	Strontium	Sr Error	Lead	Pb Error	Selenium	Se Error	Arsenic	As Error	Mercury	Hg Error
63	< LOD	7.58	37.06	4.37	18	7.75	< LOD	4.85	< LOD	8.84	< LOD	10.68
64	< LOD	8.07	122.61	7.67	78	13.22	< LOD	5.75	< LOD	15.26	< LOD	11.82
65	< LOD	8.3	85.04	6.5	32	9.91	< LOD	6.08	< LOD	11.72	< LOD	12.47
66	< LOD	8.47	89.92	6.73	29	9.53	< LOD	5.47	< LOD	10.96	< LOD	13.31
67	< LOD	7.68	38.91	4.44	< LOD	10.72	< LOD	4.98	< LOD	8.4	< LOD	9.85
71	< LOD	8.49	83.11	6.54	19	9.07	< LOD	6.45	< LOD	10.58	< LOD	11.73
72	< LOD	8.05	85.84	6.44	355	25.14	< LOD	6.8	45.9	20.02	< LOD	11.71
73	< LOD	8.13	84.8	6.31	31	9.48	< LOD	5.41	< LOD	10.39	< LOD	11.29
74	< LOD	11.03	96.32	8.44	94	17.34	< LOD	6.71	< LOD	20.35	< LOD	16.23
75	< LOD	8.12	39.52	4.69	14	7.95	< LOD	5.67	< LOD	8.43	< LOD	10.67
76	< LOD	7.99	36.73	4.5	18	8.3	< LOD	5.54	< LOD	8.89	< LOD	11.21
77	< LOD	7.56	43.52	4.54	12	7.02	< LOD	4.73	< LOD	8.5	< LOD	10.2
78	< LOD	7.67	61.92	5.5	23	8.64	< LOD	5.66	< LOD	9.88	< LOD	11.75
79	< LOD	11.85	72.87	8.23	28	13.19	< LOD	9.9	**33.3**	12.72	< LOD	24.07
80	< LOD	7.9	37.89	4.45	16	7.74	< LOD	5.19	< LOD	9.05	< LOD	10.44
81	< LOD	7.64	38.74	4.27	16	7.55	< LOD	5.26	< LOD	7.87	< LOD	9.59
82	< LOD	8.31	51.5	5.19	21	8.47	< LOD	5.28	< LOD	10.28	< LOD	11.95
83	< LOD	7.51	70.12	5.59	< LOD	10.35	< LOD	5.05	< LOD	8.14	< LOD	10.24
84	< LOD	8.04	74.13	5.89	16	7.96	< LOD	5.64	< LOD	9.63	< LOD	10.27
85	14.88	5.61	64.12	5.68	27	9.16	< LOD	5.75	< LOD	10.08	< LOD	11.58
86	10.36	4.39	36.65	3.75	14	6.23	< LOD	3.79	< LOD	6.94	< LOD	8.16
87	< LOD	8.41	111.52	7.12	20	8.48	< LOD	5.46	< LOD	9.85	< LOD	11.15
88	< LOD	7.7	55.73	5.14	24	8.5	< LOD	5.22	< LOD	9.29	< LOD	9.45
89	< LOD	8.19	78.98	6.19	27	9.31	< LOD	6.06	< LOD	10.11	< LOD	11.41
90	11.52	7.46	296.45	16.21	16726	225.89	< LOD	25.2	497.0	172.48	< LOD	27.86
91	< LOD	7.77	55.97	5.11	22	8.25	< LOD	5.01	< LOD	9.13	< LOD	10.41
92	9.05	3.88	18.27	2.69	27	6.71	< LOD	3.72	< LOD	7.16	< LOD	6.59
93	< LOD	6.87	36.14	3.93	13	6.64	< LOD	4.53	< LOD	7.4	< LOD	9.14
94	5.98	3.74	24.37	2.88	116	11.05	< LOD	3.55	< LOD	12.44	< LOD	6.88
95	< LOD	15.71	235.71	19.53	< LOD	35.68	< LOD	44.17	62777.2	474.45	< LOD	67.55
96	< LOD	7.48	38.43	4.46	16	7.75	< LOD	5.33	**15.1**	6.81	< LOD	10.08
97	< LOD	7.85	93.48	6.63	36	9.95	< LOD	5.72	< LOD	11.42	< LOD	11.47

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X-RAY FLUORESCENCE DATA

XRF No.	Zinc	Zn Error	Copper	Cu Error	Nickel	Ni Error	Cobalt	Co Error	Manganese	Mn Error
63	41.11	13.99	124	26.52	< LOD	62.13	< LOD	152.3	305.47	80.39
64	88.53	22.31	1686	78.03	< LOD	72.78	< LOD	245.59	707.52	121.12
65	62.01	19.57	1164.32	65.45	< LOD	68.75	293.96	152.01	447.36	102.36
66	46.98	19.73	1622.97	76.99	< LOD	68.93	< LOD	219.79	354.44	96.38
67	24.05	11.83	40	21.15	< LOD	60.34	< LOD	130.82	240.21	72.99
71	80.05	20.51	1049.17	63.42	< LOD	66.64	< LOD	208.08	414.08	99.36
72	58.95	18.82	1172.02	64.67	< LOD	69.33	< LOD	198.28	403.21	95.6
73	45.22	16.77	830.65	54.62	< LOD	65.05	< LOD	189.56	265.25	83.99
74	< LOD	39.59	1091.58	79.48	< LOD	103.81	< LOD	548.38	932.59	192.41
75	29.46	13.43	70	25	< LOD	62.96	< LOD	144.25	347.42	86.57
76	34.49	13.81	62	23.73	< LOD	60.94	< LOD	151.88	363.66	87.23
77	46.14	14.28	105	24.55	< LOD	58.21	< LOD	164.08	366.18	84.66
78	37.23	16.53	1003	59.15	< LOD	70.9	224.75	129.85	305.21	86.34
79	< LOD	99.16	**31638**	434.93	< LOD	139.63	1323.97	454.84	620.25	201.12
80	25.26	13.71	329	36.6	< LOD	58.52	< LOD	175.4	371.98	88.73
81	34.53	12.75	188	28.27	< LOD	57.18	< LOD	125.13	369.93	80.74
82	26.25	14.2	116	27.69	< LOD	67.96	< LOD	198.98	583.06	107.61
83	22.52	12.72	210	30.54	< LOD	57.66	< LOD	153.15	258.92	76.55
84	31.77	13.52	157	29.25	< LOD	62.74	< LOD	143.29	206.49	73.34
85	35.87	15.13	363	39.92	< LOD	66.53	< LOD	147.15	270.12	79.99
86	32.44	10.65	66	18.67	< LOD	44.62	< LOD	81.99	331.07	67.4
87	48.39	16.58	631	48.62	< LOD	67.01	< LOD	191.48	279.74	85.23
88	30.4	13.16	167	29.09	< LOD	61.92	< LOD	163.59	376.94	87.52
89	41.92	15.43	266	35.35	< LOD	67.77	< LOD	182.95	357.86	91.4
90	539.92	56.84	3132.18	141.05	< LOD	119.39	276.93	130.86	2376.18	289.73
91	28.27	13.06	78	23.67	< LOD	61.32	< LOD	165.91	284.42	79.58
92	42.22	10.13	70	16.18	< LOD	35.58	< LOD	65.8	97.12	43.27
93	26.37	11.01	78	20.77	< LOD	52.25	< LOD	115.28	215.26	64.37
94	31.82	9.78	293	25.43	< LOD	38.37	85.25	51.11	193.23	50.89
95	1315.04	188.71	95904.05	1041.21	< LOD	246.18	< LOD	428.03	5953.95	1197.96
96	27.33	12.98	170	29.39	< LOD	59.82	< LOD	128.96	267.97	77.55
97	56.13	17.31	611	48.45	< LOD	66.04	227.14	130.68	402.08	94.14

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X-RAY FLUORESCENCE DATA

XRF No.	Chromium	Cr Error	Vanadium	V Error	Antimony	Sb Error	Cadmium	Cd Error	Silver	Ag Error
63	74.01	23.55	71.63	44.88	< LOD	23.45	< LOD	13.22	< LOD	9.6
64	< LOD	39.41	148.81	62.98	< LOD	28.04	< LOD	15.13	< LOD	11.48
65	46.63	24.26	95.94	51.38	< LOD	26.39	< LOD	14.67	< LOD	11.1
66	41.88	23.47	90.75	51	< LOD	25.95	< LOD	14.49	< LOD	10.49
67	70.92	22.91	< LOD	71.87	< LOD	26.15	< LOD	14.27	< LOD	10.73
71	87.67	24.73	98.86	48.65	< LOD	26.98	< LOD	14.96	< LOD	11.33
72	42.88	22.82	88.37	48.51	< LOD	25.83	< LOD	14.06	< LOD	10.84
73	46.16	22.82	< LOD	72.81	< LOD	25.78	< LOD	14.1	< LOD	11.15
74	60.01	28.12	127.79	67.83	< LOD	30.83	< LOD	16.42	< LOD	12.74
75	61.08	21.39	< LOD	59.8	< LOD	27.1	< LOD	15.29	< LOD	11.54
76	39.01	21.45	< LOD	66.65	< LOD	25.25	< LOD	14.01	< LOD	10.22
77	45.48	24.58	< LOD	81.62	< LOD	23.76	< LOD	13.32	< LOD	9.63
78	56.63	24.29	< LOD	77.23	< LOD	26.25	< LOD	14.43	< LOD	10.7
79	< LOD	40.68	< LOD	81.49	< LOD	30.39	< LOD	16.72	< LOD	14.29
80	47.14	22.24	< LOD	70.93	< LOD	24.83	< LOD	13.87	< LOD	10.06
81	61.27	22.94	< LOD	67.16	< LOD	22.18	< LOD	12.17	< LOD	8.96
82	50.14	24.94	< LOD	86.24	< LOD	26.04	< LOD	14.8	< LOD	10.39
83	65.07	23.02	< LOD	66.96	< LOD	24.4	< LOD	13.61	< LOD	9.77
84	64.67	21.73	< LOD	63.75	< LOD	26.53	< LOD	14.69	< LOD	11.13
85	87.71	22.4	< LOD	61.37	< LOD	25.42	< LOD	14.12	< LOD	10.38
86	55.45	22.65	< LOD	53.01	< LOD	17.83	< LOD	9.51	< LOD	7.09
87	63.86	24.19	< LOD	70.26	< LOD	25.3	< LOD	14	< LOD	10.39
88	81.76	23.81	< LOD	69.72	< LOD	25.96	< LOD	14.23	< LOD	10.57
89	66.85	23.68	75.49	48.66	< LOD	25.29	< LOD	13.81	< LOD	10.54
90	< LOD	113.06	< LOD	594.76	< LOD	52.03	< LOD	29.99	< LOD	24.96
91	62.27	24.9	< LOD	85.43	< LOD	25.51	< LOD	14.47	< LOD	10.24
92	44.78	23.66	< LOD	57.65	< LOD	15.26	< LOD	8.54	< LOD	6.08
93	60.9	23.08	< LOD	65.21	< LOD	21.01	< LOD	11.59	< LOD	8.79
94	< LOD	35.92	< LOD	68.55	< LOD	16.1	< LOD	8.96	< LOD	6.53
95	36128.12	285.18	< LOD	87.78	187.05	34.84	< LOD	23.97	< LOD	17.48
96	95.9	23.02	60.44	39.36	< LOD	25	< LOD	13.84	< LOD	10.22
97	102.77	24.56	78.03	43.7	< LOD	27.44	< LOD	15.19	< LOD	11.15

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X-RAY FLUORESCENCE DATA

XRF No.	Parcel or Area	Material Description	Comments	Soil or waste	Date / Time	Duration	Units
98	Sub Area C	Sand		soil	10/11/2011 11:13	93.11	ppm
99	Sub Area C	Sand, gravel	3 photos to north showing kids on nature walk just past softball field.	soil	10/11/2011 11:16	91.81	ppm
100	Sub Area C	Sand, gravel		soil	10/11/2011 11:19	91.87	ppm
101	Sub Area C	Stamp sand		waste	10/11/2011 11:29	91.52	ppm
102	Sub Area C	Stamp sand, sand, organics		both	10/11/2011 11:31	92.03	ppm
103	Sub Area C	Dry, grayish-tan stamp sand, sand		both	10/11/2011 11:34	92.29	ppm
104	Sub Area C	Stamp sand		waste	10/11/2011 11:37	92.37	ppm
105	Mineral Building	Sand, gravel, slag		both	10/11/2011 13:11	91.78	ppm
106	Mineral Building	Gray slag		waste	10/11/2011 13:14	91.51	ppm
107	Mineral Building	Gray slag, sand		both	10/11/2011 13:16	94.38	ppm
108	Mineral Building	Gray slag	Not GPS'ed due to poor satellite coverage. Location is 15' west and 100' south of NW corner of mineral building.	waste	10/11/2011 13:19	90.94	ppm
109	Mineral Building	Gray stamp sand		waste	10/11/2011 13:22	91.79	ppm
110	Mineral Building	Gray stamp sand		waste	10/11/2011 13:28	92.82	ppm
111	Mineral Building	Brown stamp sand		waste	10/11/2011 13:33	90.91	ppm
112	Mineral Building	Brown sand		soil	10/11/2011 13:36	91.35	ppm
113	Mineral Building	Dry scale, cinders, silt, sand	SS-20.	both	10/11/2011 13:40	93.11	ppm
114	Mineral Building	Moist, brown sand, rubble		soil	10/11/2011 13:53	91.65	ppm
115	Mineral Building	Moist, brown sand		soil	10/11/2011 14:03	91.75	ppm
116	Mineral Building	Sand, stamp sand, slag		both	10/11/2011 14:07	91.82	ppm
117	Mineral Building	Gray sludge	Material is spilled out of demolished smokestack. Photographed with SS-19.	waste	10/11/2011 14:10	91.41	ppm
118	Mineral Building	Gray sludge	1 photo.	waste	10/11/2011 14:26	91.73	ppm
119	Mineral Building	Moist, dark brown sand		soil	10/11/2011 14:30	91.86	ppm

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X-RAY FLUORESCENCE DATA

XRF No.	Molybdenum	Mo Error	Strontium	Sr Error	Lead	Pb Error	Selenium	Se Error	Arsenic	As Error	Mercury	Hg Error
98	< LOD	6.92	58.85	4.91	121	13.88	< LOD	5.14	< LOD	15.83	< LOD	10.2
99	< LOD	8.06	137.96	8.14	23	8.99	< LOD	5.88	< LOD	10.7	< LOD	12.99
100	< LOD	8.25	107.13	7.23	64	12.33	< LOD	6.25	< LOD	14.56	< LOD	12.8
101	< LOD	8.42	87.25	6.84	25	9.3	< LOD	5.41	< LOD	11.75	< LOD	12.84
102	< LOD	7.08	58.74	5	30	8.54	< LOD	5.03	< LOD	9.58	< LOD	10.04
103	< LOD	8.13	127.57	7.96	28	9.57	< LOD	5.98	< LOD	11.38	< LOD	13.19
104	< LOD	8.6	95.1	7.26	32	10.45	< LOD	6.75	< LOD	12.73	< LOD	13.12
105	< LOD	8	66.39	5.91	28	9.43	< LOD	5.83	**13.4**	7.98	< LOD	13.99
106	8.59	3.93	100.58	5.27	37	7.61	6.08	2.96	21.3	6.61	< LOD	7.86
107	11.01	4.36	82.17	5.2	113	12.38	< LOD	4.92	< LOD	14.58	< LOD	9.55
108	< LOD	7.65	93.45	6.46	49	10.55	< LOD	5.52	20.7	9.03	< LOD	11.9
109	< LOD	6.98	50.67	4.59	31	8.39	< LOD	4.68	< LOD	9.85	< LOD	9.45
110	< LOD	8.17	81.84	6.71	29	9.76	< LOD	5.82	< LOD	11.61	< LOD	13.04
111	< LOD	7.79	75.05	6.02	80	12.96	< LOD	5.89	< LOD	14.98	< LOD	12.86
112	< LOD	6.86	62.54	5.12	46	9.82	< LOD	5.22	**12.7**	7.94	< LOD	9.9
113	< LOD	10.95	112.64	9.93	**866**	51.84	< LOD	10.02	< LOD	60.68	< LOD	25.22
114	< LOD	8.18	289.36	11.45	**880**	39.46	< LOD	8.32	**119.3**	31.63	< LOD	16.07
115	< LOD	7.53	74.35	5.73	291	21.63	< LOD	5.65	**38.2**	17.24	< LOD	11.82
116	< LOD	6.76	57.92	4.84	100	12.64	< LOD	4.56	< LOD	14.44	< LOD	9.19
117	< LOD	13.34	295.01	19.34	1417	82.86	33.26	16.45	2957.9	111.31	< LOD	63.71
118	< LOD	14.15	253.68	19.02	286	42.01	< LOD	23.86	2445.1	94.7	< LOD	63.73
119	< LOD	6.08	73	4.89	209	15.95	< LOD	4.34	**23.0**	12.59	< LOD	9.82

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X-RAY FLUORESCENCE DATA

XRF No.	Zinc	Zn Error	Copper	Cu Error	Nickel	Ni Error	Cobalt	Co Error	Manganese	Mn Error
98	76.86	16.77	765	47.65	< LOD	54.03	< LOD	137.69	313.05	75.56
99	87.97	20.89	648	51.59	< LOD	74.83	< LOD	240.88	695.62	121.3
100	93.1	20.27	458	44.54	78.23	50.69	< LOD	196.03	355.99	94.09
101	61.25	19.97	699.39	55.1	< LOD	80.48	< LOD	263.29	595.39	120.52
102	55.1	15.75	695	46.62	< LOD	57.87	178.59	111.34	326.77	80.91
103	59.73	20.5	1120	66.2	< LOD	80.13	< LOD	271.01	566.98	117.28
104	63.99	20.98	1057.22	67.35	< LOD	78.07	284.03	169.73	513.3	115.5
105	168.51	29.55	3649	113.54	< LOD	74.24	< LOD	228.19	419.74	102.46
106	33.97	11.66	888.28	42.85	< LOD	39.43	< LOD	99.81	82.34	45.62
107	181.31	26.28	6591	121.5	< LOD	49.97	< LOD	122.74	220.79	63.7
108	107.77	21.3	1356.29	66.89	< LOD	63.02	< LOD	175.55	286.38	82.08
109	48.63	14.3	616.61	42.97	< LOD	51.95	< LOD	106.44	287.09	71.66
110	204.93	30.55	2139.88	91.85	< LOD	87.11	286.23	188.24	835.94	137.33
111	490.93	38.98	2817.08	96.74	< LOD	64.58	< LOD	178.8	688.55	113.18
112	146.27	21.38	1224	59.86	< LOD	55.97	< LOD	135.71	328.03	78.23
113	2894.11	128.04	18638	333.5	< LOD	140.42	< LOD	809.02	1276.96	259.17
114	2564.38	86.91	11511	196.85	< LOD	72.56	< LOD	209.36	247.82	91.39
115	563.39	41.18	5495	127.4	< LOD	62.68	< LOD	127.93	97.22	62.03
116	147.53	22.23	2425	80.7	< LOD	52.75	< LOD	100.43	< LOD	80.26
117	28012.93	484.59	198552.02	1342.65	< LOD	234.3	< LOD	416.77	< LOD	299.03
118	1871.12	277.98	282923.75	1704.48	< LOD	259	< LOD	402.75	< LOD	370.58
119	1039.31	45.12	5095	105.94	< LOD	47.6	< LOD	95.63	85.15	49.81

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X-RAY FLUORESCENCE DATA

XRF No.	Chromium	Cr Error	Vanadium	V Error	Antimony	Sb Error	Cadmium	Cd Error	Silver	Ag Error
98	102.86	25.15	90.09	48.42	< LOD	23.11	< LOD	12.92	< LOD	9.44
99	44.83	24.93	101.18	55.62	< LOD	26.97	< LOD	14.95	< LOD	10.98
100	64.44	22.83	67.02	44.64	< LOD	25.21	< LOD	14.43	< LOD	10.49
101	85.43	26.27	< LOD	79.6	< LOD	28.59	< LOD	15.6	< LOD	11.53
102	50.02	24.28	91.94	48.85	< LOD	21.15	< LOD	11.81	< LOD	8.67
103	64.26	27.6	135.67	61.57	< LOD	27.95	< LOD	15.56	< LOD	11.94
104	90.74	25.1	94.01	50.03	< LOD	28.55	< LOD	15.75	< LOD	11.77
105	75.31	24.85	< LOD	74.58	< LOD	29.19	< LOD	16.36	< LOD	11.9
106	107.78	28.63	89.63	49.5	< LOD	15.31	< LOD	8.56	< LOD	6.27
107	102.92	27.77	119.87	52.26	< LOD	16.93	< LOD	9.15	< LOD	6.9
108	95.57	24.67	85.87	44.67	< LOD	22.94	< LOD	12.64	< LOD	9.17
109	64.34	22.1	< LOD	62.74	< LOD	23.12	< LOD	12.8	< LOD	9.41
110	101.82	27.37	116.62	55.16	< LOD	28.88	< LOD	16.11	< LOD	11.99
111	95.31	25.69	98.19	47.27	< LOD	24.77	< LOD	13.9	< LOD	10.29
112	105.25	24.95	< LOD	66.43	< LOD	22.83	< LOD	12.48	< LOD	9.49
113	41.74	27.53	< LOD	66.57	< LOD	34.11	< LOD	19.41	< LOD	14.04
114	204.32	30.02	83.88	55.47	< LOD	26.43	18.89	10.37	13.62	7.76
115	116.99	23.79	< LOD	58.51	< LOD	24.67	< LOD	13.95	< LOD	10.14
116	101.16	22.4	< LOD	49.71	< LOD	24.21	< LOD	13.34	< LOD	10.21
117	231.53	30.54	118.34	58.96	< LOD	36.07	51.05	15.66	19.31	11.1
118	260.14	29.59	121.05	53.73	< LOD	38.38	< LOD	21.64	23.56	12.05
119	94.61	26.01	< LOD	55.12	< LOD	17.26	< LOD	9.52	< LOD	7.01

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X-RAY FLUORESCENCE DATA

XRF No.	Parcel or Area	Material Description	Comments	Soil or waste	Date / Time	Duration	Units
120	Mineral Building	Moist, greenish-gray sludge	Within demolished smokestack. 1 photo.	waste	10/11/2011 14:34	92.3	ppm
121	Mineral Building	Sand, gray sludge, slag		both	10/11/2011 14:40	91.21	ppm
122	Mineral Building	Moist, dark gray gravel, sludge, debris		waste	10/11/2011 14:49	91.42	ppm
123	Mineral Building	Sand, gravel, debris pile		soil	10/11/2011 14:54	92.1	ppm
124	Mineral Building	Azure blue w/ white flakes on fire brick		waste	10/11/2011 14:56	91.64	ppm
125	Mineral Building	Gray stamp sand	Took 360 degree panoramic view of drums and waste from top of pile.	waste	10/11/2011 14:59	91.31	ppm
126	Mineral Building	Moist, brown sand, debris	Close-up of waste pile and possible asbestos gasket material.	soil	10/11/2011 15:02	91.75	ppm
127	Mineral Building	Stamp sand, sand		both	10/11/2011 15:06	91.05	ppm
128	Mineral Building	Sand, gravel		soil	10/11/2011 15:13	91.88	ppm
129	Mineral Building	Dry, grayish-brown sand, slag, debris	SS-18.	both	10/11/2011 15:19	91.42	ppm
130	Mineral Building	Dry, grayish-brown sand, slag, debris		both	10/11/2011 15:34	90.99	ppm
131	Mineral Building	Grayish-brown, silty sand, paper	Pile.	soil	10/11/2011 15:39	91.77	ppm
132	Mineral Building	Brown sand, slag		both	10/11/2011 15:44	91.37	ppm
133	Mineral Building	Moist, grayish-brown silty sand, gravel, slag, fibrous material		both	10/11/2011 15:46	91.62	ppm
134	Mineral Building	Grayish-brown, silty sand, gravel		soil	10/11/2011 15:50	92.42	ppm
135	Mineral Building	Light brown, silty fine sand, gravel, slag		both	10/11/2011 15:53	90.85	ppm
136	Mineral Building	Brown, silty sand, slag, brick, debris		both	10/11/2011 16:08	91.63	ppm
137	Mineral Building	Gray slag over brown sand		both	10/11/2011 16:17	91.41	ppm
138	Mineral Building	Light brown silty sand, gravel		waste	10/11/2011 16:21	91.87	ppm

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X-RAY FLUORESCENCE DATA

XRF No.	Molybdenum	Mo Error	Strontium	Sr Error	Lead	Pb Error	Selenium	Se Error	Arsenic	As Error	Mercury	Hg Error
120	< LOD	15.15	406.96	25.33	200	39.48	33.83	17.5	2189.1	94.41	< LOD	68.68
121	< LOD	8.85	89	7.4	**473**	32.45	< LOD	9.1	**213.0**	29.48	< LOD	22.52
122	< LOD	8.86	153.83	9.55	705	39.58	< LOD	9.6	157.5	33.03	< LOD	22.93
123	< LOD	7.87	98.4	6.97	285	23.16	< LOD	7.45	**93.6**	20.01	< LOD	16.99
124	< LOD	9.8	36.76	5.86	470	36.18	< LOD	9.65	< LOD	41.75	< LOD	23.95
125	< LOD	9.25	76.07	7.21	16	9.77	< LOD	7.47	< LOD	12.56	< LOD	16.34
126	< LOD	8.58	99.14	7.21	168	18.97	< LOD	7.41	**102.7**	17.74	< LOD	16
127	< LOD	9	111.43	8.08	175	20.28	< LOD	6.37	**36.4**	16.67	< LOD	14.97
128	< LOD	8.26	98.63	7.38	**598**	34.57	< LOD	8.11	**130.7**	28.78	< LOD	16.49
129	13.74	6.69	214.41	11.58	**895**	46.29	< LOD	10.25	**512.9**	44.05	< LOD	21.41
130	10.72	6.26	142.9	9.2	**717**	39.81	< LOD	9.31	**224.7**	34.47	< LOD	18.74
131	< LOD	8.63	108.29	7.74	**682**	36.98	< LOD	7.75	**191.9**	31.64	< LOD	17.44
132	< LOD	7.73	70	5.84	290	22.58	< LOD	6.48	**134.2**	20.54	< LOD	13.92
133	10.84	5.4	75.22	6.33	**2001**	59.11	< LOD	9.07	**152.0**	46.18	< LOD	15.43
134	< LOD	7.84	84.02	6.28	303	22.93	< LOD	6.4	**44.7**	18.43	< LOD	13.51
135	< LOD	11.61	84.8	9.06	397	37.05	< LOD	12.21	**130.8**	32.17	< LOD	34.39
136	< LOD	11.88	205.13	14.26	**12139**	200.9	< LOD	25.11	**3956.0**	175.82	< LOD	32.82
137	< LOD	7.72	84.3	6.33	328	23.85	< LOD	6.31	**51.3**	19.28	< LOD	14.62
138	< LOD	8.16	91.14	7.01	304	24.76	< LOD	7.52	97.7	21.36	< LOD	17.4

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X-RAY FLUORESCENCE DATA

XRF No.	Zinc	Zn Error	Copper	Cu Error	Nickel	Ni Error	Cobalt	Co Error	Manganese	Mn Error
120	< LOD	437.42	332842.34	1962.83	< LOD	291.8	< LOD	442.5	< LOD	393.95
121	3302.76	122.74	**50995**	457.25	< LOD	98.15	< LOD	254.82	576.7	135.02
122	4798.49	138.31	39287.43	405.33	< LOD	100.36	< LOD	307.1	442.3	129.55
123	1633.39	78.37	**24473**	287.51	< LOD	75.45	< LOD	175.61	414.34	103.6
124	211.73	80.76	50533.26	509.45	< LOD	110.5	< LOD	125.59	< LOD	139.98
125	93.79	28.31	1987.74	98.26	< LOD	98.07	< LOD	372.83	1133.71	175.04
126	733.31	59.17	17688	251.43	< LOD	76.16	< LOD	219.9	351.72	102.17
127	242.17	36.5	4347	134.83	< LOD	83.99	< LOD	286.28	479.97	120.64
128	525.29	55.07	16868	251.89	< LOD	81.37	< LOD	264.65	752.81	135.01
129	2156.19	101.25	**26089**	343.78	< LOD	105.33	< LOD	335.72	408.54	143.14
130	2926.05	103.15	11694	221.51	< LOD	94.9	< LOD	346.16	451.61	129.34
131	604.15	62.95	**25327**	309.68	< LOD	89.85	< LOD	252.05	652.06	128.57
132	112.94	39.14	16517	229.78	< LOD	68.84	< LOD	215.22	285.42	91.74
133	722.59	56.17	15831	231.41	< LOD	74.53	< LOD	236.95	363.88	102.25
134	436.54	41.11	7550	154.81	< LOD	68.6	< LOD	208.02	431.02	99.32
135	1443.8	148.99	**112291**	837.61	< LOD	144.08	386.97	240.17	573.5	179.24
136	2598.85	130.46	**25377**	406.68	164.91	104.42	< LOD	473.89	1121.98	227.27
137	483.18	51.96	**20908**	257.78	< LOD	70.02	< LOD	157.31	263.18	84.6
138	681.66	65.08	28233.81	320.63	< LOD	82.64	< LOD	209.41	336.6	102.88

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X-RAY FLUORESCENCE DATA

XRF No.	Chromium	Cr Error	Vanadium	V Error	Antimony	Sb Error	Cadmium	Cd Error	Silver	Ag Error
120	244.43	28.57	147	53.05	< LOD	41.14	< LOD	23.61	30.43	13.39
121	361.97	36.34	114.3	64.64	< LOD	28.24	< LOD	16.03	< LOD	12.21
122	191.74	30.62	101.56	54.71	< LOD	28.51	< LOD	16.39	< LOD	11.98
123	205.43	28.95	85.9	46.43	< LOD	26.08	< LOD	14.77	< LOD	10.83
124	211.27	24.21	< LOD	36.41	< LOD	29.51	< LOD	16.47	< LOD	12.44
125	48.19	27.21	149.2	65.07	< LOD	32.43	< LOD	17.66	< LOD	12.78
126	147.72	27.31	79.47	48.65	< LOD	27.08	< LOD	14.53	< LOD	10.47
127	121.24	27.09	115.08	53.1	< LOD	28.61	< LOD	15.76	< LOD	11.75
128	147.12	28.52	< LOD	71.53	< LOD	27.92	< LOD	15.45	< LOD	11.27
129	620.09	42.13	105	55.01	< LOD	29.43	< LOD	16.67	< LOD	12.77
130	116.16	29.37	< LOD	81.77	< LOD	27.05	< LOD	16.23	< LOD	12.26
131	141.8	29.46	< LOD	85.82	< LOD	27.23	< LOD	14.86	< LOD	11.08
132	103.56	26.31	86.56	47.18	< LOD	24.93	< LOD	13.58	< LOD	10.55
133	132.37	30.66	< LOD	87.34	< LOD	22.65	< LOD	12.53	< LOD	9.72
134	96.8	25.96	101.59	51.15	< LOD	25.48	< LOD	14.64	< LOD	10.57
135	166.57	26.78	75.24	43.64	< LOD	32.69	< LOD	19.01	< LOD	14.96
136	319.82	32.88	< LOD	72.44	**212**	28.24	38.72	17.08	42.05	12.5
137	124.64	25.49	71.78	46.13	< LOD	23.93	< LOD	13.3	< LOD	10.2
138	109.75	25.66	93.8	48.8	< LOD	26.42	< LOD	14.58	< LOD	11.06

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X-RAY FLUORESCENCE DATA

XRF No.	Parcel or Area	Material Description	Comments	Soil or waste	Date / Time	Duration	Units
139	Mineral Building	Moist, brown sand slag, debris	Pile.	both	10/11/2011 16:24	90.81	ppm
140	Mineral Building	Moist, black sand, ash, charred wood, debris	Pile.	waste	10/11/2011 16:27	91.74	ppm
141	Mineral Building	Grayish-brown slag		waste	10/11/2011 16:32	92.16	ppm
142	Mineral Building	Light brown, silty sand, slag, gravel		both	10/11/2011 16:37	91.51	ppm
143	Mineral Building	Ash material in bag	Not GPS'ed due to location being inside mineral building.	waste	10/11/2011 16:48	91.92	ppm
144	Coal Dock	Dry, greenish-gray silt, stamp sand, coal, slag	SS-16.	both	10/11/2011 17:10	91.49	ppm
145	Coal Dock	Blackish-gray, silty fine sand, slag, metal, debris, wire		both	10/11/2011 17:22	91.17	ppm
146	Coal Dock	Light brown, silty fine to medium sand, slag, coal, brick, wood		both	10/11/2011 17:24	91.7	ppm
147	Coal Dock	Blackish-gray, silty fine sand, wire, wood, debris	Took panoramic photos looking E, N, W, then S.	soil	10/11/2011 17:28	92.07	ppm
148	Coal Dock	Brownish-orange sludge	Sludge material in tipped over drum. Second drum of sludge nearby. 3 photos.	waste	10/11/2011 17:32	92.11	ppm
149	Coal Dock	Dry, light brown, silty fine to medium sand, debris, slag	Pile.	both	10/11/2011 17:38	91.44	ppm
150	Coal Dock	Dark brown, silty sand, wire, debris		both	10/11/2011 17:43	91.92	ppm
151	Coal Dock	Orangish-brown, fine sand, rusted metal, debris		both	10/11/2011 17:46	91.67	ppm
152	Coal Dock	White film on brown silty sand	11 partially buried drums. Photos	both	10/11/2011 17:53	91.89	ppm
153	Coal Dock	Black coal, stamp sand		waste	10/11/2011 17:58	91.68	ppm
154	Coal Dock	Dark brown silty sand, bark		soil	10/11/2011 18:03	91.61	ppm

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X-RAY FLUORESCENCE DATA

XRF No.	Molybdenum	Mo Error	Strontium	Sr Error	Lead	Pb Error	Selenium	Se Error	Arsenic	As Error	Mercury	Hg Error
139	< LOD	9	98.31	8.02	**2056**	67.82	< LOD	9.99	**200.8**	53.58	< LOD	17.74
140	11.87	5.81	81.71	6.77	694	36.81	< LOD	7.51	85.8	29.4	< LOD	16.69
141	< LOD	6.78	50.34	4.57	338	21.71	< LOD	5.22	33.2	17.08	< LOD	10.69
142	< LOD	8.76	141.12	9.06	88	15.47	< LOD	7.8	**30.4**	13.17	< LOD	18.8
143	7.27	4.66	156.58	7.62	132	14.56	< LOD	5.54	55.2	12.81	< LOD	12.42
144	< LOD	11.24	202.31	14.18	**5884**	142.68	< LOD	21.11	**239.9**	109.56	< LOD	54.51
145	< LOD	14.84	185.81	17.35	**7854**	205.59	< LOD	30.65	**324.1**	157.95	< LOD	84.79
146	< LOD	8.86	535.28	16.57	194	21.14	< LOD	8.44	< LOD	24.71	< LOD	19.03
147	< LOD	15.91	94.29	15.21	**9784**	256.1	83.79	28.87	**422.7**	196.81	< LOD	91.19
148	< LOD	30.8	< LOD	64.23	310184	2295.83	< LOD	242.69	17070.5	1776.79	< LOD	200.05
149	< LOD	9.18	184.86	10.39	**2354**	70.83	< LOD	10.21	**85.2**	54.26	< LOD	22.55
150	37.87	9.66	34.76	8.48	**7235**	176.73	< LOD	23.84	**352.2**	136.28	< LOD	42.23
151	< LOD	8.13	62	6.14	**4462**	89.67	< LOD	10.6	**203.6**	69.04	< LOD	16.16
152	15.37	5.27	66.3	5.63	88	13.39	< LOD	6.09	< LOD	15.82	< LOD	11.84
153	< LOD	6.58	65.53	4.86	186	15.87	6.57	3.6	35.0	12.88	< LOD	8.77
154	< LOD	7.37	73.22	5.74	**475**	27.36	< LOD	6.23	**91.5**	22.52	< LOD	13.3

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X-RAY FLUORESCENCE DATA

XRF No.	Zinc	Zn Error	Copper	Cu Error	Nickel	Ni Error	Cobalt	Co Error	Manganese	Mn Error
139	1047.94	67	7898	186.29	276.1	78.54	461.53	260.78	765.75	157.9
140	580.99	58.3	20162.35	273.23	< LOD	85.53	< LOD	227.99	431.92	109.95
141	287.97	33.36	8618.38	148.95	< LOD	55.35	< LOD	132.85	241.28	70.32
142	1255.25	79.24	**23305**	310.65	< LOD	94.49	< LOD	329.43	466.28	128.77
143	1445.04	59.44	8467.56	150.92	< LOD	59.76	< LOD	163.64	201.46	73.6
144	47716.22	506.41	**66607**	669.32	< LOD	163.26	< LOD	414.47	639.67	201.53
145	68781.52	768.39	**165608**	1315.08	< LOD	252.27	< LOD	508.8	1054.32	306.28
146	498.66	66.6	**33537**	360.69	< LOD	91.21	< LOD	259.1	158.97	96.21
147	43759.21	722.42	**305392**	1988.73	< LOD	321.62	< LOD	530.81	707.45	335.88
148	3902.02	357.41	13135.06	691.36	< LOD	717.46	< LOD	1866.23	1845.89	775.13
149	7144.09	157.45	**22536**	305.17	< LOD	96.02	< LOD	268.34	492.3	125.54
150	3213.23	198.08	**96120**	897.57	< LOD	224.66	< LOD	1036.96	3736.34	444.93
151	595.63	51.98	12485	209.93	< LOD	82.26	< LOD	224.62	< LOD	121.47
152	344.18	32.23	1813	77.62	< LOD	62.81	< LOD	82.42	< LOD	85.74
153	46.43	14.51	846.48	46.84	< LOD	50.65	233.01	120.34	< LOD	86.02
154	2913.69	84.12	5877	132.67	< LOD	65.64	< LOD	198.14	572.11	104.33

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X-RAY FLUORESCENCE DATA

XRF No.	Chromium	Cr Error	Vanadium	V Error	Antimony	Sb Error	Cadmium	Cd Error	Silver	Ag Error
139	291.44	35.77	99.68	56.75	< LOD	29.1	< LOD	16.25	< LOD	11.94
140	121.26	25.73	< LOD	62.42	< LOD	25.21	< LOD	13.93	< LOD	10.3
141	128.87	27.15	< LOD	70.49	< LOD	20.82	< LOD	11.66	< LOD	8.43
142	81.38	28.32	< LOD	81.2	< LOD	27.93	< LOD	15.28	< LOD	11.57
143	143.78	30.83	113.85	75.2	< LOD	19.05	< LOD	10.47	< LOD	7.77
144	112.35	33.69	< LOD	164.93	< LOD	36.09	< LOD	19.48	< LOD	14.56
145	140.33	30.85	156.57	99.52	50	28.73	< LOD	24.56	< LOD	16.88
146	127.33	28.6	169.03	63.8	< LOD	25.93	< LOD	14.16	< LOD	10.89
147	176.91	29.42	126.32	82.03	**638**	43.42	< LOD	29.51	< LOD	20.46
148	63.64	24.15	< LOD	66.65	1098.18	71.86	228.36	45.32	258.46	35.44
149	96.56	28.38	< LOD	105.92	< LOD	28.38	< LOD	15.85	< LOD	11.53
150	231.6	34.2	< LOD	72.78	< LOD	37.78	< LOD	21.53	< LOD	16.09
151	82.89	27.47	< LOD	68.76	< LOD	27.24	< LOD	15.81	< LOD	11.32
152	99.39	22.11	< LOD	41.15	< LOD	19.15	< LOD	10.64	< LOD	7.75
153	69.03	29.2	< LOD	73.3	< LOD	19.49	< LOD	10.72	< LOD	7.86
154	69.76	28.39	< LOD	90.88	< LOD	20.04	< LOD	11	< LOD	8.24

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X-RAY FLUORESCENCE DATA

XRF No.	Parcel or Area	Material Description	Comments	Soil or waste	Date / Time	Duration	Units
155	Coal Dock	Dry, grayish-brown silty fine to medium sand, coal, yellow material		soil	10/11/2011 18:08	91.64	ppm
156	Coal Dock	Brown sand, orange slag		both	10/11/2011 18:13	91.74	ppm
157	Coal Dock	Yellow-orange slag, sand, coal		both	10/11/2011 18:16	91.83	ppm
158	Coal Dock	Yellow-orange slag		waste	10/11/2011 18:17	31.64	ppm
159	Coal Dock	Brown silty sand, coal		soil	10/11/2011 18:20	91.52	ppm
160	Coal Dock	Scrap metal piece		waste	10/11/2011 18:28	31.55	ppm
161	Coal Dock	Black silty sand under metal debris	Metal debris appears to be shredded ammunition. Photos taken.	soil	10/11/2011 18:30	91.48	ppm
162	Coal Dock	Moist, black sand, slag		both	10/11/2011 18:34	91.89	ppm
163	Coal Dock	Orange-brown medium sand	Soil within chimney pipe laying on ground.	soil	10/11/2011 18:38	91.68	ppm
164	Coal Dock	Blackish-brown fine to medium sand, slag, coal		both	10/11/2011 18:43	92.21	ppm
165	Coal Dock	Moist, orange-brown fibrous material over dark brown sand, coal		both	10/11/2011 18:48	91.51	ppm
166	Coal Dock	Brown silty sand, coal		soil	10/11/2011 18:49	91.61	ppm
167	Coal Dock	Moist, dark brown silty sand, coal	SS-15.	soil	10/11/2011 18:54	91.64	ppm
171	Laboratory	Gray silty sand		soil	10/12/2011 9:09	91.25	ppm
172	Laboratory	Brown sand, stamp sand	Panoramic photos taken W, S, SE, E, N, NE.	both	10/12/2011 9:12	91.56	ppm
173	Laboratory	Brown sand, stamp sand		both	10/12/2011 9:14	91.32	ppm
174	Laboratory	Dark brown sand, gravel		soil	10/12/2011 9:17	91.32	ppm
175	Laboratory	Brown sand, gravel		soil	10/12/2011 9:20	91.52	ppm
176	Laboratory	Brown sand, gravel		soil	10/12/2011 9:22	91.95	ppm
177	Laboratory	Brown silty fine sand		soil	10/12/2011 9:24	91.5	ppm
178	Laboratory	Tan/gray silty fine sand		soil	10/12/2011 9:26	91.56	ppm
179	Laboratory	Brown silty sand		soil	10/12/2011 9:28	91.99	ppm
180	Laboratory	Moist, dark brown silty sand		soil	10/12/2011 9:31	91.35	ppm

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APPENDIX C

X-RAY FLUORESCENCE DATA

XRF No.	Molybdenum	Mo Error	Strontium	Sr Error	Lead	Pb Error	Selenium	Se Error	Arsenic	As Error	Mercury	Hg Error
155	17.77	5.61	92.86	6.86	**1051**	43.11	< LOD	7.91	< LOD	49.73	< LOD	13.09
156	10.76	5.27	135.99	7.79	179	18.12	< LOD	6.33	**65.4**	15.78	< LOD	11.88
157	< LOD	9.13	92.9	7.79	130	18.85	9.69	5.85	**93.0**	18.13	< LOD	14.89
158	< LOD	7.36	149.57	8.02	18	8.04	6.86	3.89	83.2	10.76	< LOD	9.29
159	8.82	5.27	104.14	6.96	161	17.44	< LOD	6.16	**52.3**	14.91	< LOD	11.48
160	< LOD	22.54	52.43	16.9	4004	218.28	< LOD	52.39	457.3	173.87	< LOD	161.62
161	< LOD	11.24	115.83	10.94	**4426**	122.27	< LOD	19.95	**214.4**	94.24	< LOD	47.17
162	9.54	5.65	229.37	10.49	43	11.3	< LOD	6.8	< LOD	13.65	< LOD	12.13
163	< LOD	8.91	89.97	7.48	44	12.11	< LOD	7.2	< LOD	14.24	< LOD	14.77
164	< LOD	7.39	323.61	11.14	89	12.93	< LOD	5.61	< LOD	14.98	< LOD	10.63
165	< LOD	7.21	71.61	5.71	23	8.38	< LOD	5.4	**19.1**	7.5	< LOD	10.68
166	< LOD	7.74	91.26	6.43	24	9.01	13.44	4.68	**47.3**	9.4	< LOD	10.15
167	< LOD	8.23	106.32	7.44	76	13.45	< LOD	6.69	**107.4**	14.95	< LOD	12.21
171	< LOD	8.07	71.25	6.05	56	11.63	< LOD	5.47	< LOD	13.54	< LOD	12.46
172	< LOD	8.39	97.82	7.1	44	11.09	< LOD	6.37	< LOD	13.14	< LOD	11.97
173	< LOD	7.72	68.2	5.69	58	11.37	< LOD	5.49	< LOD	13.07	< LOD	11.08
174	< LOD	7.75	104.53	7.01	132	16.08	< LOD	6.11	< LOD	18.77	< LOD	11.35
175	9.22	5.41	107.76	7.15	283	22.7	< LOD	6.38	< LOD	25.8	< LOD	12.53
176	< LOD	7.03	109.39	6.39	119	13.73	< LOD	5.24	< LOD	16.1	< LOD	9.57
177	< LOD	7.64	57.79	5.24	19	7.96	< LOD	4.85	< LOD	9.14	< LOD	10.28
178	< LOD	7.5	81.14	6.01	32	9.17	< LOD	5.78	< LOD	10.85	< LOD	10.97
179	< LOD	7.69	92.68	6.44	144	16.15	< LOD	5.74	< LOD	19.14	< LOD	11.02
180	< LOD	7.6	105.96	6.81	50	10.55	< LOD	5.1	< LOD	12.59	< LOD	10.73

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X-RAY FLUORESCENCE DATA

XRF No.	Zinc	Zn Error	Copper	Cu Error	Nickel	Ni Error	Cobalt	Co Error	Manganese	Mn Error
155	206.06	31.09	3029	103.19	< LOD	79.52	< LOD	340.69	310.79	107.67
156	29.78	17.9	1246	65.58	< LOD	73.35	379.15	199.16	237.27	94.95
157	< LOD	31.73	703	61.98	< LOD	103.93	< LOD	507.68	507.83	156.31
158	< LOD	14.57	199.92	30.62	< LOD	69.04	< LOD	365.58	196.6	101.27
159	< LOD	21.58	398	40.73	< LOD	68.97	< LOD	274.26	246.83	92.78
160	101947.92	1422.16	476351.72	3289.85	< LOD	591.12	< LOD	2605.11	1907.17	807.78
161	35138.03	430.18	**56777**	609.74	< LOD	168.02	< LOD	576.61	1448.24	259.98
162	< LOD	25.34	900	60.39	< LOD	80.27	304.32	189.31	289.12	100.75
163	< LOD	36.5	1224	75.91	< LOD	98.31	< LOD	490.44	2634.8	244.87
164	87.5	19.52	1277	62.99	< LOD	60.97	< LOD	191.5	290.9	82.06
165	< LOD	17.79	116	26.25	< LOD	64.73	< LOD	265.18	165.78	83.8
166	< LOD	19.01	211	31.9	< LOD	68.89	< LOD	242.79	206.78	84.68
167	< LOD	24.65	527	48.71	< LOD	79.39	< LOD	356.83	346.59	115.02
171	92.64	22.46	1600	76.14	< LOD	74.33	< LOD	241.8	682.36	119.66
172	72.45	20.26	928	61.23	< LOD	75.55	254.31	152.3	597.1	115.21
173	37.42	15.47	662	49.05	< LOD	62.37	< LOD	159.01	318.21	84.03
174	97.5	19.88	643	49.82	< LOD	66.06	< LOD	146.07	206.09	75.98
175	219.19	32.56	5526	135.55	< LOD	67.57	< LOD	210.61	388.8	97.11
176	93.08	17.99	1055	54.72	< LOD	55.53	< LOD	136.98	236.89	69.76
177	22.13	12.36	133	27.44	< LOD	57.37	< LOD	114.99	264.56	75.88
178	61.05	17.41	796	52.12	< LOD	61.33	< LOD	183.55	470.56	96.17
179	205.96	25.87	1015	58.62	< LOD	64.54	< LOD	201.7	316.16	87.05
180	81.83	19.45	1053	59.39	< LOD	65.55	264.57	140.88	475.92	99.33

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X-RAY FLUORESCENCE DATA

XRF No.	Chromium	Cr Error	Vanadium	V Error	Antimony	Sb Error	Cadmium	Cd Error	Silver	Ag Error
155	< LOD	42.85	< LOD	74.1	< LOD	20.88	< LOD	11.43	< LOD	8.35
156	60.05	29.55	< LOD	83.81	< LOD	21.51	< LOD	11.6	< LOD	8.42
157	< LOD	40.52	< LOD	91.16	< LOD	31.03	< LOD	17.01	< LOD	12.45
158	< LOD	53.66	< LOD	148.05						
159	< LOD	44.07	< LOD	83.17	< LOD	23.84	< LOD	13.21	< LOD	9.65
160	< LOD	86.56	< LOD	173.88						
161	152.76	34.83	< LOD	135.27	< LOD	31.88	< LOD	17.81	< LOD	12.82
162	77.19	26.82	91.94	50.01	< LOD	25.09	< LOD	13.93	< LOD	10.35
163	< LOD	42.75	82.6	54.73	< LOD	28.12	< LOD	15.23	< LOD	11.84
164	77.85	26.11	< LOD	80.39	< LOD	23.06	< LOD	12.78	< LOD	9.45
165	< LOD	41.65	< LOD	63.69	< LOD	24.44	< LOD	13.24	< LOD	10.34
166	< LOD	41.28	104.6	62.53	< LOD	23.48	< LOD	13.16	< LOD	9.67
167	< LOD	41.93	< LOD	73.01	< LOD	25.72	< LOD	14.47	< LOD	10.78
171	46.48	26.91	120.82	59.58	< LOD	26.03	< LOD	14.43	< LOD	10.9
172	71.48	23.86	< LOD	73.19	< LOD	26.69	< LOD	14.95	< LOD	11.26
173	75.14	23.05	< LOD	66.51	< LOD	26.72	< LOD	14.85	< LOD	11.18
174	86.15	21.56	< LOD	51.8	< LOD	25.78	< LOD	14.62	< LOD	10.5
175	66.13	23.96	< LOD	67.97	< LOD	25.54	< LOD	14.14	< LOD	10.51
176	63.03	24.5	79.53	49.7	< LOD	22.91	< LOD	12.96	< LOD	9.31
177	73.56	21.44	< LOD	59.26	< LOD	24.82	< LOD	14.25	< LOD	10.32
178	52.55	24.5	< LOD	76.05	< LOD	25.67	< LOD	14.65	< LOD	10.42
179	78.09	26.31	117.62	60.59	< LOD	24.92	< LOD	13.8	< LOD	10.12
180	55.68	25.98	< LOD	78.59	< LOD	22.85	< LOD	12.35	< LOD	9.3

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X-RAY FLUORESCENCE DATA

XRF No.	Parcel or Area	Material Description	Comments	Soil or waste	Date / Time	Duration	Units
181	Laboratory	Moist, dark brown sand		soil	10/12/2011 9:34	91.53	ppm
182	Coal Dock	Stamp sand, sand		both	10/12/2011 10:37	91.48	ppm
183	Coal Dock	Dark brown sandy topsoil	Under 3 inches of leaf litter.	soil	10/12/2011 10:41	91.61	ppm
184	Coal Dock	Stamp sand		waste	10/12/2011 10:44	91.21	ppm
185	Coal Dock	Moist, dark brown fine sand, orange material	Pile.	both	10/12/2011 10:47	91.27	ppm
186	Coal Dock	Fine silty sand		soil	10/12/2011 10:53	92.08	ppm
187	Coal Dock	Crushed limestone	2 photos.	limestone	10/12/2011 10:56	92.13	ppm
188	Coal Dock	Gray silty fine sand, coal, slag, debris		both	10/12/2011 11:04	91.67	ppm
189	Coal Dock	Moist, dark brown silty fine sand, organic matter		soil	10/12/2011 11:08	91.72	ppm
190	Coal Dock	Sand, slag		both	10/12/2011 11:12	91.64	ppm
191	Coal Dock	Moist, dark brown silty fine sand, organic matter		soil	10/12/2011 11:18	91.92	ppm
192	Coal Dock	Moist, dark brown silty fine sand, organic matter	Berm.	soil	10/12/2011 11:22	91.98	ppm
193	Coal Dock	Coal, stamp sand	Waste pile. 2 photos of multiple waste piles.	waste	10/12/2011 11:26	91.6	ppm
194	Coal Dock	Brown fine sand	1 photo to SE of waste piles.	soil	10/12/2011 11:29	92.05	ppm
195	Coal Dock	Brown sand, gravel	2 photos to south.	soil	10/12/2011 11:33	91.56	ppm
196	Coal Dock	Moist, blackish-gray silty sand, stamp sand		both	10/12/2011 11:40	92.04	ppm
197	Coal Dock	Moist, black silty sand		soil	10/12/2011 11:45	92.08	ppm
198	Coal Dock	Stamp sand, coal		waste	10/12/2011 11:50	92.03	ppm
199	Coal Dock	Moist, brown silty sand, organic matter		soil	10/12/2011 11:53	91.4	ppm
200	Coal Dock	Moist, brown silty sand, organic matter		soil	10/12/2011 11:58	91.38	ppm
201	Coal Dock	Moist, brown silty sand, coal	2 photos S and SE of railroad timber piles.	soil	10/12/2011 12:03	92.04	ppm
202	Coal Dock	Moist, brown silty sand, organic matter	2 photos S and N showing erosion in stream channel.	soil	10/12/2011 12:07	91.51	ppm

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X-RAY FLUORESCENCE DATA

XRF No.	Molybdenum	Mo Error	Strontium	Sr Error	Lead	Pb Error	Selenium	Se Error	Arsenic	As Error	Mercury	Hg Error
181	9.7	4.87	135.44	7.19	219	18.3	< LOD	5.48	**21.6**	14.34	< LOD	10.1
182	< LOD	8.74	83.12	7.1	65	13.6	< LOD	6.8	**30.3**	11.95	< LOD	14.6
183	< LOD	6.45	54.11	4.46	53	9.38	< LOD	4.23	< LOD	11.04	< LOD	8.47
184	< LOD	8.83	91.17	7.37	235	22.97	< LOD	6.68	43.0	18.78	< LOD	16.29
185	< LOD	6.06	44.68	4	85	10.89	< LOD	4.35	**15.9**	8.75	< LOD	8.37
186	< LOD	7.69	182.95	8.96	390	25.93	< LOD	6.79	**127.2**	22.48	< LOD	14.06
187	< LOD	8.32	167.93	9.38	15	8.56	< LOD	6.24	< LOD	10.34	< LOD	12.54
188	< LOD	7.41	74.17	5.76	266	20.85	< LOD	5.61	**65.6**	17.49	< LOD	11.88
189	12.16	4.57	83.11	5.55	255	18.77	< LOD	5.06	**31.4**	14.91	< LOD	10.98
190	< LOD	7.32	90.84	6.17	13	7.21	< LOD	4.89	< LOD	8.67	< LOD	9.86
191	9.29	4.33	70.03	4.88	127	13.1	5.39	3.3	**17.0**	10.35	< LOD	8.77
192	< LOD	6.7	56.85	4.71	21	7.32	< LOD	4.28	< LOD	8.27	< LOD	9.1
193	< LOD	8.34	85.66	6.88	1103	45.88	< LOD	8.52	129.0	36.55	< LOD	13.5
194	< LOD	6.4	62.4	4.72	96	11.81	< LOD	4.59	**19.8**	9.55	< LOD	8.95
195	< LOD	7.73	105.86	7.09	88	13.72	< LOD	5.94	**21.9**	11.27	< LOD	12.37
196	< LOD	9.64	105.73	8.68	175	22.57	< LOD	10.09	**122.5**	21.71	< LOD	25.01
197	< LOD	7.42	101.16	6.55	372	24.2	< LOD	5.77	**39.6**	19.13	< LOD	13.34
198	< LOD	9.66	132.43	9.35	949	47.79	< LOD	8.99	120.9	38.25	< LOD	20.66
199	< LOD	8.33	125.79	8.23	283	24.37	< LOD	7.46	**38.4**	19.49	< LOD	16.03
200	< LOD	6.85	47.57	4.42	39	8.89	< LOD	4.53	< LOD	9.99	< LOD	9.49
201	< LOD	7.13	93.27	6.16	127	14.64	6.15	4.01	**44.2**	12.57	< LOD	10.71
202	7.74	4.28	115.84	6.05	37	8.15	< LOD	3.87	< LOD	9.67	< LOD	8.58

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X-RAY FLUORESCENCE DATA

XRF No.	Zinc	Zn Error	Copper	Cu Error	Nickel	Ni Error	Cobalt	Co Error	Manganese	Mn Error
181	146.86	20.71	713	47.01	< LOD	58.92	< LOD	136.75	677.47	100.59
182	99.59	28.01	3005	113.09	< LOD	89.88	< LOD	305.31	779.86	141.69
183	73.06	15.01	655	41.63	< LOD	47.35	< LOD	103.09	219.96	61.91
184	255.63	42.34	9070.95	192.11	116.8	63.93	< LOD	322.13	881.57	150.7
185	189.98	21.45	1846	64.84	< LOD	45.31	< LOD	91.12	178.8	57.18
186	911.71	57.01	13427	206.92	< LOD	76.32	< LOD	182.27	387.6	95.08
187	34.41	15.58	287.04	40.31	< LOD	70.31	< LOD	62.04	< LOD	72.41
188	243.92	35.6	9902	171.37	< LOD	61.5	< LOD	150.31	241.62	77.5
189	616.1	41.22	8418	145.48	< LOD	56.53	< LOD	90.47	246.64	67.75
190	< LOD	18.12	689	47.6	< LOD	58.35	< LOD	135.34	< LOD	87.5
191	244.56	24.92	2917	81.96	< LOD	48.69	< LOD	115.84	100.23	53.46
192	94.4	16.11	305	31.64	< LOD	50.94	< LOD	88.22	195.43	61.31
193	363.67	41.23	5575.81	144.13	< LOD	83.67	< LOD	379.39	497.07	127.73
194	77.7	16.59	1457	59.67	< LOD	47.66	< LOD	112.43	190.88	60.8
195	163.88	29.84	4982	129.09	< LOD	69.84	< LOD	207.41	728.65	118.18
196	1769.1	116.93	**67015**	568.91	< LOD	115.53	< LOD	315.42	352.11	132.46
197	684.71	49.97	13872	201.11	< LOD	63.81	341.98	129.13	168.94	74.71
198	2826.75	110.74	20794.62	309.22	< LOD	106.08	< LOD	396.35	603.36	154.1
199	1230.12	71	16226	248.02	< LOD	84.91	< LOD	265.87	614.24	127.96
200	69.59	15.52	609	42.35	< LOD	52.92	< LOD	109.07	430.81	80.98
201	74.65	23.46	4543	113.58	< LOD	64.41	< LOD	231.82	294.42	85.82
202	185.62	20.5	979	48.53	< LOD	44.15	< LOD	101.93	212.8	60.17

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X-RAY FLUORESCENCE DATA

XRF No.	Chromium	Cr Error	Vanadium	V Error	Antimony	Sb Error	Cadmium	Cd Error	Silver	Ag Error
181	68.11	23.79	< LOD	66.33	< LOD	21.8	< LOD	12.08	< LOD	9.16
182	67.67	25.75	80.7	51.8	< LOD	30.41	< LOD	17.21	< LOD	12.42
183	74.43	23.78	< LOD	59.56	< LOD	20.75	< LOD	11.74	< LOD	8.59
184	59.23	27.71	145.32	59.13	< LOD	29.45	< LOD	16.43	< LOD	11.85
185	80.33	22.59	< LOD	51.86	< LOD	21.06	< LOD	11.99	< LOD	8.78
186	127.4	27.26	< LOD	78.66	< LOD	22.83	< LOD	12.43	< LOD	9.36
187	92.09	20.64	< LOD	32.12	< LOD	31.5	< LOD	17.83	< LOD	13.04
188	107.8	24.66	< LOD	64.4	< LOD	24.41	< LOD	13.95	< LOD	10.22
189	100.9	24.8	76.56	38.66	< LOD	17.57	< LOD	9.8	< LOD	7.32
190	59.88	21.57	69.52	37.25	< LOD	21.13	< LOD	11.72	< LOD	8.79
191	49.25	24.07	< LOD	65.49	< LOD	17.35	< LOD	9.77	< LOD	7.18
192	77.6	22.08	< LOD	56.51	< LOD	22.54	< LOD	12.62	< LOD	9.15
193	< LOD	42.76	97.19	51.72	< LOD	25.35	< LOD	14.18	< LOD	10.47
194	51.44	23.48	< LOD	63.04	< LOD	20.08	< LOD	11.19	< LOD	8.2
195	84.47	25.12	< LOD	71.24	< LOD	25.45	< LOD	14.19	< LOD	10.53
196	130.47	26.53	75.02	43.93	< LOD	31.09	< LOD	17.28	< LOD	13.86
197	81.63	26.31	< LOD	73.58	< LOD	21.46	< LOD	11.81	< LOD	8.8
198	191.21	32.03	< LOD	84.04	< LOD	30.25	< LOD	16.6	< LOD	12.98
199	163.78	29.02	79.37	48.54	< LOD	26.75	< LOD	15.17	< LOD	10.55
200	101.93	24.6	< LOD	60.45	< LOD	20.27	< LOD	11.16	< LOD	8.38
201	53.81	28.76	98.47	53.05	< LOD	20.08	< LOD	11.07	< LOD	7.8
202	80.45	25.57	< LOD	59.33	< LOD	16.61	< LOD	9.09	< LOD	6.43

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X-RAY FLUORESCENCE DATA

XRF No.	Parcel or Area	Material Description	Comments	Soil or waste	Date / Time	Duration	Units
203	Coal Dock	Dark brown stamp sand, slag, coal	SS-13.	both	10/12/2011 12:15	91.58	ppm
204	Coal Dock	Moist, reddish-brown stamp sand, slag, coal		waste	10/12/2011 12:35	91.38	ppm
205	Coal Dock	Moist, dark brown sand, slag, coal		both	10/12/2011 12:39	91.22	ppm
206	Coal Dock	Gray stamp sand, coal, slag		waste	10/12/2011 12:45	93.93	ppm
207	Coal Dock	Brown silty medium sand, stamp sand, slag, coal		both	10/12/2011 12:49	91.5	ppm
208	Coal Dock	Brown silty medium sand, stamp sand, slag, coal	2 photos to east showing stream channel through stamp sands leading to ditch on north side of parcel that eventually empties into Torch Lake.	both	10/12/2011 12:54	91.55	ppm
209	Historical Museum	Brown silty fine sand		soil	10/12/2011 15:20	91.73	ppm
210	Historical Museum	Dry, gray silty fine to medium sand, slag		both	10/12/2011 15:22	91.16	ppm
211	Historical Museum	Dry, gray silty fine to medium sand, slag		both	10/12/2011 15:25	91.07	ppm
212	Historical Museum	Gray stamp sand, slag	4 photos to W, S, E, and N.	waste	10/12/2011 15:27	91.75	ppm
213	Historical Museum	Brown sand, organic matter		soil	10/12/2011 15:31	91.11	ppm
214	Historical Museum	Stamp sand		waste	10/12/2011 15:33	91.4	ppm
215	Historical Museum	Brown sand		soil	10/12/2011 15:36	91.49	ppm
216	Historical Museum	Brown sand, organic matter		soil	10/12/2011 15:38	91.59	ppm
217	Historical Museum	Tannish-gray sand		soil	10/12/2011 15:41	91.6	ppm
218	Historical Museum	Moist, black silty sand	1 photo to south.	soil	10/12/2011 15:44	91.2	ppm
219	Historical Museum	Dark brown medium sand, slag, wood debris	2 photos with SS-11.	both	10/12/2011 15:46	93.87	ppm
220	Historical Museum	Stamp sand		waste	40828.66458	92.06	ppm
221	Historical Museum	Stamp sand		waste	40828.66875	91.8	ppm

C & H Lake Linden Operations
Lake Linden, Michigan
October 10-13, 2011

APPENDIX C

X-RAY FLUORESCENCE DATA

XRF No.	Molybdenum	Mo Error	Strontium	Sr Error	Lead	Pb Error	Selenium	Se Error	Arsenic	As Error	Mercury	Hg Error
203	< LOD	8.26	101.72	7.33	64	12.77	< LOD	6.42	**28.2**	11.09	< LOD	13.34
204	< LOD	7.33	94.12	6.21	24	8.21	< LOD	4.67	< LOD	9.48	< LOD	9.45
205	< LOD	7.43	129.1	7.42	39	9.77	< LOD	5.2	< LOD	11.66	< LOD	10.83
206	< LOD	7.72	104.76	6.95	153	16.97	< LOD	6.19	35.9	14.08	< LOD	12.54
207	< LOD	7.66	112.57	7.31	61	12.06	< LOD	6.44	**15.9**	9.79	< LOD	11.96
208	< LOD	8.22	99.13	7.18	72	13.15	< LOD	5.94	< LOD	15.62	< LOD	13.36
209	< LOD	7.81	56.85	5.27	34	9.51	< LOD	5.56	< LOD	11.32	< LOD	10.9
210	< LOD	9.38	105.89	7.82	73	14.16	< LOD	6.23	< LOD	16.94	< LOD	14.71
211	< LOD	8.65	109.61	7.73	150	18.31	< LOD	6.55	**27.7**	14.87	< LOD	13.83
212	< LOD	8.72	97.94	7.26	147	17.95	< LOD	6.61	< LOD	21.42	< LOD	14.1
213	< LOD	6.91	45.33	4.41	17	7.16	< LOD	4.34	**9.0**	5.9	< LOD	9.3
214	< LOD	8.77	120.39	8.41	14	8.92	< LOD	7.15	< LOD	10.81	< LOD	14.95
215	< LOD	7.98	43.39	4.79	49	10.7	< LOD	5.12	< LOD	12.47	< LOD	11.45
216	10.5	4.48	55.75	4.53	57	9.73	< LOD	4.52	< LOD	10.64	< LOD	8.95
217	< LOD	7.6	80.88	6.05	23	8.42	< LOD	5.26	< LOD	9.48	< LOD	11.51
218	< LOD	6.71	60.5	4.93	149	15.09	< LOD	5.36	**19.7**	11.94	< LOD	9.6
219	< LOD	7.61	229.44	9.57	207	18.62	< LOD	5.36	**23.6**	14.7	< LOD	11.37
220	< LOD	8.82	122.6	8.08	120	16.59	< LOD	6.34	< LOD	19.1	< LOD	13.7
221	< LOD	8.79	117.79	7.97	116	16.54	< LOD	6.9	< LOD	18.88	< LOD	14.1

C & H Lake Linden Operations
Lake Linden, Michigan
October 10-13, 2011

APPENDIX C

X-RAY FLUORESCENCE DATA

XRF No.	Zinc	Zn Error	Copper	Cu Error	Nickel	Ni Error	Cobalt	Co Error	Manganese	Mn Error
203	95.13	32.66	8305	174.83	< LOD	80.02	< LOD	252.99	595.53	119.73
204	57.12	16.96	1384.78	64.59	< LOD	56.09	< LOD	136.83	225.3	71.38
205	< LOD	19.52	456	41.4	< LOD	61.67	< LOD	144.74	157.09	67.99
206	87.04	26.72	5206.88	130.06	< LOD	75.65	362.92	159.91	446.97	102.76
207	108.63	23.61	1984	83.32	< LOD	70.76	< LOD	230.66	565.3	109.99
208	77.34	23.07	1860	84.32	< LOD	76.33	306.73	181.46	612.62	121.39
209	67.22	18.16	931	56.98	< LOD	67.61	< LOD	167.53	436.73	93.02
210	96.72	35.37	9128	191.32	< LOD	81.21	< LOD	269.49	585.53	127.23
211	133.51	32.15	5939	151.07	< LOD	73.89	< LOD	249.73	427.54	110.15
212	132.29	29.79	4426.76	129.07	85.33	56.13	< LOD	248.25	511.44	114.65
213	69.27	15.03	130	24.52	< LOD	53.15	< LOD	132.78	294.29	73.59
214	46.49	23.39	1763.72	88.58	< LOD	88.96	< LOD	345.34	789.57	147.87
215	56.51	16.23	213	32.5	< LOD	65.23	< LOD	168.45	332.53	87.02
216	447.85	29.91	604	40.43	< LOD	48.31	< LOD	91.53	228.18	61.91
217	35.9	17.31	1595	71.89	< LOD	61.72	< LOD	171.73	365.74	88.37
218	168.56	24.22	3055	90.04	< LOD	58.15	219.26	110.91	432.06	85.03
219	147.03	24.46	2109	80.65	< LOD	67.54	< LOD	232.62	357.85	92.48
220	85.18	27.9	4221.07	126.97	< LOD	86.48	< LOD	315.35	595.63	128.17
221	83.72	29.35	5309.23	142.91	< LOD	80.71	329.95	191.48	569.37	122.33

C & H Lake Linden Operations
Lake Linden, Michigan
October 10-13, 2011

APPENDIX C

X-RAY FLUORESCENCE DATA

XRF No.	Chromium	Cr Error	Vanadium	V Error	Antimony	Sb Error	Cadmium	Cd Error	Silver	Ag Error
203	81.2	26.03	114.14	50.41	< LOD	27.91	< LOD	15.77	< LOD	11.42
204	90.88	24.05	64.97	43.11	< LOD	23.61	< LOD	13.19	< LOD	9.68
205	106.47	23.3	< LOD	57.98	< LOD	24.1	< LOD	13.49	< LOD	9.95
206	80.42	26.33	95.98	52.46	< LOD	26.56	< LOD	14.78	< LOD	10.92
207	70.88	25.13	88.65	50.61	< LOD	25.74	< LOD	14.16	< LOD	10.69
208	58.07	24.9	96.91	48.12	< LOD	25.83	< LOD	14.6	< LOD	10.56
209	83.48	24.71	< LOD	77.29	< LOD	25.26	< LOD	14.06	< LOD	10.51
210	61.37	24.97	103.63	55.25	< LOD	28.38	< LOD	15.55	< LOD	12.39
211	64.65	24.48	84.31	49.43	< LOD	26.7	< LOD	14.87	< LOD	11.11
212	100.38	26.92	120.79	73.45	< LOD	27.98	< LOD	16.04	< LOD	11.54
213	48.65	22.9	< LOD	69.58	< LOD	21.67	< LOD	12.04	< LOD	8.85
214	< LOD	40.34	155.49	65.66	< LOD	29.82	< LOD	16.65	< LOD	12.16
215	72.39	23.27	< LOD	69.21	< LOD	25.43	< LOD	14.17	< LOD	10.16
216	94.34	25.16	< LOD	61.52	< LOD	16.04	< LOD	8.62	< LOD	6.42
217	69.09	24.32	< LOD	77.59	< LOD	25.79	< LOD	14.36	< LOD	10.83
218	54.62	26.24	< LOD	80.42	< LOD	19.68	< LOD	11.09	< LOD	8.19
219	51.52	26.42	115.77	52.59	< LOD	23.35	< LOD	13.07	< LOD	9.34
220	65.63	28.15	141.12	60.12	< LOD	28.09	< LOD	15.5	< LOD	11.66
221	75.18	27.24	119.91	58.76	< LOD	27.16	< LOD	15	< LOD	11.33

C & H Lake Linden Operations
Lake Linden, Michigan
October 10-13, 2011

APPENDIX C

X-RAY FLUORESCENCE DATA

XRF No.	Parcel or Area	Material Description	Comments	Soil or waste	Date / Time	Duration	Units
222	Historical Museum	Dry, grayish-brown silty fine to medium sand, gravel, slag, debris, w/ copper oxide staining		both	10/12/2011 16:07	91.51	ppm
223	Historical Museum	Moist, brown silty fine sand, gravel slag		both	10/12/2011 16:10	91.37	ppm
224	Historical Museum	Brown sand, slag, gravel	2 photos to north and east. SS-12.	both	10/12/2011 16:18	91.39	ppm
225	Historical Museum	Dry, grayish-brown fine to medium sand, slag, wire, glass		both	10/12/2011 16:53	91.25	ppm
226	Historical Museum	Dry, grayish-brown fine to medium sand		soil	10/12/2011 16:56	92.34	ppm
227	Historical Museum	Brown silty sand, organic material		soil	10/12/2011 16:59	91.7	ppm
228	Historical Museum	Moist, dark brown silty fine sand		soil	10/12/2011 17:04	90.91	ppm
A			Part 201 direct contact criteria	soil			ppm
B			Part 201 direct contact criteria comment	soil			
Notes:							
123	Cells with bold numbers have concentrations that exceed state residential direct contact criteria.						
	These values were used to estimate the extent of contaminated soil near the ground surface.						
	The dark gray row near the bottom of the spreadsheet presents the direct contact criteria.						
	Some elements detected by the XRF unit do not have state direct contact criteria. These have been hidden and are not visible.						
	Light gray rows in the spreadsheet represent waste or rock material.						
	Direct contact criteria in this table are only applicable to soil. Data for soils are not shaded.						
< LOD	This means less than the limit of detection.						
ppm	parts per million						

C & H Lake Linden Operations
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October 10-13, 2011

APPENDIX C

X-RAY FLUORESCENCE DATA

XRF No.	Molybdenum	Mo Error	Strontium	Sr Error	Lead	Pb Error	Selenium	Se Error	Arsenic	As Error	Mercury	Hg Error
222	< LOD	9.7	171.26	10.24	127	18.54	< LOD	7.13	**50.3**	16.21	< LOD	18.09
223	< LOD	8.49	167.96	9.06	95	14.76	< LOD	6.58	< LOD	16.67	< LOD	12.47
224	< LOD	9.91	260.18	12.69	**1741**	63.83	< LOD	9.7	**438.3**	54.12	< LOD	19
225	12.31	6.97	192.74	11.5	**613**	40.27	< LOD	10.01	**218.6**	35.46	< LOD	20.93
226	< LOD	8.32	115.85	7.93	38	10.92	< LOD	6.3	< LOD	12.91	< LOD	14.32
227	15.54	5.14	85.97	6.06	62	11.22	< LOD	5.41	< LOD	13.38	< LOD	10.13
228	< LOD	6.34	53.86	4.37	33	7.83	< LOD	4.16	< LOD	8.48	< LOD	8.51
A	2,600		330,000		400		2,600		7.6		160	
B												

Notes:

123 Cells with bold numbers have concentrations that exceed state residential direct contact criteria.

These values were used to estimate the extent of contaminated soil near the ground surface.

The dark gray row near the bottom of the spreadsheet presents the direct contact criteria.

Some elements detected by the XRF unit do not have state direct contact criteria. These have been hidden and are not visible.

Light gray rows in the spreadsheet represent waste or rock material.

Direct contact criteria in this table are only applicable to soil. Data for soils are not shaded.

< LOD This means less than the limit of detection.

ppm parts per million

C & H Lake Linden Operations
Lake Linden, Michigan
October 10-13, 2011

APPENDIX C

X-RAY FLUORESCENCE DATA

XRF No.	Zinc	Zn Error	Copper	Cu Error	Nickel	Ni Error	Cobalt	Co Error	Manganese	Mn Error
222	154.33	49.24	17681	279.31	< LOD	102.3	< LOD	345.08	779.01	155.8
223	106.96	27.77	4497	127.2	< LOD	74.02	< LOD	236.01	342	99.11
224	1948.06	88.6	8591	198.34	< LOD	103.97	< LOD	364.66	923.04	168.18
225	2168.72	99.15	11538	240.25	< LOD	106.29	< LOD	434.23	1312.41	205.11
226	75.5	23.02	1259	72.67	< LOD	80.11	< LOD	312.75	792.38	139.43
227	159.6	22.11	796	51.27	< LOD	59.49	178.86	91.19	260.13	74.34
228	57.27	13.21	448	34.5	< LOD	43.12	< LOD	80.57	127.52	51.64
A	170,000		20000		40,000		2,600		25,000	
B										

Notes:

123 Cells with bold numbers have concentrations that exceed state residential direct contact criteria.

These values were used to estimate the extent of contaminated soil near the ground surface.

The dark gray row near the bottom of the spreadsheet presents the direct contact criteria.

Some elements detected by the XRF unit do not have state direct contact criteria. These have been hidden and are not visible.

Light gray rows in the spreadsheet represent waste or rock material.

Direct contact criteria in this table are only applicable to soil. Data for soils are not shaded.

< LOD This means less than the limit of detection.

ppm parts per million

C & H Lake Linden Operations
Lake Linden, Michigan
October 10-13, 2011

APPENDIX C

X-RAY FLUORESCENCE DATA

XRF No.	Chromium	Cr Error	Vanadium	V Error	Antimony	Sb Error	Cadmium	Cd Error	Silver	Ag Error
222	135.45	29.1	< LOD	86.15	< LOD	29.2	< LOD	16.5	< LOD	12.77
223	84.17	25.13	< LOD	72.38	< LOD	25.77	< LOD	14.33	< LOD	10.47
224	212.34	31.66	< LOD	85.55	< LOD	31.08	< LOD	18.49	< LOD	13.9
225	433.16	40.28	102.62	62.51	< LOD	33.67	< LOD	18.47	< LOD	14.48
226	66.01	27.53	127.86	61.62	< LOD	29.17	< LOD	16.24	< LOD	11.96
227	97.95	23.88	65.01	39.14	< LOD	19.83	< LOD	10.99	< LOD	8.29
228	80.31	23.42	< LOD	57.86	< LOD	19.87	< LOD	11.36	< LOD	7.99
A	2,500		750		180		550		2,500	
B	chrome VI									

Notes:

123 Cells with bold numbers have concentrations that exceed state residential direct contact criteria.

These values were used to estimate the extent of contaminated soil near the ground surface.

The dark gray row near the bottom of the spreadsheet presents the direct contact criteria.

Some elements detected by the XRF unit do not have state direct contact criteria. These have been hidden and are not visible.

Light gray rows in the spreadsheet represent waste or rock material.

Direct contact criteria in this table are only applicable to soil. Data for soils are not shaded.

< LOD This means less than the limit of detection.

ppm parts per million

Appendix D

Site Inspection Site Photographs

FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 1 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/10/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Autumn Lawson

DESCRIPTION: Close-up view of SS-01.

DATE: 10/10/11

DIRECTION OF PHOTOGRAPH: North

PHOTOGRAPH BY: Autumn Lawson

DESCRIPTION: Distant view of SS-01.

FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 2 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/10/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Autumn Lawson

DESCRIPTION: Close-up view of SS-02.

DATE: 10/10/11

DIRECTION OF PHOTOGRAPH: South

PHOTOGRAPH BY: Autumn Lawson

DESCRIPTION: Distant view of SS-02.

FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 3 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/10/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Autumn Lawson

DESCRIPTION: Close-up view of SS-03.

DATE: 10/10/11

DIRECTION OF PHOTOGRAPH: West

PHOTOGRAPH BY: Autumn Lawson

DESCRIPTION: Distant view of SS-03.

FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 4 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Autumn Lawson

DESCRIPTION: Close-up view of SS-04.

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: South

PHOTOGRAPH BY: Autumn Lawson

DESCRIPTION: Distant view of SS-04.

FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 5 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Autumn Lawson

DESCRIPTION: Close-up view of SS-05.

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: North

PHOTOGRAPH BY: Autumn Lawson

DESCRIPTION: Distant view of SS-05.

FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 6 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Autumn Lawson

DESCRIPTION: Close-up view of SS-06.

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: North Northwest

PHOTOGRAPH BY: Autumn Lawson

DESCRIPTION: Distant view of SS-06.

FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 7 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/10/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Autumn Lawson

DESCRIPTION: Close-up view of SS-07.

DATE: 10/10/11

DIRECTION OF PHOTOGRAPH: North Northeast

PHOTOGRAPH BY: Autumn Lawson

DESCRIPTION: Distant view of SS-07.

FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 8 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/10/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Autumn Lawson

DESCRIPTION: Close-up view of SS-08.

DATE: 10/10/11

DIRECTION OF PHOTOGRAPH: South Southwest

PHOTOGRAPH BY: Autumn Lawson

DESCRIPTION: Distant view of SS-08.

FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 9 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/10/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Autumn Lawson

DESCRIPTION: Close-up view of SS-09.

DATE: 10/10/11

DIRECTION OF PHOTOGRAPH: West

PHOTOGRAPH BY: Autumn Lawson

DESCRIPTION: Distant view of SS-09.

FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 10 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/12/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Autumn Lawson

DESCRIPTION: Close-up view of SS-10.

DATE: 10/12/11

DIRECTION OF PHOTOGRAPH: South

PHOTOGRAPH BY: Autumn Lawson

DESCRIPTION: Distant view of SS-10.

FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 11 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/12/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Autumn Lawson

DESCRIPTION: Close-up view of SS-11.

DATE: 10/12/11

DIRECTION OF PHOTOGRAPH: South

PHOTOGRAPH BY: Autumn Lawson

DESCRIPTION: Distant view of SS-11.

FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 12 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/12/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Autumn Lawson

DESCRIPTION: Close-up view of SS-12.

DATE: 10/12/11

DIRECTION OF PHOTOGRAPH: North Northeast

PHOTOGRAPH BY: Autumn Lawson

DESCRIPTION: Distant view of SS-12.

FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 13 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/12/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Autumn Lawson

DESCRIPTION: Close-up view of SS-13.

DATE: 10/12/11

DIRECTION OF PHOTOGRAPH: North

PHOTOGRAPH BY: Autumn Lawson

DESCRIPTION: Distant view of SS-13.

FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 14 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/12/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Autumn Lawson

DESCRIPTION: Close-up view of SS-14.

DATE: 10/12/11

DIRECTION OF PHOTOGRAPH: East

PHOTOGRAPH BY: Autumn Lawson

DESCRIPTION: Distant view of SS-14.

FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C&H Lake Linden Operations PAGE: 15 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Autumn Lawson

DESCRIPTION: Close-up view of SS-15.

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: Northeast

PHOTOGRAPH BY: Autumn Lawson

DESCRIPTION: Distant view of SS-15.

FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 16 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Autumn Lawson

DESCRIPTION: Close-up view of SS-16.

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: West

PHOTOGRAPH BY: Autumn Lawson

DESCRIPTION: Distant view of SS-16.

FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 17 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: Down

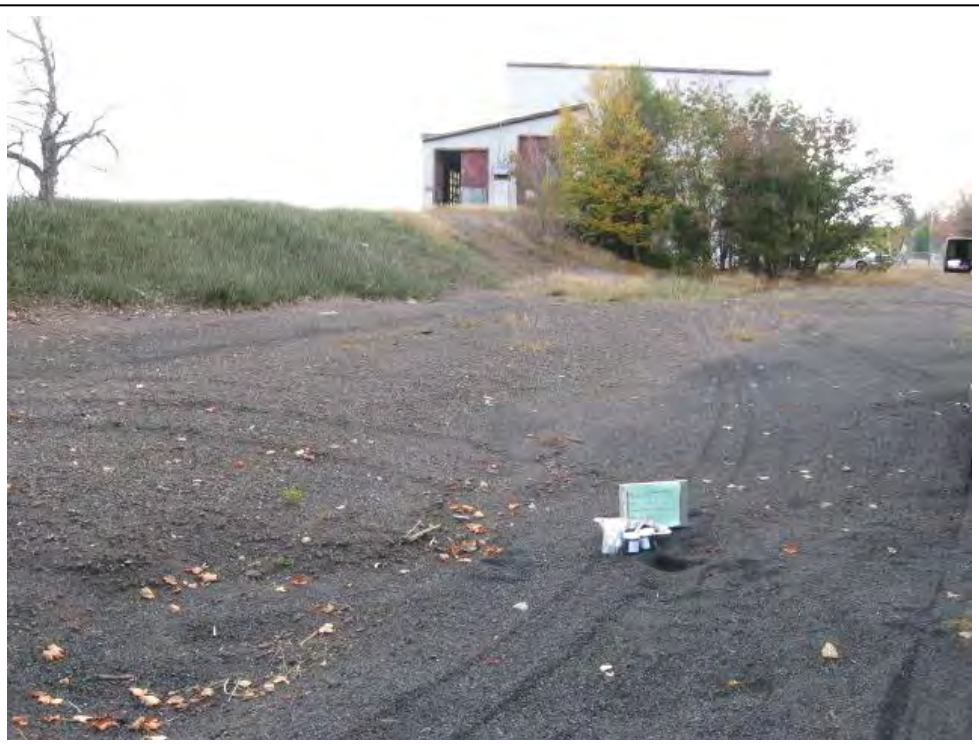
PHOTOGRAPH BY: Autumn Lawson

DESCRIPTION: Close-up view of SS-17.

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: Southwest

PHOTOGRAPH BY: Autumn Lawson



DESCRIPTION: Distant view of SS-17.

FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 18 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Autumn Lawson

DESCRIPTION: Close-up view of SS-18.

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: Southwest

PHOTOGRAPH BY: Autumn Lawson

DESCRIPTION: Distant view of SS-18.

FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 19 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Autumn Lawson

DESCRIPTION: Close-up view of SS-19.

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: East Northeast

PHOTOGRAPH BY: Autumn Lawson

DESCRIPTION: Distant view of SS-19.

FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 20 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Autumn Lawson

DESCRIPTION: Close-up view of SS-20.

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: South

PHOTOGRAPH BY: Autumn Lawson

DESCRIPTION: Distant view of SS-20.

FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 21 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/10/11

DIRECTION OF PHOTOGRAPH: Down

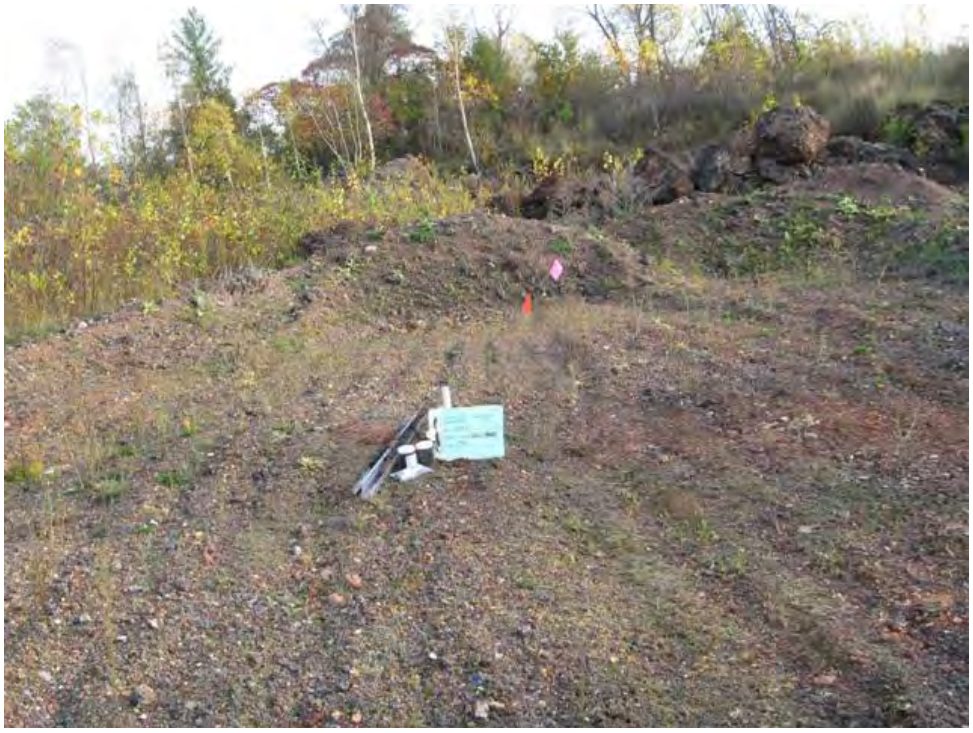
PHOTOGRAPH BY: Barb Vetort Tiffany

DESCRIPTION: Close-up view of SB-01.

DATE: 10/10/11

DIRECTION OF PHOTOGRAPH: East

PHOTOGRAPH BY: Barb Vetort Tiffany



DESCRIPTION: Distant view of SB-01.

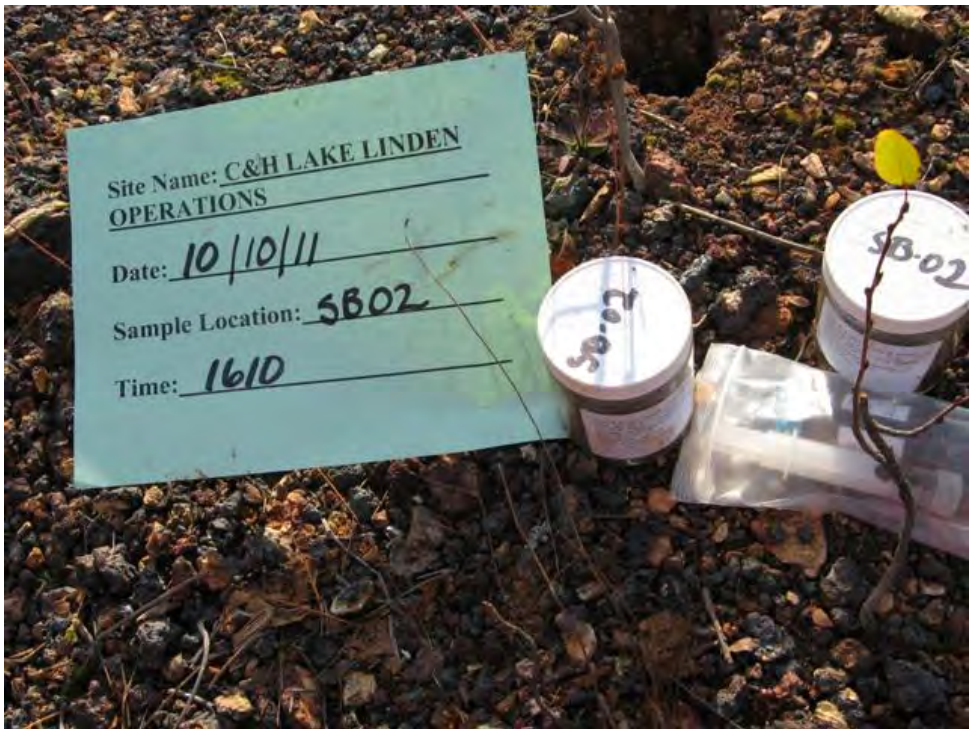
FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 22 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/10/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Barb Vetort Tiffany

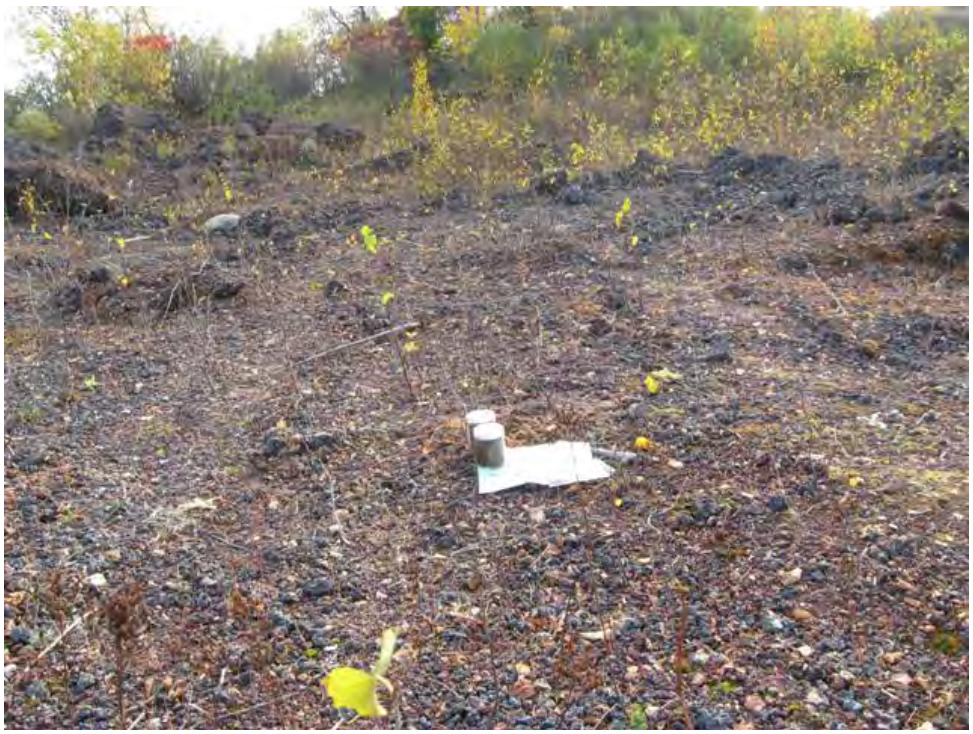


DESCRIPTION: Close-up view of SB-02.

DATE: 10/10/11

DIRECTION OF PHOTOGRAPH: South

PHOTOGRAPH BY: Barb Vetort Tiffany



DESCRIPTION: Distant view of SB-02.

FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 23 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/10/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Teresa Ducsay

DESCRIPTION: Close-up view of SB-03.

DATE: 10/10/11

DIRECTION OF PHOTOGRAPH: North

PHOTOGRAPH BY: Teresa Ducsay

DESCRIPTION: Distant view of SB-03.

FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 24 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/10/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Barb Vetort Tiffany

DESCRIPTION: Close-up view of SB-04.

DATE: 10/10/11

DIRECTION OF PHOTOGRAPH: East

PHOTOGRAPH BY: Barb Vetort Tiffany

DESCRIPTION: Distant view of SB-04.

FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 25 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/10/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Barb Vetort Tiffany

DESCRIPTION: Close-up view of SB-05.

DATE: 10/10/11

DIRECTION OF PHOTOGRAPH: East

PHOTOGRAPH BY: Barb Vetort Tiffany

DESCRIPTION: Distant view of SB-05.

FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 26 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: Down

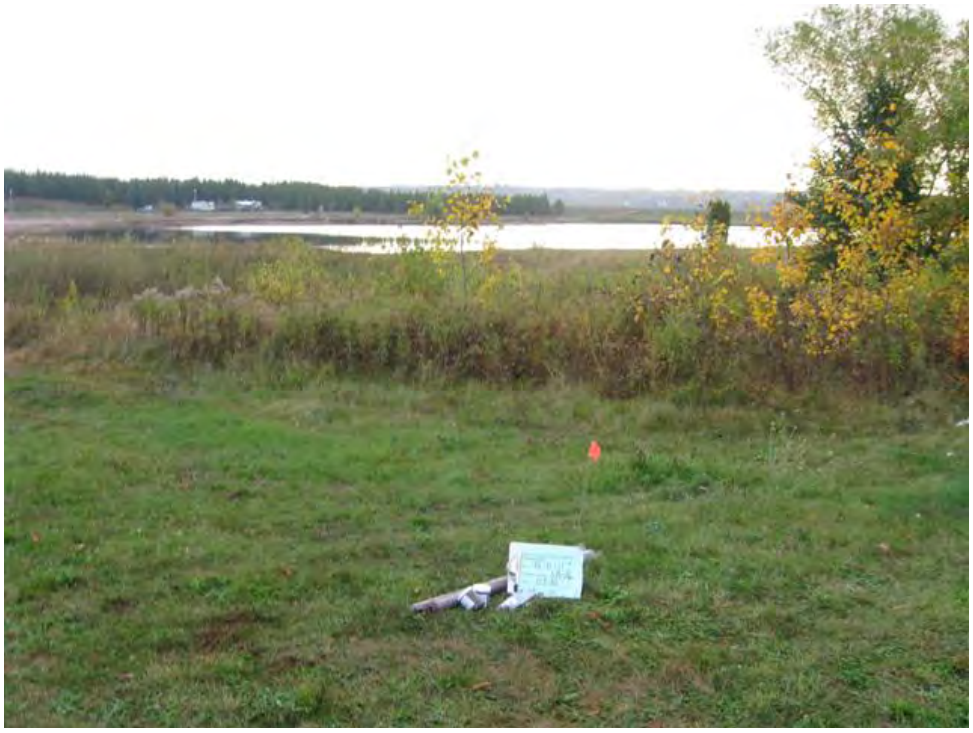
PHOTOGRAPH BY: Teresa Ducsay

DESCRIPTION: Close-up view of SB-06.

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: East

PHOTOGRAPH BY: Teresa Ducsay



DESCRIPTION: Distant view of SB-06.

FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 27 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Teresa Ducsay

DESCRIPTION: Close-up view of SB-07.

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: East

PHOTOGRAPH BY: Teresa Ducsay

DESCRIPTION: Distant view of SB-07.

FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 28 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Barb Vetort Tiffany

DESCRIPTION: Close-up view of SB-08.

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: Northeast

PHOTOGRAPH BY: Barb Vetort Tiffany

DESCRIPTION: Distant view of SB-08.

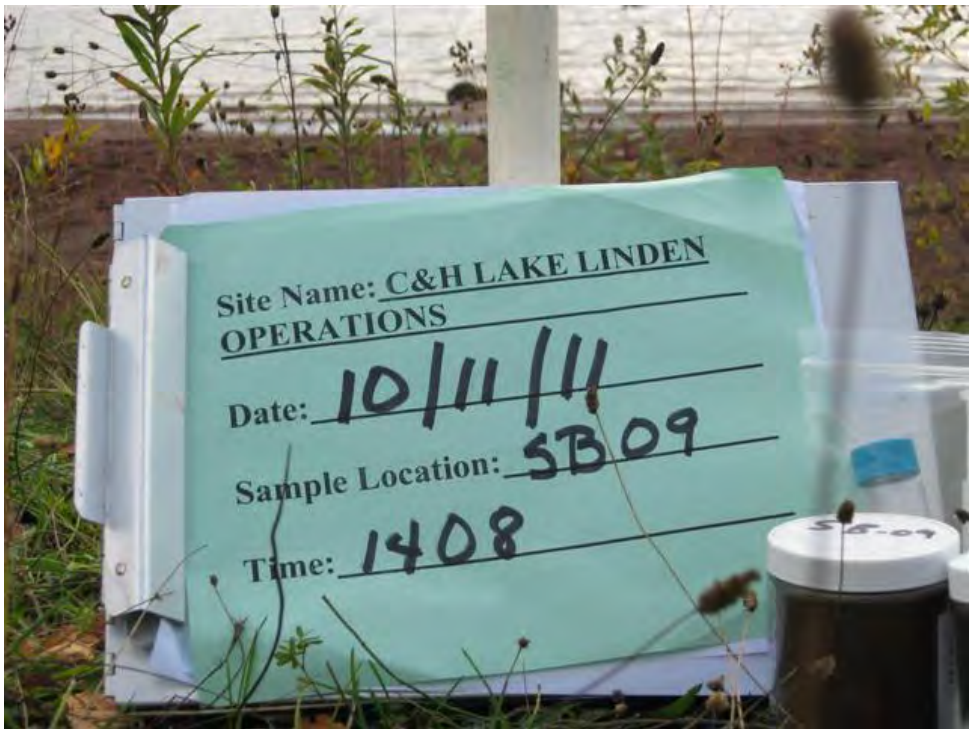
FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 29 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Barb Vetort Tiffany



DESCRIPTION: Close-up view of SB-09.

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: East

PHOTOGRAPH BY: Barb Vetort Tiffany

DESCRIPTION: Distant view of SB-09.

FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 30 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Barb Vetort Tiffany

DESCRIPTION: Close-up view of SB-10.

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: East

PHOTOGRAPH BY: Barb Vetort Tiffany

DESCRIPTION: Distant view of SB-10.

FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 31 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Barb Vetort Tiffany

DESCRIPTION: Close-up view of SB-11.

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: Northeast

PHOTOGRAPH BY: Barb Vetort Tiffany

DESCRIPTION: Distant view of SB-11.

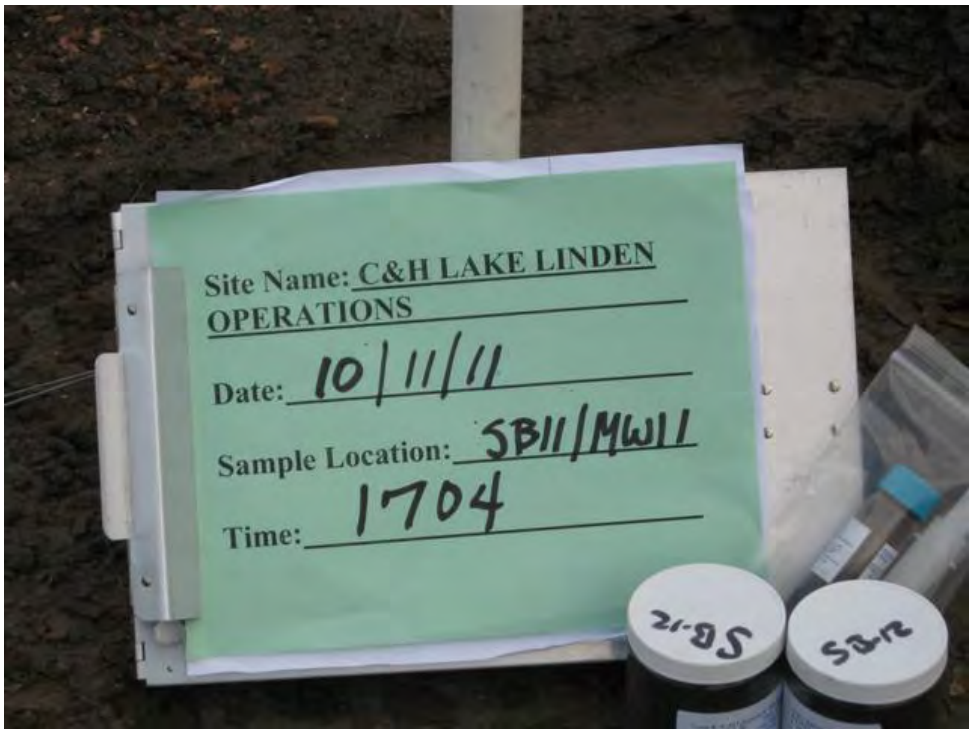
FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 32 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Barb Vetort Tiffany



DESCRIPTION: Close-up view of SB-12.

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: East

PHOTOGRAPH BY: Barb Vetort Tiffany

DESCRIPTION: Distant view of SB-12.

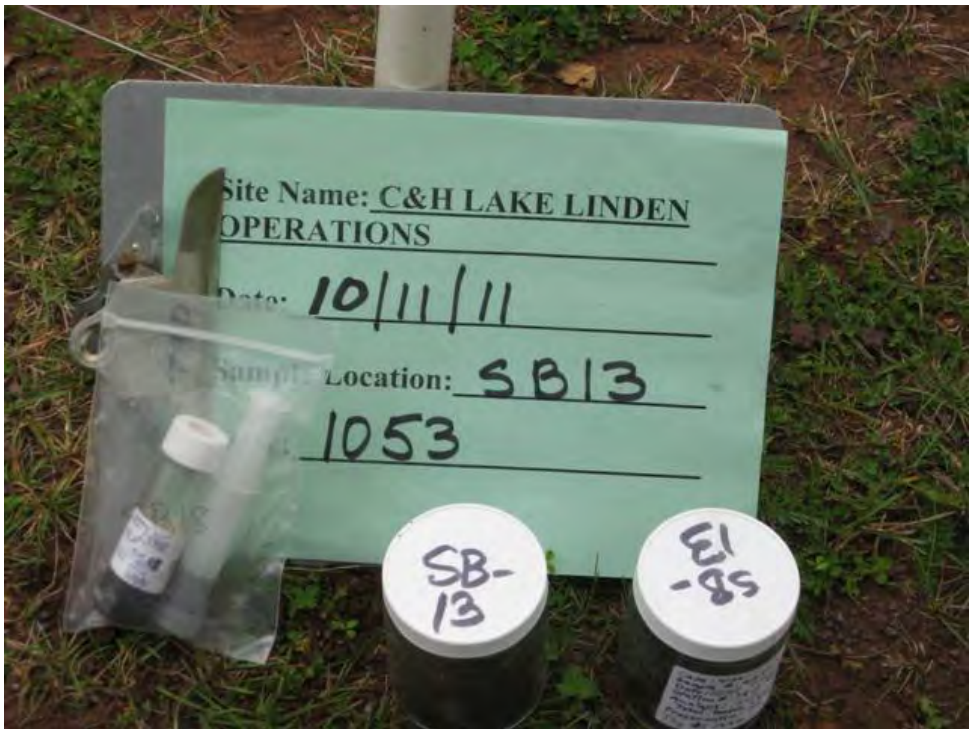
FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 33 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Barb Vetort Tiffany



DESCRIPTION: Close-up view of SB-13.

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: East

PHOTOGRAPH BY: Barb Vetort Tiffany

DESCRIPTION: Distant view of SB-13.

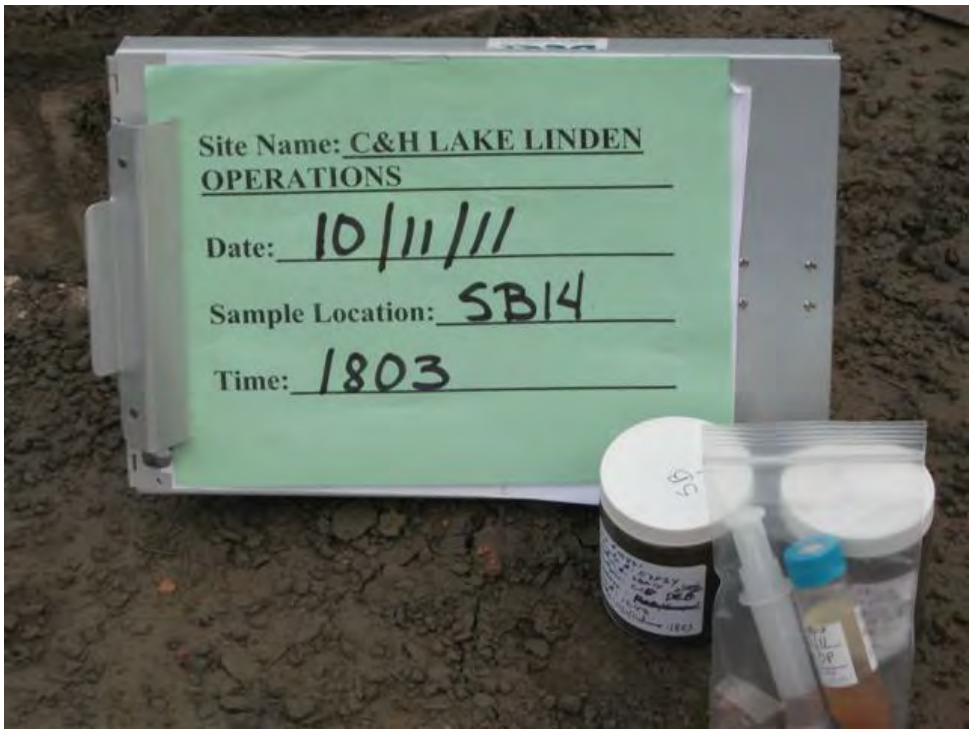
FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 34 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Barb Vetort Tiffany



DESCRIPTION: Close-up view of SB-14.

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: East

PHOTOGRAPH BY: Barb Vetort Tiffany

DESCRIPTION: Distant view of SB-14.

FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 35 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/12/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Mark Henry

DESCRIPTION: Close-up view of MW-01.

DATE: 10/12/11

DIRECTION OF PHOTOGRAPH: North

PHOTOGRAPH BY: Mark Henry

DESCRIPTION: Distant view of MW-01

FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 36 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/12/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Mark Henry

DESCRIPTION: Close-up view of MW-02.

DATE: 10/12/11

DIRECTION OF PHOTOGRAPH: North

PHOTOGRAPH BY: Mark Henry

DESCRIPTION: Distant view of MW-02.

FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 37 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/12/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Charles Graff

DESCRIPTION: Close-up view of MW-03.

DATE: 10/12/11

DIRECTION OF PHOTOGRAPH: North

PHOTOGRAPH BY: Charles Graff

DESCRIPTION: Distant view of MW-03.

FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 38 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Carol Hefferan Tracy

DESCRIPTION: Close-up view of MW-04.

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: East

PHOTOGRAPH BY: Carol Hefferan Tracy

DESCRIPTION: Distant view of MW-04.

FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 39 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Teresa Ducsay

DESCRIPTION: Close-up view of MW-05.

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: East

PHOTOGRAPH BY: Teresa Ducsay

DESCRIPTION: Distant view of MW-05.

FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 40 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Teresa Ducsay

DESCRIPTION: Close-up view of MW-06.

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: Northwest

PHOTOGRAPH BY: Teresa Ducsay

DESCRIPTION: Distant view of MW-06.

FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 41 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Teresa Ducsay

DESCRIPTION: Close-up view of MW-07.

DATE: 10/11/11

DIRECTION OF PHOTOGRAPH: East

PHOTOGRAPH BY: Teresa Ducsay

DESCRIPTION: Distant view of MW-07.

FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 42 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/12/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Teresa Ducsay

DESCRIPTION: Close-up view of MW-08.

DATE: 10/12/11

DIRECTION OF PHOTOGRAPH: North

PHOTOGRAPH BY: Teresa Ducsay

DESCRIPTION: Distant view of MW-08.

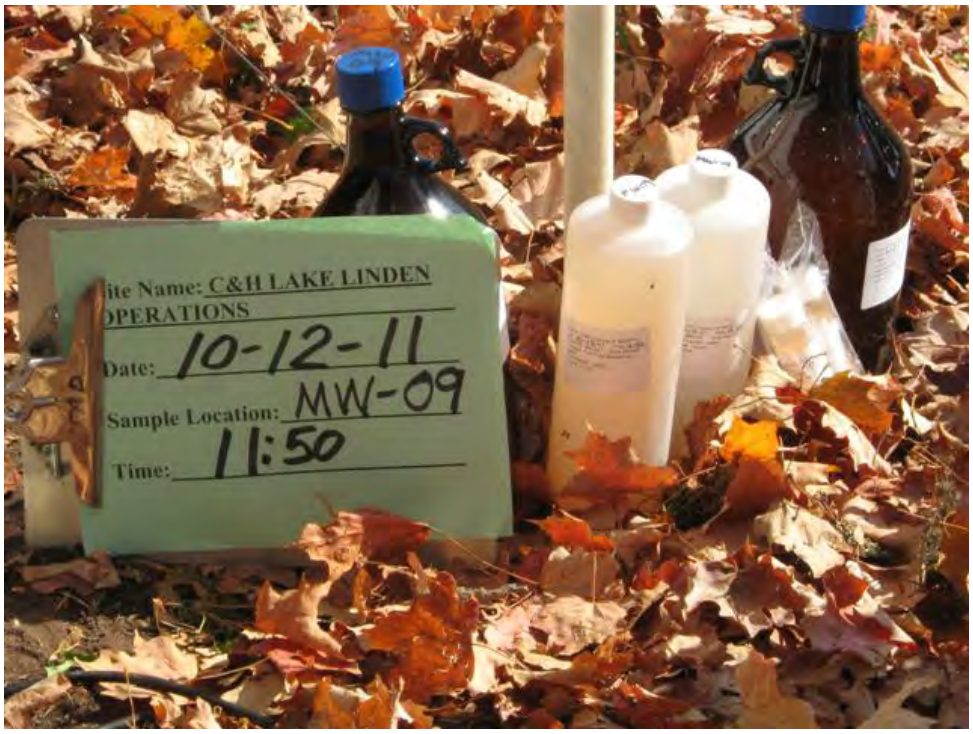
FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 43 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/12/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Barb Vetort Tiffany



DESCRIPTION: Close-up view of MW-09.

DATE: 10/12/11

DIRECTION OF PHOTOGRAPH: East

PHOTOGRAPH BY: Barb Vetort Tiffany

DESCRIPTION: Distant view of MW-09.

FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 44 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/12/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Carol Hefferan Tracy

DESCRIPTION: Close-up view of MW-10.

DATE: 10/12/11

DIRECTION OF PHOTOGRAPH: South

PHOTOGRAPH BY: Carol Hefferan Tracy

DESCRIPTION: Distant view of MW-10.

FIELD PHOTOGRAPHY LOG SHEET

PROPERTY NAME: C & H Lake Linden Operations PAGE: 45 OF: 80
U.S. EPA ID #: MIN000510619

DATE: 10/12/11

DIRECTION OF PHOTOGRAPH: Down

PHOTOGRAPH BY: Charles Graff

DESCRIPTION: Close-up view of MW-11.

DATE: 10/12/11

DIRECTION OF PHOTOGRAPH: West

PHOTOGRAPH BY: Charles Graff

DESCRIPTION: Distant view of MW-11.