

**REMOVAL ASSESSMENT REPORT
GAY STAMP SANDS SITE - RS
GAY, KEWEENAW COUNTY, MICHIGAN**

Draft Report

Prepared for:

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1. INTRODUCTION

Sustainment and Restoration Service LLC (SRS) performed the Removal Assessment at the Gay Stamp Sands Site (Site) located in Gay, Keweenaw County, Michigan. SRS, the Superfund Technical Assessment and Response Team (START) contractor, was tasked by the United States Environmental Protection Agency (U.S. EPA), under contract number EP-S5-16-01 and Technical Direction Document (TDD) number 0001/S05-0001-19-06-001, to perform this Removal Assessment (RS). START was tasked to prepare a site-specific Health and Safety Plan (HASP) and a site-specific Sampling and Analysis Plan (SAP); procure the services of an analytical laboratory; screen surface soil for metals with an X-Ray Fluorescence (XRF) instrument; collect soil and debris samples ; document on-site conditions with written logbook notes and still photographs; evaluate analytical data; and, prepare this report. The SRS START Team conducted the field investigation and sampling on July 10th, 2019.

This report summarizes the Site background, discusses the assessment, provides a summary of the analytical data, and discusses potential site-related threats. The appendices for this report include a XRF instrument readings table (Appendix A), photographic log (Appendix B), the laboratory analytical results package (Appendix C), and an excerpt regarding the Gay Stamp Sands Site from the Torch Lake Area Assessment (Appendix D).

2. SITE BACKGROUND

This section provides a description of the Site and the Site history.

2.1 Site Description

The Gay Stamp Sands Site is located on the south side of 2nd Street and Gay Lac La Belle, in Gay, Keweenaw County, Michigan. The Site is in a rural setting and is defined by the global positioning system (GPS) coordinates 47.226284° latitude and -88.161709° longitude (see Figure 1 – Site Location Map). The Site is near residential and commercial properties to the west, empty lots to the north and south, and Lake Superior to the east. The distance to the closest neighboring property to the west is approximately 70 feet. A smoke tower and several building ruins and piles of debris are located on the Site (see Figure 2 – Site Features Map).

2.2 Site History

From 1890 to 1920, copper mining activities were conducted in the Village of Gay, Michigan. These activities and operations resulted in the generation of approximately 37.3 million cubic yards (mcy) of stamp sand, which was disposed of in or along the shores of Lake Superior. Stamp sand is a byproduct of copper extraction and contain heavy metals (Weston, 2007). The Site is the location of the former Mohawk and Wolverine Mining Companies stamp mill, which operated from early 1900 until 1932 (EGLE, 2019).

The Gay Stamp Sands location and associated stamp sands were included in the Torch Lake Area Assessment (TLAA) conducted by U.S. EPA's Emergency Response Branch (ERB) in 2007/2008. The TLAA conducted by U.S. EPA's FIELDS group and START contractor evaluated both the area around the smokestack at Gay Stamp as well as stamp sands which extend more than 5 miles down the beach to the Traverse River. Piles of suspect asbestos-containing material (ACM), some as large as 20 feet by 20 feet by 4 feet were noted in the TLAA report. XRF screening data from soil samples, as well as laboratory chemical analysis of soil samples collected during the TLAA exhibited high arsenic and lead concentrations. Concentrations of lead and arsenic in soils were as high as 850 milligrams per kilogram (mg/kg) and 670 mg/kg, respectively. Laboratory analytical data for soil samples collected by the START contractor exhibited arsenic concentrations above the applicable Residential and Industrial Removal Management Levels for Chemicals (RMLs) (Weston, 2007).



Legend

- Piles of Debris
- Building Ruins
- Site Boundary
- Smokestack

0 120 240 480 Feet



US Environmental Protection Agency

Gay Stamp Sands Site - RS
Gay, Keweenaw County, Michigan
TDD No.: S05-0001-19-06-001

Figure 2
Site Features



In June 2019, the State of Michigan Department of Environment, Great Lakes, and Energy (EGLE) wrote a letter to U.S. EPA asking for assistance in addressing the threats from contamination at the Gay Stamp Sands Site. In the letter, EGLE notes the elevated levels of heavy metals previously found in surface soils at the Site, potential ACM, and the high use of the Site by locals and tourists for recreation (EGLE, 2019).

3. REMOVAL ASSESSMENT ACTIVITIES

U.S. EPA On-Scene Coordinator (OSC) Brian Kelly and START member Hannah Hiscox performed Site removal assessment activities on July 10th, 2019. Assessment activities included Site reconnaissance, collecting data using an XRF instrument, and collecting samples for ACM analysis.

A site-specific SAP was developed for conducting the assessment prior to mobilizing to the Site. The SAP described the problem statement, decision inputs, study boundaries, sampling strategy, and any needed equipment.

This section summarizes Site Reconnaissance (subsection 3.1) and Sampling (subsection 3.2). Table 1 presents a summary of collected samples and Figure 3 shows where samples and XRF readings were collected within the Site. XRF instrument readings are presented in Appendix A and photographic documentation of the Site visit and sampling activities are provided in Appendix B.

3.1 Site Reconnaissance

Site reconnaissance for the property was performed in level “D” personal protective equipment (PPE) in accordance with the approved site-specific HASP. Site reconnaissance was conducted to identify environmental concerns/materials present at the Site.

The Site was comprised of a smokestack, building ruins, and various piles of debris and soil (see photographs 1; 3-11 in Appendix B). Site features are shown on Figure 2. There was evidence of trespassing throughout the Site. A makeshift campfire was observed on the Site and bullet casings were observed scattered on the ground (see photographs 12-14 in Appendix B).

3.2 Sampling

START was tasked to collect and analyze debris samples for ACM and collect XRF readings of surface soils. During RS activities, six bulk debris samples and one duplicate sample was collected for ACM analysis. Bulk samples were collected from several representative areas on the Site (see photographs 6-10 in Appendix B). Unique sample identification (ID) numbers and 8-ounce glass jars were used for each collected sample. Date and time were documented at the time of sample collection. Table 1 lists samples, locations, and requested analysis information. Sample locations are shown on Figure 3.

XRF data was also collected at the Site based on a grid sampling approach. Multiple readings of metal concentrations were collected from each grid. XRF reading locations are shown on Figure 3. The Site contaminants of concern were lead and arsenic, based on previous sampling activities conducted at the Site. XRF readings for metals in soils at a majority of locations were at or below the lower spectrum of

applicable removal management level (RML) exceedance criteria. XRF readings from few of the sample locations exceeded RML criteria for lead and arsenic. However, these readings were not significant enough to warrant collection and analysis of samples for metals at a commercial laboratory. Therefore, no XRF corresponding soil samples were collected for laboratory analysis during this assessment.

Table 1 Removal Assessment Sample Summary Gay Stamp Sands Site RS Gay, Keweenaw County, Michigan			
Sample ID	Sample Description	Laboratory Analysis	Sample Location
GSS-ASB01-0719	Potential ACM and Debris	Asbestos determination by PLM	West side of Site in trail
GSS-ASB02-0719	Potential ACM and Debris	Asbestos determination by PLM	West side of Site, from potential asbestos pile at bottom of trail
GSS-ASB03-0719	Potential ACM and Debris	Asbestos determination by PLM	East side of Site, northern end of potential asbestos row
GSS-ASB04-0719	Potential ACM and Debris	Asbestos determination by PLM	East side of Site, near eastern structure
GSS-ASB05-0719	Potential ACM and Debris	Asbestos determination by PLM	South Side of Site
GSS-ASB06-0719	Potential ACM and Debris	Asbestos determination by PLM	South Side of Site
GSS-ASB06X-0719	Potential ACM and Debris	Asbestos determination by PLM	South Side of Site

Notes:

PLM – Polarized Light Microscopy

Samples were collected on July 10th, 2019 under TDD No. S05-0001-19-06-001 by START contractor SRS.



G:\GIS_Workspace\2016 Projects\2016082 - Gay Stamp Sands\Figure 3 - Sampling Locations Map.mxd

Legend

- XRF Reading
- Asbestos Sample
- XRF Grid

0 75 150 300 Feet



United States Environmental Protection Agency

Gay Stamp Sands Site - RS
Gay, Keweenaw County, Michigan
TDD No.: S05-0001-19-06-001

Figure 3
Sampling Locations Map



4. SAMPLE ANALYTICAL RESULTS

START reviewed the sample analytical data and supporting quality assurance/quality control (QA/QC) data provided by ALS Environmental laboratory. The analytical data package is included in Appendix C.

The Occupational Safety and Health Administration (OSHA) defines ACM as any material that contains more than one percent asbestos per Code of Federal Regulations (CFR) Title 29 Part 1910.1001. Sample analytical results for asbestos analysis are shown in Table 2. Based on the results, all six samples analyzed were found to have ACM. The highest result was observed in sample GSS-ASB03-0719, with 48.94% chrysotile asbestos. Asbestos results are listed in Table 2.

START also compiled the recorded XRF readings of surficial soils. Selected XRF readings are listed in Table 3. Only lead and arsenic are listed in Table 3 due to historical sampling and exceedances of these compounds (see Weston, 2007). A full table of all XRF data can be found in Appendix A. Analytical data was compared to U.S. EPA Residential Soil Removal Management Levels (RMLs) with a cancer risk of 10^{-4} and a Hazard Quotient of 1, updated by U.S. EPA May 2019. Residential soil RMLs were selected as a conservative measure due to the proximity of residents to the Site and due to documented trespassing at the Site, both from this removal assessment and previous assessments at the Site (see EGLE, 2019). The XRF data shows exceedances for both lead and arsenic. The only exceedance for lead was at XRF location number 21 (see Figure 3) with a reading of 1,125 mg/kg. The highest exceedance for arsenic was at XRF location number 11 (see Figure 3) with a reading of 132 mg/kg. Other arsenic exceedances occurred at XRF location numbers 06 and 13, with readings of 85 mg/kg and 71 mg/kg, respectively.

Table 2 Asbestos Sample Analytical Results Gay Stamp Sands RS Gay, Keweenaw County, Michigan					
Date	Sample ID	Type	Regulatory Criteria¹	Results (% Asbestos)	Asbestos Type
7/10/2019	GSS-ASB01-0719	N	1% Asbestos	28.47	Chrysotile
7/10/2019	GSS-ASB02-0719	N	1% Asbestos	29.14	Chrysotile
7/10/2019	GSS-ASB03-0719	N	1% Asbestos	48.94	Chrysotile
7/10/2019	GSS-ASB04-0719	N	1% Asbestos	20-30	Chrysotile
7/10/2019	GSS-ASB05-0719	N	1% Asbestos	5-10	Chrysotile
7/10/2019	GSS-ASB06-0719	N	1% Asbestos	10-20	Chrysotile
7/10/2019	GSS-ASB06X-0719	FD	1% Asbestos	30-40	Chrysotile

Notes:

See Figure 3 for sample locations

ACM - Asbestos Containing Material

N - Normal (field sample)

FD - Field Duplicate

% - Percent

1 - US code of Asbestos Hazard Emergency Response (15 US Code 2642)

Bold - Results meet or exceed the definition for ACM

Analysis provided by ALS Environmental Laboratory, Holland, MI

Table 3
Select XRF Instrument Readings
Gay Stamp Sands RS
Gay, Keweenaw County, Michigan

Date Sample No. Matrix Units				Parameter			
				Lead	Error	Arsenic	Error
Residential RMLs ^a				400 mg/kg		68 mg/kg	
7/10/2019	XRF01	Soil	mg/kg	109 +/-47		ND +/-38	
7/10/2019	XRF02	Soil	mg/kg	278 +/-59		ND +/-51	
7/10/2019	XRF03	Soil	mg/kg	ND +/-49		ND +/-33	
7/10/2019	XRF04	Soil	mg/kg	313 +/-54		ND +/-52	
7/10/2019	XRF05	Soil	mg/kg	ND +/-85		ND +/-53	
7/10/2019	XRF06	Soil	mg/kg	89 +/-39		85 +/-39	
7/10/2019	XRF07	Soil	mg/kg	53 +/-32		ND +/-29	
7/10/2019	XRF08	Soil	mg/kg	395 +/-48		ND +/-51	
7/10/2019	XRF09	Soil	mg/kg	141 +/-38		ND +/-32	
7/10/2019	XRF10	Soil	mg/kg	226 +/-69		ND +/-61	
7/10/2019	XRF11	Soil	mg/kg	100 +/-41		132 +/-50	
7/10/2019	XRF12	Soil	mg/kg	51 +/-45		ND +/-35	
7/10/2019	XRF13	Soil	mg/kg	ND +/-34		71 +/-36	
7/10/2019	XRF14	Soil	mg/kg	ND +/-38		ND +/-30	
7/10/2019	XRF15	Soil	mg/kg	ND +/-37		ND +/-25	
7/10/2019	XRF16	Soil	mg/kg	92 +/-51		ND +/-42	
7/10/2019	XRF17	Soil	mg/kg	126 +/-60		ND +/-47	
7/10/2019	XRF18	Soil	mg/kg	81 +/-62		ND +/-42	
7/10/2019	XRF19	Soil	mg/kg	76 +/-38		ND +/-36	
7/10/2019	XRF20	Soil	mg/kg	1125 +/-86		ND +/-98	
7/10/2019	XRF21	Soil	mg/kg	86 +/-42		ND +/-35	
7/10/2019	XRF21a	Soil	mg/kg	ND +/-53		ND +/-36	
7/10/2019	XRF22	Soil	mg/kg	308 +/-71		ND +/-64	

Notes:

See Figure 3 for sample locations

XRF - X-Ray Fluorescence

mg/kg - milligrams per kilogram

ND - Not Detected, fell below the XRF instrument's level of detection

a - USEPA Removal Management Levels for cancer risk at 10^{-4} and Hazard Quotient of 1 for non-carcinogens. May 2019 (<https://www.epa.gov/risk/regional-removal-management-levels-chemicals-rmls>)

Bold - Results exceed regulatory limits

Readings XRF21 and XRF21a were taken from the same location, XRF21a was taken from inside a sand bag

5. POTENTIAL SITE RELATED THREATS

Threats posed by on-site contamination and Site conditions were evaluated in accordance with The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) criteria for initiating a removal action as listed under Title 40 of the CFR, Section 300.415(b) (2). Paragraph (b) (2) of 40 CFR Section 300.415 lists factors to be considered when determining the appropriateness of a potential removal action at a site. Potential site-related threats to human health and the environment were evaluated based on the criteria listed in 40 CFR, Sections 261.21 through 261.24 and 40 CFR §761.62. Factors that may be applicable to the Site are discussed below.

Actual or potential exposure of nearby human populations, animals, or the food chain to hazardous substances or pollutants or contaminants (40 CFR 300.415(b)(2)(i))

Bulk sample results confirmed the presence of ACM at the Site. ACM was observed on the ground in debris piles surrounding the concrete foundations. These debris piles are situated outdoors and exposed to precipitation and wind. High levels of lead and arsenic were also found in the surface soils at the Site. The Torch Lake Area Assessment report indicated elevated levels of arsenic and lead in the soils, with readings as high as 670 mg/kg and 850 mg/kg, respectively (Weston, 2007). There is a high potential for wind and other weather conditions to cause migration and/or release ACM and metal-contaminated dust to the surrounding areas. There are residences and commercial properties near the Site to the west and such potential releases could pose exposure threats to these populations. There have also been documented cases of vandalism and trespassing at the Site, both historically and currently with this removal assessment. During the Site reconnaissance, START documented a makeshift campfire site and bullet casings (see photographs 12-14 in Appendix B) and EGLE has previously documented people trespassing and using the property for paintball games and as an Off Road Vehicle (ORV) track (EGLE, 2019).

Asbestos is the name of a group of six fibrous minerals (amosite, chrysotile, crocidolite, tremolite, actinolite, and anthrophyllite) that naturally occur in the environment. Asbestos has historically been used in building materials, friction products, heat-resistant fabrics, packaging, gaskets, and coatings. Human exposure to asbestos through inhalation may result in scar-like tissue in the lungs and the pleural membrane (lining) surrounding the lung, leading to a disease called asbestosis. People with asbestosis have difficulty breathing and, in severe cases, heart enlargement. Asbestosis is a serious disease and can eventually lead to disability and death. The Department of Health and Human Services (DHHS), the World Health Organization (WHO), and the U.S. EPA have determined that asbestos is a human carcinogen (ATSDR, 1999).

Lead is a naturally occurring element that does not degrade in the environment. In the United States, historical sources of human exposure to lead have been from leaded gasoline, lead paint, lead pipes, mining and smelting of ore, and manufacturing. Based on the vast literature of human lead exposure, it is understood that lead has negative neurological effects, affecting cognitive function especially in children; no safe level of lead has been identified for children. When exposed to high levels of lead, neurotoxic effects including deteriorating motor skills, memory loss, and personality changes have been observed in humans. Exposure to lead can also have negative impacts on the cardiovascular, hematological, immunological, reproductive, and other systems. The U.S. EPA and the International Agency for Research on Cancer (IARC) have classified inorganic lead compounds as a probable human carcinogen, or probably carcinogenic to humans (ATSDER, 2019).

Arsenic, like lead, is a naturally occurring element found in soil and minerals that does not degrade in the environment. It may enter the environment during mining and smelting operations. Arsenic can attach itself to other particles, and travel via the wind. Humans can be exposed to arsenic through ingestion and inhalation; ingesting foods or water containing arsenic, ingesting soil contaminated with arsenic due to hand-to-mouth transfer, or inhaling dust from soils contaminated with arsenic. When exposed at low levels, people may experience stomach irritation, nausea, vomiting, and decreased production of blood cells causing fatigue, and heart problems. If a large enough single dose is ingested (above 60,000 ppb), the exposure can result in death. Long term exposure can result in patterns of skin changes, including patches or darkened skin and the possibility of developing skin cancer. The U.S. EPA and the IARC have determined that inorganic Arsenic is carcinogenic to humans (ATSDR, 2007).

The presence of ACM, along with lead and arsenic on the Site, pose a threat to individuals who enter the Site. As evidenced by previously mentioned evidence of trespassing, people have easy and uncontrolled access to the Site and it is reasonable to assume that trespassers may continue to access the Site. Those entering the Site will come into contact with ACM debris piles and surface soils exceeding EPA RMLs for lead and arsenic. The presence of these substances outdoors also poses a threat to the nearby residential and business population of the Village of Gay. These substances can further degrade and be picked up in the wind as dust.

Hazardous substances or pollutants or contaminants in drums, barrels, tanks, or other bulk storage containers that may pose a threat of release (40 CFR 300.415(b)(2)(iii))

No substances or pollutants were documented in drums, barrels, tanks, or other bulk storage containers at the Site. However, there were several piles of now confirmed ACM on the Site that meets the definition

of, and act as, bulk storage and pose a threat of release of ACM. The TLAA report recorded one of these debris piles being as large as 20 feet by 20 feet and 4 feet high.

Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released (40 CFR 300.415(b)(2)(v))

ACM is present in debris piles scattered outdoors throughout the Site. This material is not protected and is fully exposed to the elements and the wind. Further degradation of the ACM will generate dust and could potentially allow the ACM to become airborne and migrate offsite and threaten nearby residents. Lead and arsenic present in levels exceeding U.S. EPA RMLs in surface soils could also be picked up by the wind as dust and migrate offsite.

6. SUMMARY

U.S. EPA and START conducted a removal assessment at the Gay Stamp Sands Site located in Gay, Keweenaw County, Michigan on July 10th, 2019. During the removal assessment, XRF readings were collected from surface soils around the Site and six samples were collected for ACM analysis.

Analytical results for the asbestos samples indicated ACM in all of the collected samples, ranging from 5-10% to 48.94% Chrysotile content. XRF readings indicated exceedances of U.S. EPA RMLs for both lead and arsenic in surface soils.

The presence of ACM and elevated levels of lead and arsenic at the Site, multiple debris piles with ACM, along with unrestricted Site access conditions pose potential threats to human health and the environment and meet the criteria of a removal action, as defined under Title 40 of the CFR, Section 300.415(b) (2).

7. REFERENCES

- Agency for Toxic Substances and Disease Registry (ATSDR). (1999). “Toxicological Profile for Asbestos.” Retrieved from: <https://www.atsdr.cdc.gov/ToxProfiles/tp61.pdf>.
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- Michigan Department of Environment, Great Lakes, and Energy (EGLE). (2019). “Letter to Mr. Brian Kelly, U.S. Environmental Protection Agency Region V, From: Clifton Clark, Remediation and Redevelopment Division, EGLE.
- Weston Solutions, INC (Weston). (2007). “Summary Report for the Torch Lake Area Assessment, Torch Lake NPL Site and Surrounding areas, Keweenaw Peninsula, Michigan.”

APPENDIX A

XRF Instrument Readings Table

Appendix A
XRF Instrument Readings
Gay Stamp Sands RS
Gay, Keweenaw County, Michigan

	Sample No.	XRF01	XRF02	XRF03	XRF04	XRF05	XRF06	XRF07	XRF08	XRF09	XRF10	XRF11	XRF12	XRF13	XRF14
	Date	7/10/19	7/10/19	7/10/19	7/10/19	7/10/19	7/10/19	7/10/19	7/10/19	7/10/19	7/10/19	7/10/19	7/10/19	7/10/19	7/10/19
	Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Parameter	Units														
MnO	mg/kg	146	520	361	833	516	623	479	443	887	1224	687	713	374	481
Fe2O3	mg/kg	12290	22543	12027	63430	9952	67115	48352	84366	51467	82013	81416	73859	43274	45456
Co	mg/kg	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Ni	mg/kg	< LOD	96	< LOD	108	185	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Cu	mg/kg	198	664	628	3239	909	94473	24986	9709	5752	16612	154254	6596	112447	26051
Zn	mg/kg	996	3113	381	< LOD	176	< LOD	< LOD	65	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
As	mg/kg	< LOD	< LOD	< LOD	< LOD	< LOD	85	< LOD	< LOD	< LOD	< LOD	132	< LOD	71	< LOD
Se	mg/kg	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Rb	mg/kg	206	163	271	123	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Sr	mg/kg	178	236	255	201	211	214	127	65	172	356	117	277	87	156
Y	mg/kg	57	104	< LOD	110	< LOD	53	47	44	85	114	< LOD	139	< LOD	68
Zr	mg/kg	< LOD	< LOD	< LOD	< LOD	< LOD	39	< LOD	25	< LOD	< LOD	37	< LOD	31	38
Nb	mg/kg	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Mo	mg/kg	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Ag	mg/kg	< LOD	148	< LOD	< LOD	238	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Cd	mg/kg	< LOD	< LOD	< LOD	< LOD	517	209	< LOD	< LOD	< LOD	< LOD	670	< LOD	< LOD	< LOD
Sn	mg/kg	< LOD	< LOD	< LOD	693	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	261	< LOD
Sb	mg/kg	< LOD	759	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Ba	mg/kg	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
La	mg/kg	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Hf	mg/kg	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Ta	mg/kg	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
W	mg/kg	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Pt	mg/kg	< LOD	< LOD	< LOD	< LOD	< LOD	178	< LOD	< LOD	< LOD	< LOD	179	< LOD	< LOD	< LOD
Au	mg/kg	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Hg	mg/kg	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Tl	mg/kg	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Pb	mg/kg	149	< LOD	< LOD	313	< LOD	< LOD	< LOD	395	141	226	< LOD	51	< LOD	< LOD
Bi	mg/kg	< LOD	278	< LOD	< LOD	< LOD	89	< LOD	< LOD	< LOD	< LOD	100	< LOD	< LOD	< LOD
Th	mg/kg	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	53	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
U	mg/kg	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD

Appendix A
XRF Instrument Readings
Gay Stamp Sands RS
Gay, Keweenaw County, Michigan

	Sample No.	XRF15	SRF16	XRF17	XRF18	XRF19	XRF20	XRF21	XRF21a	XRF22
	Date	7/10/19	7/10/19	7/10/19	7/10/19	7/10/19	7/10/19	7/10/19	7/10/19	7/10/19
	Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Parameter	Units									
MnO	mg/kg	881	771	372	145	203	927	552	870	679
Fe2O3	mg/kg	90635	76459	36883	10914	20484	141526	95481	103664	98299
Co	mg/kg	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Ni	mg/kg	89	< LOD	120	< LOD	< LOD	< LOD	< LOD	158	< LOD
Cu	mg/kg	3863	10496	13621	209	7417	49810	7878	2129	1371
Zn	mg/kg	91	< LOD	< LOD	< LOD	< LOD	1974	< LOD	246	432
As	mg/kg	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Se	mg/kg	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Rb	mg/kg	66	< LOD	230	550	< LOD	66	< LOD	< LOD	< LOD
Sr	mg/kg	198	265	198	266	85	277	97	230	79
Y	mg/kg	104	82	143	225	< LOD	80	31	167	< LOD
Zr	mg/kg	81	< LOD	< LOD	< LOD	< LOD	79	59	181	< LOD
Nb	mg/kg	< LOD	< LOD	< LOD	< LOD	66	< LOD	< LOD	< LOD	< LOD
Mo	mg/kg	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Ag	mg/kg	< LOD	< LOD	< LOD	216	< LOD	< LOD	< LOD	219	< LOD
Cd	mg/kg	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Sn	mg/kg	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	295	796
Sb	mg/kg	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Ba	mg/kg	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
La	mg/kg	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Hf	mg/kg	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Ta	mg/kg	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
W	mg/kg	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Pt	mg/kg	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Au	mg/kg	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Hg	mg/kg	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Tl	mg/kg	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Pb	mg/kg	< LOD	92	126	< LOD	< LOD	< LOD	86	< LOD	308
Bi	mg/kg	< LOD	< LOD	< LOD	81	< LOD	1125	< LOD	< LOD	< LOD
Th	mg/kg	< LOD	< LOD	< LOD	< LOD	76	< LOD	< LOD	< LOD	< LOD
U	mg/kg	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD

Notes:

XRF - X-Ray Fluorescence

LOD - Instrument's Level of Detection

mg/kg - milligrams per kilogram

See Figure 3 for sample locations

XRF21 and XRF21a readings were taken from the same location -

XRF21a reading was taken from inside a sand bag

APPENDIX B

Photographic Log

Site: Gay Stamp Sands Site RS
Location: Gay, Keweenaw
 County, Michigan
Contract: EP-S5-16-01
TDD: S05-0001-19-06-001
OSC: Brian Kelly

Date: 7/10/2019
Photographer: Hanna Hiscox

Photograph No.: 1

Base of Smoke Tower at north
 end of Site



Site: Gay Stamp Sands Site RS
Location: Gay, Keweenaw
 County, Michigan
Contract: EP-S5-16-01
TDD: S05-0001-19-06-001
OSC: Brian Kelly

Date: 7/10/2019
Photographer: Hanna Hiscox

Photograph No.: 2

XRF instrument.



Site: Gay Stamp Sands Site RS

Location: Gay, Keweenaw
County, Michigan

Contract: EP-S5-16-01

TDD: S05-0001-19-06-001

OSC: Brian Kelly

Date: 7/10/2019

Photographer: Hanna Hiscox

Photograph No.: 3

View across Site showing
multiple debris piles with
potential ACM.



Site: Gay Stamp Sands Site RS

Location: Gay, Keweenaw
County, Michigan

Contract: EP-S5-16-01

TDD: S05-0001-19-06-001

OSC: Brian Kelly

Date: 7/10/2019

Photographer: Hanna Hiscox

Photograph No.: 4

Pile of potential ACM scattered
on the ground.



Site: Gay Stamp Sands Site RS
Location: Gay, Keweenaw
 County, Michigan
Contract: EP-S5-16-01
TDD: S05-0001-19-06-001
OSC: Brian Kelly

Date: 7/10/2019
Photographer: Hanna Hiscox

Photograph No.: 5

More piles of potential ACM.



Site: Gay Stamp Sands Site RS
Location: Gay, Keweenaw
 County, Michigan
Contract: EP-S5-16-01
TDD: S05-0001-19-06-001
OSC: Brian Kelly

Date: 7/10/2019
Photographer: Hanna Hiscox

Photograph No.: 6

Pile sampled for asbestos,
 sample ASB01



Site: Gay Stamp Sands Site RS
Location: Gay, Keweenaw
 County, Michigan
Contract: EP-S5-16-01
TDD: S05-0001-19-06-001
OSC: Brian Kelly

Date: 7/10/2019
Photographer: Hanna Hiscox

Photograph No.: 7

Material sampled for asbestos,
 sample ASB02.



Site: Gay Stamp Sands Site RS
Location: Gay, Keweenaw
 County, Michigan
Contract: EP-S5-16-01
TDD: S05-0001-19-06-001
OSC: Brian Kelly

Date: 7/10/2019
Photographer: Hanna Hiscox

Photograph No.: 8

Material sampled for asbestos,
 sample ASB03.



Site: Gay Stamp Sands Site RS
Location: Gay, Keweenaw
 County, Michigan
Contract: EP-S5-16-01
TDD: S05-0001-19-06-001
OSC: Brian Kelly

Date: 7/10/2019
Photographer: Hanna Hiscox

Photograph No.: 9

Material sampled for asbestos,
 sample ASB04.



Site: Gay Stamp Sands Site RS
Location: Gay, Keweenaw
 County, Michigan
Contract: EP-S5-16-01
TDD: S05-0001-19-06-001
OSC: Brian Kelly

Date: 7/10/2019
Photographer: Hanna Hiscox

Photograph No.: 10

Material sampled for asbestos,
 samples ASB06 and ASB06X.



Site: Gay Stamp Sands Site RS
Location: Gay, Keweenaw
 County, Michigan
Contract: EP-S5-16-01
TDD: S05-0001-19-06-001
OSC: Brian Kelly

Date: 7/10/2019
Photographer: Hanna Hiscox

Photograph No.: 11

Orange flags marking suspected
 areas with ACM.



Site: Gay Stamp Sands Site RS
Location: Gay, Keweenaw
 County, Michigan
Contract: EP-S5-16-01
TDD: S05-0001-19-06-001
OSC: Brian Kelly

Date: 7/10/2019
Photographer: Hanna Hiscox

Photograph No.: 12

Area with exceeding levels of
 lead or arsenic per XRF
 readings. Bullet casings
 scattered on the ground.



Site: Gay Stamp Sands Site RS

Location: Gay, Keweenaw
County, Michigan

Contract: EP-S5-16-01

TDD: S05-0001-19-06-001

OSC: Brian Kelly

Date: 7/10/2019

Photographer: Hanna Hiscox

Photograph No.: 13

Campsite/camp fire area on the
Site.



Site: Gay Stamp Sands Site RS

Location: Gay, Keweenaw
County, Michigan

Contract: EP-S5-16-01

TDD: S05-0001-19-06-001

OSC: Brian Kelly

Date: 7/10/2019

Photographer: Hanna Hiscox

Photograph No.: 14

Another view of campsite/camp
fire area on the Site.



APPENDIX C

Laboratory Analytical Results Package



24-Jul-2019

Hannah Hiscox
Sustainment and Restoration Services, LLC
79 West Monroe
Suite 1119
Chicago, IL 60603

Re: **Gay Stamp Sands - RV**

Work Order: **19070725**

Dear Hannah,

ALS Environmental received 7 samples on 12-Jul-2019 09:30 AM for the analyses presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental - Holland and for only the analyses requested.

Sample results are compliant with industry accepted practices and Quality Control results achieved laboratory specifications. Any exceptions are noted in the Case Narrative, or noted with qualifiers in the report or QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained from ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.

The total number of pages in this report is 19.

If you have any questions regarding this report, please feel free to contact me:

ADDRESS: 3352 128th Avenue, Holland, MI, USA
PHONE: +1 (616) 399-6070 FAX: +1 (616) 399-6185

Sincerely,

A handwritten signature in black ink, appearing to read "Chad Whelton".

Electronically approved by: Chad Whelton

Chad Whelton
Project Manager

Report of Laboratory Analysis

Certificate No: MN 026-999-449

ALS GROUP USA, CORP Part of the ALS Laboratory Group A Campbell Brothers Limited Company

Environmental 

www.alsglobal.com

RIGHT SOLUTIONS RIGHT PARTNER

Client: Sustainment and Restoration Services, LLC
Project: Gay Stamp Sands - RV
Work Order: 19070725

Work Order Sample Summary

<u>Lab Samp ID</u>	<u>Client Sample ID</u>	<u>Matrix</u>	<u>Tag Number</u>	<u>Collection Date</u>	<u>Date Received</u>	<u>Hold</u>
19070725-01	GSS-ASB01-0719	Waste		7/10/2019 13:41	7/12/2019 09:30	<input type="checkbox"/>
19070725-02	GSS-ASB02-0719	Waste		7/10/2019 13:48	7/12/2019 09:30	<input type="checkbox"/>
19070725-03	GSS-ASB03-0719	Waste		7/10/2019 13:57	7/12/2019 09:30	<input type="checkbox"/>
19070725-04	GSS-ASB04-0719	Waste		7/10/2019 14:04	7/12/2019 09:30	<input type="checkbox"/>
19070725-05	GSS-ASB05-0719	Waste		7/10/2019 14:06	7/12/2019 09:30	<input type="checkbox"/>
19070725-06	GSS-ASB06-0719	Waste		7/10/2019 14:15	7/12/2019 09:30	<input type="checkbox"/>
19070725-07	GSS-ASB06X-0719	Waste		7/10/2019 14:15	7/12/2019 09:30	<input type="checkbox"/>

ALS Group, USA

Date: 24-Jul-19

Client: Sustainment and Restoration Services, LLC

Project: Gay Stamp Sands - RV

Work Order: 19070725

Case Narrative

Asbestos analysis performed by ALS Cincinnati laboratory.

ALS Group, USA

Date: 24-Jul-19

Client: Sustainment and Restoration Services, LLC
Project: Gay Stamp Sands - RV

Work Order: 19070725

Lab ID: 19070725-01A **Collection Date:** 7/10/2019 1:41:00 PM
Client Sample ID: GSS-ASB01-0719 **Matrix:** WASTE

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
----------	--------	------	--------------	-------	-----------------	---------------

SUBCONTRACTED ANALYSES			SUBCONTRACT			Analyst: ALS
Subcontracted Analyses	See attached		as noted	1		7/23/2019

Lab ID: 19070725-02A **Collection Date:** 7/10/2019 1:48:00 PM
Client Sample ID: GSS-ASB02-0719 **Matrix:** WASTE

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
----------	--------	------	--------------	-------	-----------------	---------------

SUBCONTRACTED ANALYSES			SUBCONTRACT			Analyst: ALS
Subcontracted Analyses	See attached		as noted	1		7/23/2019

Lab ID: 19070725-03A **Collection Date:** 7/10/2019 1:57:00 PM
Client Sample ID: GSS-ASB03-0719 **Matrix:** WASTE

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
----------	--------	------	--------------	-------	-----------------	---------------

SUBCONTRACTED ANALYSES			SUBCONTRACT			Analyst: ALS
Subcontracted Analyses	See attached		as noted	1		7/23/2019

Lab ID: 19070725-04A **Collection Date:** 7/10/2019 2:04:00 PM
Client Sample ID: GSS-ASB04-0719 **Matrix:** WASTE

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
----------	--------	------	--------------	-------	-----------------	---------------

SUBCONTRACTED ANALYSES			SUBCONTRACT			Analyst: ALS
Subcontracted Analyses	See attached		as noted	1		7/23/2019

Lab ID: 19070725-05A **Collection Date:** 7/10/2019 2:06:00 PM
Client Sample ID: GSS-ASB05-0719 **Matrix:** WASTE

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
----------	--------	------	--------------	-------	-----------------	---------------

SUBCONTRACTED ANALYSES			SUBCONTRACT			Analyst: ALS
Subcontracted Analyses	See attached		as noted	1		7/23/2019

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA**Date:** 24-Jul-19**Client:** Sustainment and Restoration Services, LLC
Project: Gay Stamp Sands - RV**Work Order:** 19070725**Lab ID:** 19070725-06A **Collection Date:** 7/10/2019 2:15:00 PM
Client Sample ID: GSS-ASB06-0719 **Matrix:** WASTE

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
SUBCONTRACTED ANALYSES			SUBCONTRACT			Analyst: ALS
Subcontracted Analyses	See attached			as noted	1	7/23/2019

Lab ID: 19070725-07A **Collection Date:** 7/10/2019 2:15:00 PM
Client Sample ID: GSS-ASB06X-0719 **Matrix:** WASTE

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
SUBCONTRACTED ANALYSES			SUBCONTRACT			Analyst: ALS
Subcontracted Analyses	See attached			as noted	1	7/23/2019

Note: See Qualifiers page for a list of qualifiers and their definitions.



Cincinnati, OH
+1 513 733 5336

Fort Collins, CO
+1 970 490 1511

Everett, WA
+1 425 356 2600

Holland, MI
+1 616 399 6070

Chain of Custody Form

Page 1 of 1

COC ID: 46064

Houston, TX
+1 281 530 5656

Middletown, PA
+1 717 944 5541

Spring City, PA
+1 610 948 4903

Salt Lake City, UT
+1 801 266 7700

South Charleston, WV
+1 304 356 3168

York, PA
+1 717 505 5280

Customer Information			Project Information			ALS Project Manager: _____ ALS Work Order #: 19070725												
Parameter/Method Request for Analysis																		
Purchase Order		Project Name	PLM Asbestos (Bulk)															
Work Order		Project Number	52016001-1019															
Company Name	Sustainment & Restoration Services	Bill To Company	Sustainment & Restoration Services															
Send Report To	Hannah Hiscox	Invoice Attn																
Address	79 West Monroe, Suite 1119,	Address																
City/State/Zip	Chicago, IL, 60603	City/State/Zip																
Phone	(312)-220-7771 ext 2224	Phone																
Fax		Fax																
e-Mail Address	HHiscox@SR511C.COM	e-Mail Address	AP@SR511C.COM															

No.	Sample Description	Date	Time	Matrix	Pres.	# Bottles	A	B	C	D	E	F	G	H	I	J	Hold
1	GSS-ASB01-0719	7/10/19	13:41	Waste	N/A	1	X										
2	GSS-ASB02-0719		13:48			1	X										
3	GSS-ASB03-0719		13:57			1	X										
4	GSS-ASB04-0719		14:04			1	X										
5	GSS-ASB05-0719		14:06			1	X										
6	GSS-ASB06-0719		14:15			1	X										
7	GSS-ASB06X-0719		14:15			1	X										
8																	
9																	
10																	

Sampler(s) Please Print & Sign		Shipment Method		Turnaround Time in Business Days (BD)				Results Due Date:	
Hannah Hiscox		FedEx		<input checked="" type="checkbox"/> 10 BD <input type="checkbox"/> 5 BD <input type="checkbox"/> 3 BD <input type="checkbox"/> 2 BD <input type="checkbox"/> 1 BD				Standard time	
Relinquished by:	Date:	Time:	Received by:	Notes:					
Hannah Hiscox	7/10/19	16:00	FED EX						
Relinquished by:	Date:	Time:	Received by (Laboratory):						
FED EX	7/12/19	0930							
Logged by (Laboratory):	Date:	Time:	Checked by (Laboratory):	Cooler ID	Cooler Temp	QC Package: (Check One Box Below)			
DES	7/12/19	1030		SR2	5.2°C	<input type="checkbox"/> Level II Std QC <input type="checkbox"/> TRRP Checklist			
				<input type="checkbox"/> Level III Std QC/Raw Data <input type="checkbox"/> TRRP Level IV					
				<input type="checkbox"/> Level IV SW846/CLP <input type="checkbox"/> Other					
Preservative Key: 1-HCl 2-HNO ₃ 3-H ₂ SO ₄ 4-NaOH 5-Na ₂ S ₂ O ₃ 6-NaHSO ₄ 7-Other 8-FC 9-5035									

Note: 1. Any changes must be made in writing once samples and COC Form have been submitted to ALS Environmental.
2. Unless otherwise agreed in a formal contract, services provided by ALS Environmental are expressly limited to the terms and conditions stated on the reverse.
3. The Chain of Custody is a legal document. All information must be completed accurately.

Copyright 2012 by ALS Environmental.

Sample Receipt Checklist

Client Name: SRS

Date/Time Received: 12-Jul-19 09:30

Work Order: 19070725

Received by: DS

Checklist completed by Diane Shaw
eSignature

12-Jul-19
Date

Reviewed by: Chad Whelton
eSignature

15-Jul-19
Date

Matrices: Waste

Carrier name: FedEx

Shipping container/cooler in good condition?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	Not Present <input type="checkbox"/>
Custody seals intact on shipping container/cooler?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Not Present <input checked="" type="checkbox"/>
Custody seals intact on sample bottles?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Not Present <input checked="" type="checkbox"/>
Chain of custody present?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Chain of custody signed when relinquished and received?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Chain of custody agrees with sample labels?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Samples in proper container/bottle?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Sample containers intact?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Sufficient sample volume for indicated test?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
All samples received within holding time?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Container/Temp Blank temperature in compliance?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Sample(s) received on ice?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Temperature(s)/Thermometer(s):	<u>5.2/5.2 c</u>		<u>SR2</u>
Cooler(s)/Kit(s):	<u></u>		
Date/Time sample(s) sent to storage:	<u>7/12/2019 10:36:17 AM</u>		
Water - VOA vials have zero headspace?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	No VOA vials submitted <input checked="" type="checkbox"/>
Water - pH acceptable upon receipt?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	N/A <input checked="" type="checkbox"/>
pH adjusted?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	N/A <input checked="" type="checkbox"/>
pH adjusted by:	<u>-</u>		

Login Notes:

Client Contacted:

Date Contacted:

Person Contacted:

Contacted By:

Regarding:

Comments:

CorrectiveAction:



23-Jul-2019

Chad Whelton
ALS Laboratory Group, Inc.
3352 128th Avenue
Holland, MI 49424

Tel: (616) 399-6070
Fax: (616) 399-6185

Re: 19070725

Work Order: **1907598**

Dear Chad,

ALS Environmental received 7 samples on 16-Jul-2019 10:40 AM for the analyses presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental and for only the analyses requested.

QC sample results for this data met laboratory specifications. Any exceptions are noted in the Case Narrative, or noted with qualifiers in the report or QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained from ALS Laboratory Group. Samples will be disposed in 30 days unless storage arrangements are made.

The total number of pages in this report is 12.

If you have any questions regarding this report, please feel free to contact me.

Sincerely,

A handwritten signature in cursive script that reads "Shawn Smythe".

Electronically approved by: Danielle Strasinger

Shawn Smythe
Project Manager

ADDRESS 4388 Glendale Milford Rd Cincinnati, OH 45242- | PHONE (513) 733-5336 | FAX (513) 733-5347

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Environmental 

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RIGHT SOLUTIONS RIGHT PARTNER

Client: ALS Laboratory Group, Inc.
Project: 19070725
Work Order: 1907598

Work Order Sample Summary

<u>Lab Samp ID</u>	<u>Client Sample ID</u>	<u>Matrix</u>	<u>Tag Number</u>	<u>Collection Date</u>	<u>Date Received</u>	<u>Hold</u>
1907598-01	19070725-01A	Soil		7/10/2019 13:41	7/16/2019 10:40	<input type="checkbox"/>
1907598-02	19070725-02A	Soil		7/10/2019 13:48	7/16/2019 10:40	<input type="checkbox"/>
1907598-03	19070725-03A	Soil		7/10/2019 13:57	7/16/2019 10:40	<input type="checkbox"/>
1907598-04	19070725-04A	Soil		7/10/2019 14:04	7/16/2019 10:40	<input type="checkbox"/>
1907598-05	19070725-05A	Soil		7/10/2019 14:06	7/16/2019 10:40	<input type="checkbox"/>
1907598-06	19070725-06A	Soil		7/10/2019 14:15	7/16/2019 10:40	<input type="checkbox"/>
1907598-07	19070725-07A	Soil		7/10/2019 14:15	7/16/2019 10:40	<input type="checkbox"/>

Client: ALS Laboratory Group, Inc.
Project: 19070725
Work Order: 1907598

Case Narrative

It is the responsibility of the client to notify the lab of any certification requirements in writing via the chain of custody as this may determine the preparation and analytical procedures employed.

Laboratory accreditation does not in any way constitute approval or endorsement by any accrediting body or agency of the federal government. Please contact ALS Cincinnati QA/QC Manager for accreditation identifications and certifications.

All sample collection is performed outside of ALS and is the sole responsibility of the client.

Sample condition acceptable upon receipt except where noted. Estimates of concentration are semi-quantitative and are made on an area basis. Results apply only to portions of samples analyzed. Samples disposed after 60 days. Cover letter signatory indicates report generation only. Raw data validated by peer analyst. Analyst responsible for technical content of report. The reporting limit (RL) for asbestos in bulk materials is 1% and is a function of the quantity of sample analyzed, the nature of any matrix interferences, sample preparation, and fiber size and distribution.

Results reported as ND indicate that no asbestos was detected.

Results reported as "Trace" indicate that asbestos was detected at some level confidently determined to be <1% which is considered inconclusive according to New York ELAP.

Results reported as "Near 1%" indicate that while asbestos was detected at a level confidently determined to be <1% as prepared, the inherent uncertainty of the quantification technique(s) employed and the concentration nearing the 1% mark necessitate the recommendation that verification of these results by a more accurate and precise method be made.

ALS performs variety of PLM methods for asbestos in bulk building materials including EPA 600/R-93/116, NIOSH 9002, ELAP 198.1, and ELAP 198.6. In addition, we perform a modified uncertified version of EPA 600/R-04/004 for asbestos in vermiculite which reports asbestos as present or absent only, an in-house developed uncertified method ALS SOP ENV 004 for asbestos in soil, and asbestos in soil by ASTM D7521.

Regardless of the method requested, all samples are examined according to mandatory method protocol. Any optional method protocol are eliminated from the initial analysis but may be performed upon client request. These may include; insufficient sample volume rejection*, phase separation of layered or heterogeneous samples, ashing to remove organic interferences, acid dissolution to remove mineral carbonate interferences, point counting**, and analysis by transmission electron microscopy (TEM) to verify ND results.

All samples are examined by stereomicroscope for the determination of homogeneity, texture, friability, color, and extent of fibrous components. Non-asbestos materials such as foil, paper, metal, plastic, pebbles, or organic debris are ignored and a subsample of the remaining material homogenized by some means for examination by polarized light microscope (PLM). Information obtained via both stereomicroscope and PLM are used in the final qualitative and quantitative analysis of fibrous components.

NOTE: Any visible building debris in soil samples such as pieces of drywall, roofing material,

Client: ALS Laboratory Group, Inc.
Project: 19070725
Work Order: 1907598

Case Narrative

insulation, concrete, etc., are not included in the soil analysis. If present, these are considered possible asbestos containing materials (ACM) and may be analyzed as separate samples upon client request.

*Sufficient sample volume is material dependent. For samples such as floor tiles, roofing felts, sheet insulation, etc., three to four square inches of the layered material is preferred. For materials such as ceiling tiles, loose fill insulation, pipe insulation, etc., one cubic inch (~15cc) is preferred. For samples of thin coating materials such as paints, mastics, spray plasters, etc., a smaller sample size may be suitable. For vermiculite analysis, a one gallon ziploc bag full of dry, loose material is acceptable. For ENV 004 soil samples, a 4oz jar is recommended. The ASTM D7521 Soil method requires a minimum of 8oz and a maximum of 16oz of homogeneous soil.

**PLM samples at or near the 1% detection limit may be analyzed by the 400 point count analysis which refers to method EPA 600/M4/82/020, or AHERA method EPA 40 CFR Part 763, Sub. E, App. E as these are synonymous.

ALS Environmental

Date: 23-Jul-19

Client: ALS Laboratory Group, Inc.
Project: 19070725**Work Order:** 1907598**Lab ID:** 1907598-01A
Client Sample ID: 19070725-01A**Collection Date:** 7/10/2019 1:41:00 PM
Matrix: SOIL

Analyses	Result	Units	Analytical Results
----------	--------	-------	--------------------

Asbestos by PLM with Ashing

Date Analyzed 7/19/2019

Macroscopic Examination

Prep Date: 7/19/2019 E600/R-93/116

Analyst: MRS

Color	Black
Description	Material
Homogeneity	Homogeneous
Texture	Resinous

Asbestiform Minerals

E600/R-93/116

Amosite	ND	%
Anthophyllite	ND	%
Chrysotile	28.47	%
Crocidolite	ND	%
Tremolite - actinolite	ND	%

Total asbestos	28.47	%
-----------------------	--------------	----------

Lab ID: 1907598-02A
Client Sample ID: 19070725-02A**Collection Date:** 7/10/2019 1:48:00 PM
Matrix: SOIL

Analyses	Result	Units	Analytical Results
----------	--------	-------	--------------------

Asbestos by PLM with Ashing

Date Analyzed 7/19/2019

Macroscopic Examination

Prep Date: 7/19/2019 E600/R-93/116

Analyst: MRS

Color	Black
Description	Material
Homogeneity	Homogeneous
Texture	Resinous

Asbestiform Minerals

E600/R-93/116

Amosite	ND	%
Anthophyllite	ND	%
Chrysotile	29.14	%
Crocidolite	ND	%
Tremolite - actinolite	ND	%

Total asbestos	29.14	%
-----------------------	--------------	----------

Note:

ALS Environmental

Date: 23-Jul-19

Client: ALS Laboratory Group, Inc.
Project: 19070725

Work Order: 1907598

Lab ID: 1907598-03A
Client Sample ID: 19070725-03A

Collection Date: 7/10/2019 1:57:00 PM
Matrix: SOIL

Analyses	Result	Units	Analytical Results
Asbestos by PLM with Ashing			Date Analyzed 7/19/2019
Macroscopic Examination	Prep Date: 7/19/2019	E600/R-93/116	Analyst: MRS
Color	Black		
Description	Material		
Homogeneity	Homogeneous		
Texture	Resinous		
Asbestiform Minerals		E600/R-93/116	
Amosite	ND	%	
Anthophyllite	ND	%	
Chrysotile	48.94	%	
Crocidolite	ND	%	
Tremolite - actinolite	ND	%	
Total asbestos	48.94	%	

Note:

ALS Environmental

Date: 23-Jul-19

Client: ALS Laboratory Group, Inc.
Project: 19070725

Work Order: 1907598

Lab ID: 1907598-04A
Client Sample ID: 19070725-04A

Collection Date: 7/10/2019 2:04:00 PM
Matrix: SOIL

Analyses	Result	Units	Analytical Results
Asbestos by PLM			Date Analyzed 7/19/2019
Macroscopic Examination	Prep Date: 7/18/2019	E600/R-93/116	Analyst: MRS
Color	Brown		
Description	Material		
Homogeneity	Homogeneous		
Texture	Fibrous		
Other Materials			E600/R-93/116
Cellulose	ND	%	
Fiberglass	ND	%	
Non-fibrous	>30<=40	%	
Other fibers	ND	%	
Resin/binder	>20<=30	%	
Asbestiform Minerals			E600/R-93/116
Amosite	ND	%	
Anthophyllite	ND	%	
Chrysotile	>20<=30	%	
Crocidolite	ND	%	
Tremolite - actinolite	ND	%	
Total asbestos	>20<=30	%	

Note:

ALS Environmental

Date: 23-Jul-19

Client: ALS Laboratory Group, Inc.
Project: 19070725

Work Order: 1907598

Lab ID: 1907598-05A
Client Sample ID: 19070725-05A

Collection Date: 7/10/2019 2:06:00 PM
Matrix: SOIL

Analyses	Result	Units	Analytical Results
Asbestos by PLM			Date Analyzed 7/19/2019
Macroscopic Examination	Prep Date: 7/18/2019	E600/R-93/116	Analyst: MRS
Color	Brown		
Description	Material		
Homogeneity	Homogeneous		
Texture	Fibrous		
Other Materials			E600/R-93/116
Cellulose	ND	%	
Fiberglass	ND	%	
Non-fibrous	>50<=60	%	
Other fibers	ND	%	
Resin/binder	>20<=30	%	
Asbestiform Minerals			E600/R-93/116
Amosite	ND	%	
Anthophyllite	ND	%	
Chrysotile	>5<=10	%	
Crocidolite	ND	%	
Tremolite - actinolite	ND	%	
Total asbestos	>5<=10	%	

Note:

ALS Environmental

Date: 23-Jul-19

Client: ALS Laboratory Group, Inc.
Project: 19070725

Work Order: 1907598

Lab ID: 1907598-06A
Client Sample ID: 19070725-06A

Collection Date: 7/10/2019 2:15:00 PM
Matrix: SOIL

Analyses	Result	Units	Analytical Results
Asbestos by PLM			Date Analyzed 7/19/2019
Macroscopic Examination	Prep Date: 7/18/2019	E600/R-93/116	Analyst: MRS
Color	Brown		
Description	Material		
Homogeneity	Homogeneous		
Texture	Fibrous		
Other Materials			E600/R-93/116
Cellulose	ND	%	
Fiberglass	ND	%	
Non-fibrous	>40<=50	%	
Other fibers	ND	%	
Resin/binder	>20<=30	%	
Asbestiform Minerals			E600/R-93/116
Amosite	ND	%	
Anthophyllite	ND	%	
Chrysotile	>10<=20	%	
Crocidolite	ND	%	
Tremolite - actinolite	ND	%	
Total asbestos	>10<=20	%	

Note:

ALS Environmental

Date: 23-Jul-19

Client: ALS Laboratory Group, Inc.
Project: 19070725

Work Order: 1907598

Lab ID: 1907598-07A
Client Sample ID: 19070725-07A

Collection Date: 7/10/2019 2:15:00 PM
Matrix: SOIL

Analyses	Result	Units	Analytical Results
Asbestos by PLM			Date Analyzed 7/19/2019
Macroscopic Examination	Prep Date: 7/18/2019	E600/R-93/116	Analyst: MRS
Color	Brown		
Description	Material		
Homogeneity	Homogeneous		
Texture	Fibrous		
Other Materials			E600/R-93/116
Cellulose	ND	%	
Fiberglass	ND	%	
Non-fibrous	>20<=30	%	
Other fibers	ND	%	
Resin/binder	>20<=30	%	
Asbestiform Minerals			E600/R-93/116
Amosite	ND	%	
Anthophyllite	ND	%	
Chrysotile	>30<=40	%	
Crocidolite	ND	%	
Tremolite - actinolite	ND	%	
Total asbestos	>30<=40	%	

Note:

ALS Environmental

Date: 23-Jul-19

Client: ALS Laboratory Group, Inc.
Project: 19070725
WorkOrder: 1907598

QUALIFIERS, ACRONYMS, UNITS

<u>Qualifier</u>	<u>Description</u>
*	Value exceeds Regulatory Limit
a	Not accredited
B	Analyte detected in the associated Method Blank above the Reporting Limit
E	Value above quantitation range
H	Analyzed outside of Holding Time
J	Analyte detected below quantitation limit
n	Not offered for accreditation
ND	Not Detected at the Reporting Limit
O	Sample amount is > 4 times amount spiked
P	Dual Column results percent difference > 40%
R	RPD above laboratory control limit
S	Spike Recovery outside laboratory control limits
U	Analyzed but not detected above the MDL

<u>Acronym</u>	<u>Description</u>
DUP	Method Duplicate
E	EPA Method
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MBLK	Method Blank
MDL	Method Detection Limit
MQL	Method Quantitation Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PDS	Post Digestion Spike
PQL	Practical Quantitation Limit
SDL	Sample Detection Limit
SW	SW-846 Method

<u>Units Reported</u>	<u>Description</u>
%	

Sample Receipt Checklist

Client Name: **ALS-HOLLAND**

Date/Time Received: **16-Jul-19 10:40**

Work Order: **1907598**

Received by: **SNH**

Checklist completed by Stephanie Harrington
eSignature

16-Jul-19
Date

Reviewed by: Danielle Strasinger
eSignature

23-Jul-19
Date

Matrices:

Carrier name: **FedEx**

Shipping container/cooler in good condition?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	Not Present <input type="checkbox"/>
Custody seals intact on shipping container/cooler?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Not Present <input checked="" type="checkbox"/>
Custody seals intact on sample bottles?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Not Present <input checked="" type="checkbox"/>
Chain of custody present?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Chain of custody signed when relinquished and received?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Chain of custody agrees with sample labels?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Samples in proper container/bottle?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Sample containers intact?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Sufficient sample volume for indicated test?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
All samples received within holding time?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Container/Temp Blank temperature in compliance?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Temperature(s)/Thermometer(s):	<input type="text"/>		
Cooler(s)/Kit(s):	<input type="text"/>		
Water - VOA vials have zero headspace?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	No VOA vials submitted <input checked="" type="checkbox"/>
Water - pH acceptable upon receipt?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	N/A <input checked="" type="checkbox"/>
pH adjusted?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	N/A <input checked="" type="checkbox"/>
pH adjusted by:	<input type="text"/>		

Login Notes:

Client Contacted:

Date Contacted:

Person Contacted:

Contacted By:

Regarding:

Comments:

CorrectiveAction:

APPENDIX D

Torch Lake Area Assessment Excerpt

**SUMMARY REPORT FOR THE
TORCH LAKE AREA ASSESSMENT
TORCH LAKE NPL SITE
AND SURROUNDING AREAS
KEWEENAW PENINSULA, MICHIGAN**

Prepared for:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region V Emergency Response Branch
9311 Groh Road
Gross Ile, Michigan 48138

Prepared by:

WESTON SOLUTIONS, INC.
2501 Jolly Road, Suite 100
Okemos, Michigan 48864

Date Prepared	December 13, 2007
TDD Number	S05-0002-0708-020
Contract Number	EP-S5-06-04
Document Control Number	274-2A-ABDT
START Project Manager	Daniel M. Capone
Telephone No.	(906) 482-3085
U.S. EPA On-Scene Coordinator	Brian Kelly

**SUMMARY REPORT FOR THE
TORCH LAKE AREA ASSESSMENT
TORCH LAKE NPL SITE
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KEWEENAW PENINSULA, MICHIGAN**

Prepared for:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region V Emergency Response Branch
9311 Groh Road
Gross Ile, Michigan 48138

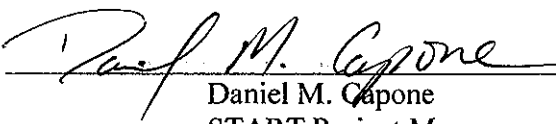
Prepared by:

WESTON SOLUTIONS, INC.
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Okemos, Michigan 48864

December 13, 2007

Prepared by 
Jeffrey S. Binkley
Project Manager

Date 12/13/07

Reviewed &
Approved by 
Daniel M. Capone
START Project Manager

Date 12-13-07

EXECUTIVE SUMMARY

Weston Solutions, Inc. (WESTON®) has prepared this Summary Report to describe the September 2007 Torch Lake Area Assessment (AA) at the request of the United States Environmental Protection Agency (U.S. EPA), under the Superfund Technical Assessment and Response Team (START) contract between WESTON and the U.S. EPA (Contract No. EP-S5-06-04).

Study Area

The focus of the AA was on 17 Areas of Investigation (AOI) identified jointly by U.S. EPA and the Michigan Department of Environmental Quality (MDEQ) that were impacted by historical copper mining operations in the Keweenaw Peninsula. The AA included portions of the Torch Lake National Priorities List (NPL) Site where stamp sands are the primary media of concern. The AOIs are depicted on **Figure 1**.

Study Objectives

The primary objective of the Torch Lake AA was to evaluate imminent threats to human health, welfare and the environment, along with identification of areas for additional investigation. The specific geographical locations and exposure pathways evaluated during the AA were:

- Direct-contact hazards associated with newly-exposed stamp sand and the potential presence of other mining-era related waste along the western shoreline of Torch Lake as a result of significantly lower surface-water levels. The area evaluated was the recently exposed shoreline between the edge of the U.S. EPA-installed vegetative cover and the waters edge as a result of the significantly lower surface-water levels in Lake Superior and its contiguous water bodies. These previously shallow water areas had not been investigated;
- Direct-contact hazards associated with exposed stamp sand and the potential presence of other mining-era related waste near Gay, Michigan where no remedial efforts have been implemented; and
- Limited evaluation of potential environmental concerns at abandoned mining-era related industrial buildings, ruins, and land areas proximal to the western shoreline of Torch Lake, the shoreline of Lake Superior, and the north side of the Portage Waterway between the Quincy Smelter and H&Y Marina.

WESTON START conducted field tasks including performing visual assessments and documentation of conditions at each AOI, screening soils for metals content by x-ray fluorescence, sampling soils for laboratory analysis, and using global positioning system equipment to log and map targeted locations/media to meet the primary objective as further described in **Section 2**.

Findings

Comprehensive assessments were not in the scope of the AA, and therefore, lead paint, structural stability, physical hazards and other common environmental hazards known to affect historical industrial properties and structures are not included in this report unless suspected materials were readily apparent during reconnaissance or documented through previous studies. Suspect asbestos-containing material (ACM) encountered during reconnaissance or documented through previous studies is noted in the key findings. A complete summary of AA findings is provided in **Section 3**.

Findings at one or more AOI included dilapidated structures and exposed foundation materials and debris, documented and suspect friable ACM and other suspect hazardous building materials, exposed stamp sand and slag, miscellaneous items (including, but not limited to drums, cylinders, aboveground storage tanks, and surface debris), a tar vault and exposed stamp sand and tar along the Portage Waterway shoreline, and underwater drums presumed to be associated with the historical industrial operations surrounding Torch Lake.

Recommendations

Recommendations for further investigation, remedial action, or no further action are provided in **Section 4** for each AOI. The purpose of the Torch Lake AA was to determine if imminent and substantial threats existed and to make recommendations on further assessment. A comprehensive assessment of all environmental hazards known to affect historical industrial properties and structures was not within the scope of the AA. Furthermore, it should be noted that many of the potential environmental issues have been evaluated previously by the MDEQ and the U.S. EPA Remedial Branch.

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SECTION 1 INTRODUCTION

On August 24, 2007, the United States Environmental Protection Agency (U.S. EPA) initiated an area assessment (AA) at select areas of the Torch Lake National Priorities List (Torch Lake NPL) Site along the western shoreline of Torch Lake, the northern shoreline of the Portage Waterway, the western shoreline of Torch Lake, and the exposed shoreline of the Gay Stamp Sands deposit. The purpose of this AA was to identify potential imminent threats to human health, welfare, and the environment, along with identification of areas for additional investigation. U.S. EPA tasked the Weston Solutions, Inc. (WESTON®) Superfund Technical Assessment and Response Team (START) to perform the AA under START Contract No. EP-S5-06-04, Technical Direction Document (TDD) No. S05-0002-0708-020.

1.1 SITE LOCATION

The Portage Waterway and Torch Lake are located proximal to Hancock, Houghton County, Michigan (**Figure 1**). Gay, Michigan is located approximately 14 miles northeast of Torch Lake, on the shores of Lake Superior. The assessment study area encompasses Areas of Investigation (AOI) that include buildings, structures, five miles of exposed stamp sand shoreline along the western margin of Torch Lake, and five miles of stamp sand shoreline along Lake Superior near the town of Gay, Michigan. Targeted areas are presented in **Section 2**, and depicted on **Figure 1**.

1.2 SITE HISTORY

Copper mining occurred in the Keweenaw Peninsula from the 1890s until 1969. Mill tailings (stamp sands) were deposited in and along the shorelines of multiple lakes. Some industry is present in the area, but the primary business and commerce in the area today centers around recreation and tourism. Approximately 4,000 people live within one mile of Torch Lake.

About 200 million tons of copper mill stamp sands were dumped into Torch Lake, filling about 20 percent (%) of the lake, by volume. The contaminated sediments are believed to be 70 feet thick in some areas, and surface sediments contain copper concentration up to 2,000 parts per million (ppm). The stamp sands deposited in Torch Lake and along the shoreline were dredged during the early part of the 1900s. Flotation and leaching chemicals were used in some instances

to reclaim copper. The stamp sands and much of the flotation chemicals were returned to the lake bed and deposited along the shoreline. In addition to the mined copper, copper-containing materials from other areas were reclaimed. Other wastes were also historically deposited in and along the shoreline of Torch Lake, including mine pumpage, leaching chemicals, explosives residues, and mining byproducts. In 1972, an estimated 27,000 gallons of cupric ammonium carbonate were released into the Torch Lake from storage vats. Barrels have been found at several sites along the shoreline of the lake and on the lake bottom.

The Torch Lake NPL Site is comprised of several smaller sites ranging from approximately 10 acres to more than 200 acres. The sites are located around the Keweenaw Peninsula. The Torch Lake NPL Site was primarily listed because of the detrimental ecological effects of copper and mine tailings on aquatic organisms and to the surface water of Torch Lake. When it was added to the NPL, the Torch Lake NPL Site was defined to include Torch Lake, the northern portion of Portage Lake, North Entry, and tributary areas. Other related areas were added during the investigation phase and the Record of Decision (ROD) for Operable Units 1 and 3 addressed tailing piles and slag piles/beach deposited along the western shore of Torch Lake, Northern Portage Lake, Keweenaw Waterway, Lake Superior, Boston Pond and Calumet Lake. Tailing piles in Lake Linden, Hubbell/Tamarack City, Mason, Calumet Lake, Boston Pond, Michigan Smelter, Isle Royale, Lake Superior, and Gross Point were also included. The remedial investigation and cleanup efforts focused on areas along the shores of Torch Lake and the surrounding areas, where stamp sands and tailings were a concern for erosion into the waterways. Buildings and other related structures that were not shown to be a concern for erosion into surface water, were not included as part of the Torch Lake NPL Site.

By the fall of 2004, approximately 700 acres of stamp sands and slag were remediated by U.S. EPA. This included stamp sands along the western shore of Torch Lake, Dollar Bay, Point Mills, Calumet Lake, Boston Pond, and Michigan Smelter. The U.S. EPA Torch Lake NPL Site cleanup primarily addressed the negative ecological effects on area water bodies as a result of more than a century of copper mining, milling, and smelting in the area. The most significant ecological effect is the degradation of the benthic community in area water bodies as a result of past and current metal and particulate-matter surface water loadings from mining wastes, including stamp sand, located on land along and near area water bodies. The U.S. EPA cleanup

decision for terrestrial portions of Torch Lake NPL Site is documented in the September 30, 1992, U.S.EPA ROD.

The 1992 ROD included constructing a soil and vegetative cover over exposed mining wastes on properties that border area water bodies. This cover was designed to prevent further contamination and ecological degradation of area water bodies by reducing the ongoing transport (*i.e.*, wind erosion, surface water runoff, and shoreline erosion) and loading of mining waste metals and particulate matter. The area water bodies were then allowed to naturally recover.

In August 1994, U.S. EPA contracted with the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) to perform remedial design work. In September 1998, U.S. EPA also contracted with the USDA-NRCS to perform remedial action management and oversight throughout the cleanup process.

In April 2002, a partial NPL delisting of the Lake Linden portion of the Torch Lake NPL Site and all of operable unit 2 (sediments, surface water, and groundwater) was finalized. The partial delisting of the Hubbell/Tamarack City portion of the Torch Lake NPL Site was finalized in 2004.

Low lake levels experienced during 2007 at Torch Lake exposed stamp sands and, in the Village of Lake Linden, a sludge material previously under water along the shore. The Michigan Department of Environmental Quality (MDEQ) collected samples of the sludge which was located adjacent to a public beach within the Lake Linden Recreation Park (LLRP). Laboratory analysis of the sludge revealed the presence of antimony, arsenic, barium, copper, and lead at concentrations exceeding MDEQ Part 201 Residential Direct Contact Criteria (RDCC) (Use of surveyed properties varied and comparison to RDCC is for reference only), and exceeded, by a factor of 20, the extract of Toxicity Characteristic Leaching Procedure (TCLP) limits. These results indicate the sludge was a characteristically hazardous waste under 40 Code of Federal Regulations (CFR) 261.24. This discovery prompted a time-critical removal action to remove the sludge and the need for additional assessment to determine if other areas were similarly impacted.

3.15.4 Summary of XRF Results

WESTON START screened two locations with an Innov-X 4000 XP/Auto XRF (**Table 13**). No metals were detected at concentrations greater than RDCC.

3.15.5 Summary of Laboratory Results

A sample was collected and submitted for laboratory verification analysis from one location, BootjackB-17. This sample was not screened with an XRF because it was raining heavily during the AA. No metals concentrations were detected greater than RDCC at BootjackB-17.

A sample was also collected for PCB analysis at location BootjackB-17. All results were non-detect.

3.16 AOI 14 – GAY STAMP SANDS

3.16.1 Site Description

Copper mining activities conducted between 1890 and 1920 in the Village of Gay, Keweenaw County, Michigan resulted in the generation of approximately 37.3 million CY (mcy) of stamp sand that was placed in or along Lake Superior near the Village of Gay. A byproduct of copper extraction, stamp sand contains heavy metals at concentrations that may pose a risk to aquatic organisms. Herein, the definition of the Gay Stamp Sands site (AOI 14) includes the following features (**Figure 10a**):

- The original stamp sand deposit (original deposit) located near the former Village of Gay, Michigan copper stamping mill (former Gay mill); and
- Approximately 5.3 miles of shoreline that begins at the original deposit and continues southerly to the Traverse River harbor breakwall. This stretch of shoreline has been covered by stamp sand due to migration from the original deposit.

It is estimated that the original deposit is receding at a rate of 8.0 meters per year (26.0 feet per year).

Currently, widespread reuse for road traction, as well as recreational and construction use of the stamp sand occurs throughout the Keweenaw Peninsula. It is also expected that the migrating stamp sand will eventually bypass the Traverse River harbor and deposit on the currently

unaffected beach south of the breakwall. Beneficial use impairments may include degradation of fish and wildlife habitat, degradation of the benthos, and degradation of aesthetics.

This area was not part of the Torch Lake NPL Site and therefore not part of previous U.S. EPA remedial efforts and constitutes a new AOI based on the presence of stamp sand.

3.16.2 Review of Existing Site Information

As of 2007, several studies were conducted for the Gay Stamp Sands by MDEQ and USACE:

- **2001 USACE Quantification and Fate Study:** In this study, the location and quantity of stamp sand was determined at three sites including the Gay Stamp Sands Site. An analysis of current and historic aerial photography in conjunction with an analysis of bathymetric data was performed to determine the aerial extent of stamp sand migration. The volume of stamp sand in the littoral system and the rate at which the stockpiles erode was determined using similar methods. Lastly, several mitigation alternatives at each study area were presented with the purpose of preventing further movement of the stamp sands. These alternatives included structural solutions such as stone revetments, steel sheet-pile bulkheads and groins, and non-structural approaches such as dredging, capping, and bioengineering as summarized in the *Quantification and Fate of Keweenaw Stamp Sand* (USACE, Detroit District, December 2001).
- **September 2003 MDEQ RRD Pre-remedial Unit of the Superfund Section and the RRD Geological Services Unit (GSU):** MDEQ collected 274 soil samples from the northern deposit area and 24 soil samples from the southern deposit area at the Gay Stamp Sands site. MDEQ also collected 10 groundwater samples from the northern deposit area for analysis of both dissolved and total metals to evaluate the effects of stamp sand on surface water. MDEQ compared the soil and groundwater sampling results to Part 201 criteria and provided a summary in *MDEQ Interoffice Communication* (MDEQ, May 2004). According to MDEQ Interoffice Communication, none of the samples collected from the southern area exceeded the RDCC for any of the metals. One sample out of 274 samples collected from the northern area exceeded RDCC for arsenic. One out of 274 samples collected from the northern area exceeded the generic Commercial/Industrial PSIC for manganese. MDEQ also compared groundwater sampling results for dissolved metals to Part 201 Residential/Commercial I Drinking Water Criteria. Aluminum and manganese were detected above Residential/Commercial I Drinking Water Criteria in several of the samples.
- **2004-2006 WESTON Toxicological Evaluation:** WESTON prepared a Toxicological Evaluation for the Gay stamp sands in response to a request from the MDEQ RRD in 2004 (*Toxicological Evaluation for the Gay, Michigan Stamp Sand* [WESTON, September 2006]). The purpose of the Toxicological Evaluation was to evaluate the potential for exposure to stamp sand contaminants in reuse scenarios, including road traction, recreational, and construction uses. WESTON assessed the effects on human health and aquatic systems in each scenario. The results of the Toxicological Evaluation

indicated the stamp sand re-use scenarios posed acceptable risks to human health, with the exception of consumption of groundwater that has contact with stamp sand. However, WESTON determined that the Gay stamp sands posed an unacceptable risk to aquatic organisms based on the bioassay testing as summarized in the Toxicological Evaluation.

- **2004 MDEQ Geophysical Survey:** MDEQ RRD GSU conducted a geophysical survey to assess the depth and quantity of stamp sand extending from the Traverse River breakwall to approximately 4,500 feet north of the breakwall along the Lake Superior Shoreline. Results are summarized in the *Geophysical Investigation Migrating Stamp Sand* (MDEQ January 2005).
- **2004-2007 WESTON Technical Evaluation (TE):** WESTON conducted a TE in response to a request from the MDEQ RRD in 2004 (*Migrating Stamp Sand Mitigation Plan, Technical Evaluation* [WESTON, March 2007]). The purpose of the TE was to build on the previous migration mitigation study conducted by USACE and develop alternatives to preclude further erosion of the original stamp sand deposit, and ensure the unaffected, clean beach south of the Traverse River harbor breakwall is not contaminated by the southward migration of eroded stamp sand. The TE included the review of existing data; completion of hydrographic and limited topographic surveys; development of alternatives; hydrodynamic modeling analysis; and evaluation of alternatives. The recommended alternative to carry over into final design was the least-cost alternative, which included construction of a revetment at the original deposit and implementation of maintenance dredging.

3.16.3 Summary of Field Activities

WESTON START performed reconnaissance and XRF screening in the historic mining process building ruins at AOI 14 on September 10, 2007. The building ruins contained exposed foundation materials, debris, slag and exposed stamp sands. U.S. EPA FIELDS performed reconnaissance and XRF screening along the shoreline at AOI 14 on September 10, 2007.

Other features that were documented at AOI 14 during the AA include:

- Poor site security;
- Potential roofing ACM present in stockpiles on site; the largest pile is 20 feet by 20 feet by 4 feet;
- Residue from an unknown burned material;
- Evidence of household-waste and other non-mining-related dumping at the site; and
- A structurally compromised chimney stack that may pose a physical hazard.

3.16.4 Summary of XRF Results

WESTON START screened 15 locations in the historic mining process building with an Innov-X 4000 XP/Auto XRF (**Table 14**) and collected three samples for verification via laboratory analysis. All 15 XRF screening locations contained stained material suspected of containing metals. Seven of the 15 screening locations exhibited concentrations of metals greater than RDCC (**Figure 10b**); including seven exceedances for arsenic, four exceedances for copper, two exceedances for silver, one exceedance for lead, and four exceedances for iron. Material exhibiting metal concentrations greater than RDCC included green-stained sands (locations GayB-5, GayB-6, and GayB-11), black-stained soils (locations GayB-8, GayB-14, and GayB-15), and stamp sand (location GayB-12).

U.S. EPA FIELDS screened 38 locations along the shoreline at AOI 14 with an Innov-X 4000 XP/Auto XRF (**Table 14**) and collected one sample for verification via laboratory analysis. No obviously contaminated or stained material was observed during site reconnaissance and screening of stamp sands along the shoreline. Thus, the U.S. EPA FIELDS team screened the stamp sands every one quarter mile along the Gay Stamp Sands shoreline deposit. Three of the 38 samples screened along the shoreline exhibited concentrations of arsenic greater than RDCC (**Figure 10c**) (locations GAY-S1-07, GAY-S1-21, and GAY-S1-30).

3.16.5 Summary of Laboratory Results

Three of the 15 WESTON START historic mining building XRF screening locations were verified via laboratory analysis (GayB-6, GayB-11 and GayB-14):

- Laboratory results for the sample collected at location GayB-6 indicated the sample contained copper and arsenic at concentrations greater than RDCC. XRF screening of this location exhibited copper, arsenic, and silver concentrations greater than RDCC. The silver concentration at location GayB-6 determined during XRF screening was approximately ten times greater than the laboratory analytical result.
- Laboratory results for the sample collected at location GayB-11 indicated the sample contained copper and arsenic at concentrations greater than RDCC. XRF screening of the soil yielded similar results.

- Laboratory results for the sample collected at location GayB-14 indicated the sample contained concentrations of arsenic and lead greater than RDCC. XRF screening of the soil yielded similar results.

WESTON START also collected samples for PCB analysis at locations GayB-6, GayB-11, and GayB-14. All results were non-detect.

One of the 38 locations screened with an XRF along the shoreline by the U.S. EPA FIELDS team was verified via laboratory analysis (GAY-S1-21). Laboratory results indicated that no metals were present in the sample at concentrations that exceeded RDCC. According to results of XRF screening at location Gay-S1-21, arsenic concentrations exceeded RDCC. The concentration of arsenic as determined by XRF screening was 9 mg/kg, and as determined by laboratory analysis was 0.67 mg/kg.

The U.S. EPA FIELDS team also collected a sample for PCB analysis at location Gay-S1-21. All results were non-detect.

3.17 WESTERN SHORELINE OF TORCH LAKE

3.17.1 Site Description

Multiple areas along the western shoreline of Torch Lake are composed of stamp sand deposits. Historically, these stamp sand deposits have been present as sediments on the lake bottom. Currently, they are present as beach sand due to lake level regression.

3.17.2 Review of Existing Site Information

The planned U.S. EPA remedial activities are summarized in the Torch Lake NPL Site ROD, and a summary of the completed Torch Lake remedial action is provided in the *Superfund Preliminary Site Closeout Report, Final Remedial Action for Torch Lake Superfund Site, Houghton County, Michigan* (U.S. EPA, 2005). A comprehensive Remedial Action Completion Report is being compiled by the U.S. EPA Remedial Program at this time. Therefore, the extent of remediation of these mining-waste deposits via the placement of the vegetative cover is not restated here.

Table 14 - AOI 14 XRF Screening and Laboratory Analytical Results
Torch Lake Site Assessment
September 10, 2007

Parameter	Part 201 SDBL	Part 201 RDCC	Sample Name	GayB-2	GayB-3	GayB-4	GayB-5	GayB-6	GayB-6	GayB-7	GayB-8
			Sampling Date	09/10/07	09/10/07	09/10/07	09/10/07	09/10/07	09/10/07	09/10/07	09/10/07
			Sample Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
			Sample Type	XRF	XRF	XRF	XRF	Laboratory	XRF	XRF	XRF
			Sample Number/ Location	Gay Sands Ruins	Gay Sands Ruins	Gay Sands Ruins	Gay Sands Ruins	Gay Sands Ruins	Gay Sands Ruins	Gay Sands Ruins	Gay Sands Ruins
			Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Metals											
Titanium	--	--	mg/kg	6,743	11,503	11,224	22,214	NT	30,265	7,908	20,461
Chromium	18	790,000	mg/kg	<LOD	<LOD	<LOD	<LOD	16	<LOD	<LOD	<LOD
Manganese	440	25,000	mg/kg	614	625	791	1,323	270	<LOD	844	<LOD
Iron	12,000	160,000	mg/kg	149,596	84,797	85,090	296,329	NT	368,539	75,486	268,277
Cobalt	6.8	2,600	mg/kg	1,278	1,078	799	<LOD	13	<LOD	775	<LOD
Nickel	20	40,000	mg/kg	<LOD	<LOD	<LOD	<LOD	33	<LOD	<LOD	<LOD
Copper	32	20,000	mg/kg	1,421	2,586	1,371	450,143	320,000	653,430	9,606	596,985
Zinc	47	170,000	mg/kg	243	76	94	<LOD	180 J	<LOD	212	<LOD
Arsenic	5.8	7.6	mg/kg	<LOD	<LOD	<LOD	325	350	409	<LOD	325
Selenium	0.41	2,600	mg/kg	<LOD	<LOD	<LOD	21	NT	46	<LOD	34
Rubidium	--	--	mg/kg	12	<LOD	<LOD	20	NT	21	19	<LOD
Strontium	--	330,000	mg/kg	95	256	132	166	<230	228	170	153
Zirconium	--	--	mg/kg	122	144	139	<LOD	NT	<LOD	166	<LOD
Molybdenum	--	2,600	mg/kg	<LOD	<LOD	<LOD	<LOD	NT	<LOD	<LOD	<LOD
Silver	1	2,500	mg/kg	<LOD	<LOD	<LOD	1,971	220	2,941	111	2,646
Cadmium	1.2	550	mg/kg	<LOD	<LOD	<LOD	<LOD	NT	<LOD	<LOD	<LOD
Tin	--	--	mg/kg	<LOD	<LOD	<LOD	<LOD	NT	<LOD	<LOD	<LOD
Antimony	--	180	mg/kg	<LOD	<LOD	<LOD	<LOD	NT	<LOD	<LOD	<LOD
Barium	75	37,000	mg/kg	<LOD	<LOD	<LOD	<LOD	NT	<LOD	<LOD	<LOD
Mercury	0.13	160	mg/kg	<LOD	<LOD	<LOD	<LOD	1.30	<LOD	<LOD	<LOD
Lead	21	400	mg/kg	88	20	<LOD	95	290	<LOD	144	<LOD
Aluminum	6,900	50,000	mg/kg	NT	NT	NT	NT	8,200 J	NT	NT	NT
Beryllium	--	410	mg/kg	NT	NT	NT	NT	0.52 *	NT	NT	NT
Lithium	9.8	4,200	mg/kg	NT	NT	NT	NT	3	NT	NT	NT

Table 14 - AOI 14 XRF Screening and Laboratory Analytical Results
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Parameter	Part 201 SDBL	Part 201 RDCC	Sample Name	GayB-9	GayB-11	GayB-11	GayB-12	GayB-13	GayB-14	GayB-14	GayB-15
			Sampling Date	09/10/07	09/10/07	09/10/07	09/10/07	09/10/07	09/10/07	09/10/07	09/10/07
			Sample Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
			Sample Type	XRF	Laboratory	XRF	XRF	XRF	Laboratory	XRF	XRF
			Sample Number/ Location	Gay Sands Ruins	Gay Sands Ruins	Gay Sands Ruins	Gay Sands Ruins	Gay Sands Ruins	Gay Sands Ruins	Gay Sands Ruins	Gay Sands Ruins
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg		
Metals											
Titanium	--	--	mg/kg	11,513	NT	16,167	14,455	10,290	NT	8,885	6,235
Chromium	18	790,000	mg/kg	<LOD	45	<LOD	<LOD	<LOD	61	<LOD	<LOD
Manganese	440	25,000	mg/kg	995	200	918	782	501	610	660	1,980
Iron	12,000	160,000	mg/kg	92,730	NT	94,199	79,604	59,432	NT	61,926	367,120
Cobalt	6.8	2,600	mg/kg	655	14	<LOD	870	<LOD	12	512	<LOD
Nickel	20	40,000	mg/kg	<LOD	39	<LOD	<LOD	<LOD	31	<LOD	<LOD
Copper	32	20,000	mg/kg	17,720	430,000	286,596	1,624	1,219	990	1,073	1,082
Zinc	47	170,000	mg/kg	372	97 J	<LOD	82	53	14,000 J	10,509	1,258
Arsenic	5.8	7.6	mg/kg	<LOD	670	370	27	<LOD	58	132	46
Selenium	0.41	2,600	mg/kg	<LOD	NT	18	<LOD	<LOD	NT	13	<LOD
Rubidium	--	--	mg/kg	7	NT	<LOD	67	24	NT	28	17
Strontium	--	330,000	mg/kg	167	<240	159	236	182	<200	124	200
Zirconium	--	--	mg/kg	122	NT	<LOD	199	142	NT	103	110
Molybdenum	--	2,600	mg/kg	<LOD	NT	<LOD	<LOD	<LOD	NT	<LOD	<LOD
Silver	1	2,500	mg/kg	148	150	1,127	<LOD	<LOD	0.94	111	<LOD
Cadmium	1.2	550	mg/kg	<LOD	NT	<LOD	<LOD	<LOD	NT	<LOD	<LOD
Tin	--	--	mg/kg	<LOD	NT	<LOD	<LOD	<LOD	NT	<LOD	<LOD
Antimony	--	180	mg/kg	<LOD	NT	<LOD	<LOD	<LOD	NT	<LOD	<LOD
Barium	75	37,000	mg/kg	<LOD	NT	<LOD	<LOD	<LOD	NT	<LOD	<LOD
Mecury	0.13	160	mg/kg	<LOD	0.63	<LOD	<LOD	<LOD	0.026	<LOD	<LOD
Lead	21	400	mg/kg	198	82	<LOD	38	19	850	698	123
Aluminum	6,900	50,000	mg/kg	NT	7,200 J	NT	NT	NT	11,000 J	NT	NT
Beryllium	--	410	mg/kg	NT	0.8 *	NT	NT	NT	<4.1	NT	NT
Lithium	9.8	4,200	mg/kg	NT	2.90	NT	NT	NT	5.00	NT	NT

Table 14 - AOI 14 XRF Screening and Laboratory Analytical Results
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Parameter	Part 201 SDBL	Part 201 RDCC	Sample Name	GayB-16	GAY-S1-01	GAY-S1-02	GAY-S1-03	GAY-S1-04	GAY-S1-05	GAY-S1-06	GAY-S1-07	
			Sampling Date	09/10/07	09/10/07	09/10/07	09/10/07	09/10/07	09/10/07	09/10/07	09/10/07	09/10/07
			Sample Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
			Sample Type	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF
			Sample Number/ Location	Gay Sands Ruins	Gay Sands	Gay Sands	Gay Sands	Gay Sands	Gay Sands	Gay Sands	Gay Sands	Gay Sands
			Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Metals												
Titanium	--	--	mg/kg	10,134	10,171	10,673	9,024	11,671	10,912	<LOD	13,812	
Chromium	18	790,000	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Manganese	440	25,000	mg/kg	651	577	663	693	769	660	<LOD	617	
Iron	12,000	160,000	mg/kg	74,650	80,898	79,501	67,592	84,928	80,635	78,331	78,670	
Cobalt	6.8	2,600	mg/kg	642	705	681	690	822	834	<LOD	764	
Nickel	20	40,000	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Copper	32	20,000	mg/kg	1,122	1,504	1,640	1,153	1,237	2,590	3,867	1,750	
Zinc	47	170,000	mg/kg	595	91	100	66	97	111	<LOD	106	
Arsenic	5.8	7.6	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	11	
Selenium	0.41	2,600	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Rubidium	--	--	mg/kg	20	9	10	14	10	9	<LOD	14	
Strontium	--	330,000	mg/kg	155	115	118	153	82	136	169	121	
Zirconium	--	--	mg/kg	105	155	140	129	158	143	<LOD	158	
Molybdenum	--	2,600	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Silver	1	2,500	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Cadmium	1.2	550	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Tin	--	--	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	96	<LOD	<LOD	
Antimony	--	180	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Barium	75	37,000	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Mecury	0.13	160	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Lead	21	400	mg/kg	45	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Aluminum	6,900	50,000	mg/kg	NT	NT	NT	NT	NT	NT	NT	NT	
Beryllium	--	410	mg/kg	NT	NT	NT	NT	NT	NT	NT	NT	
Lithium	9.8	4,200	mg/kg	NT	NT	NT	NT	NT	NT	NT	NT	

Table 14 - AOI 14 XRF Screening and Laboratory Analytical Results
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Parameter	Part 201 SDBL	Part 201 RDCC	Sample Name	GAY-S1-08	GAY-S1-09	GAY-S1-10	GAY-S1-11	GAY-S1-12	GAY-S1-13	GAY-S1-14	GAY-S1-15	
			Sampling Date	09/10/07	09/10/07	09/10/07	09/10/07	09/10/07	09/10/07	09/10/07	09/10/07	09/10/07
			Sample Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
			Sample Type	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF
			Sample Number/ Location	Gay Sands	Gay Sands	Gay Sands	Gay Sands	Gay Sands	Gay Sands	Gay Sands	Gay Sands	Gay Sands
			Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Metals												
Titanium	--	--	mg/kg	8,750	10,213	10,463	11,121	10,560	8,508	9,451	9,974	
Chromium	18	790,000	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Manganese	440	25,000	mg/kg	547	514	621	787	641	584	623	595	
Iron	12,000	160,000	mg/kg	69,174	75,427	74,525	77,926	73,338	68,150	69,781	69,246	
Cobalt	6.8	2,600	mg/kg	797	793	572	663	961	904	855	857	
Nickel	20	40,000	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Copper	32	20,000	mg/kg	2,655	1,788	1,438	1,584	1,691	1,378	1,503	1,608	
Zinc	47	170,000	mg/kg	90	89	96	93	68	72	94	68	
Arsenic	5.8	7.6	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Selenium	0.41	2,600	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Rubidium	--	--	mg/kg	13	13	9	13	10	14	14	17	
Strontium	--	330,000	mg/kg	160	118	87	113	115	83	128	147	
Zirconium	--	--	mg/kg	131	147	143	158	142	143	143	136	
Molybdenum	--	2,600	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Silver	1	2,500	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Cadmium	1.2	550	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Tin	--	--	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Antimony	--	180	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Barium	75	37,000	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	570	<LOD	<LOD	
Mecury	0.13	160	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Lead	21	400	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Aluminum	6,900	50,000	mg/kg	NT	NT	NT	NT	NT	NT	NT	NT	
Beryllium	--	410	mg/kg	NT	NT	NT	NT	NT	NT	NT	NT	
Lithium	9.8	4,200	mg/kg	NT	NT	NT	NT	NT	NT	NT	NT	

Table 14 - AOI 14 XRF Screening and Laboratory Analytical Results
Torch Lake Site Assessment
September 10, 2007

Parameter	Part 201 SDBL	Part 201 RDCC	Sample Name	GAY-S1-16	GAY-S1-17	GAY-S1-18	GAY-S1-19	GAY-S1-20	GAY-S1-21	GAY-S1-21	GAY-S1-22
			Sampling Date	09/10/07	09/10/07	09/10/07	09/10/07	09/10/07	09/10/07	09/10/07	09/10/07
			Sample Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
			Sample Type	XRF	XRF	XRF	XRF	XRF	Laboratory	XRF	XRF
			Sample Number/ Location	Gay Sands	Gay Sands	Gay Sands	Gay Sands	Gay Sands	Gay Sands	Gay Sands	Gay Sands
			Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Metals											
Titanium	--	--	mg/kg	9,917	10,636	8,842	10,269	11,052	NT	9,116	10,956
Chromium	18	790,000	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	19 J	<LOD	<LOD
Manganese	440	25,000	mg/kg	727	747	648	605	718	300	463	437
Iron	12,000	160,000	mg/kg	72,488	76,196	77,658	71,544	77,381	NT	67,952	78,651
Cobalt	6.8	2,600	mg/kg	612	770	787	754	634	18 J	660	968
Nickel	20	40,000	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	23 J	<LOD	<LOD
Copper	32	20,000	mg/kg	1,363	1,498	1,449	1,399	1,822	1,400 J	1,365	4,132
Zinc	47	170,000	mg/kg	86	69	84	76	90	62 J	76	71
Arsenic	5.8	7.6	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	0.67 J *	9	<LOD
Selenium	0.41	2,600	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	NT	<LOD	<LOD
Rubidium	--	--	mg/kg	21	13	14	6	16	NT	11	10
Strontium	--	330,000	mg/kg	106	108	129	113	103	<210	90	64
Zirconium	--	--	mg/kg	138	149	156	139	146	NT	147	154
Molybdenum	--	2,600	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	NT	<LOD	<LOD
Silver	1	2,500	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	0.8 J	<LOD	<LOD
Cadmium	1.2	550	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	NT	<LOD	<LOD
Tin	--	--	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	NT	86	<LOD
Antimony	--	180	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	NT	<LOD	<LOD
Barium	75	37,000	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	NT	<LOD	<LOD
Mercury	0.13	160	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	0.0055 *	<LOD	<LOD
Lead	21	400	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	1.5 J *	<LOD	<LOD
Aluminum	6,900	50,000	mg/kg	NT	NT	NT	NT	NT	15,000 J	NT	NT
Beryllium	--	410	mg/kg	NT	NT	NT	NT	NT	<4.3 J	NT	NT
Lithium	9.8	4,200	mg/kg	NT	NT	NT	NT	NT	5.10	NT	NT

Table 14 - AOI 14 XRF Screening and Laboratory Analytical Results
Torch Lake Site Assessment
September 10, 2007

Parameter	Part 201 SDBL	Part 201 RDCC	Sample Name	GAY-S1-23i	GAY-S1-24i	GAY-S1-25	GAY-S1-26	GAY-S1-27	GAY-S1-28i	GAY-S1-29	GAY-S1-30	
			Sampling Date	09/10/07	09/10/07	09/10/07	09/10/07	09/10/07	09/10/07	09/10/07	09/10/07	09/10/07
			Sample Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
			Sample Type	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF
			Sample Number/ Location	Gay Sands	Gay Sands	Gay Sands	Gay Sands	Gay Sands	Gay Sands	Gay Sands	Gay Sands	Gay Sands
			Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Metals												
Titanium	--	--	mg/kg	10,414	8,978	10,630	10,800	15,367	7,414	11,585	11,931	
Chromium	18	790,000	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Manganese	440	25,000	mg/kg	585	687	674	747	988	574	553	781	
Iron	12,000	160,000	mg/kg	72,208	80,007	82,089	79,444	99,957	73,580	76,728	81,050	
Cobalt	6.8	2,600	mg/kg	891	1,293	745	885	956	819	609	878	
Nickel	20	40,000	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Copper	32	20,000	mg/kg	1,028	1,097	2,222	4,484	1,617	2,028	1,828	1,855	
Zinc	47	170,000	mg/kg	76	83	109	99	109	83	86	91	
Arsenic	5.8	7.6	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	10	
Selenium	0.41	2,600	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Rubidium	--	--	mg/kg	6	6	9	10	12	21	18	8	
Strontium	--	330,000	mg/kg	79	101	91	106	111	128	110	89	
Zirconium	--	--	mg/kg	127	138	156	149	183	196	139	160	
Molybdenum	--	2,600	mg/kg	13	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Silver	1	2,500	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Cadmium	1.2	550	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Tin	--	--	mg/kg	<LOD	<LOD	<LOD	<LOD	91	<LOD	<LOD	<LOD	
Antimony	--	180	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Barium	75	37,000	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Mecury	0.13	160	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Lead	21	400	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Aluminum	6,900	50,000	mg/kg	NT	NT	NT	NT	NT	NT	NT	NT	
Beryllium	--	410	mg/kg	NT	NT	NT	NT	NT	NT	NT	NT	
Lithium	9.8	4,200	mg/kg	NT	NT	NT	NT	NT	NT	NT	NT	

Table 14 - AOI 14 XRF Screening and Laboratory Analytical Results
Torch Lake Site Assessment
September 10, 2007

Parameter	Part 201 SDBL	Part 201 RDCC	Sample Name	GAY-S1-31	GAY-S1-32	GAY2-001	GAY2-002	GAY2-003	GAY2-004	GAY2-005	GAY2-006	
			Sampling Date	09/10/07	09/10/07	09/10/07	09/10/07	09/10/07	09/10/07	09/10/07	09/10/07	09/10/07
			Sample Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
			Sample Type	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF
			Sample Number/ Location	Gay Sands	Gay Sands	Gay Sands	Gay Sands	Gay Sands	Gay Sands	Gay Sands	Gay Sands	Gay Sands
			Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Metals												
Titanium	--	--	mg/kg	11,393	9,286	7,806	8,975	8,622	9,812	10,590	6,915	
Chromium	18	790,000	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Manganese	440	25,000	mg/kg	740	820	<LOD	<LOD	<LOD	<LOD	232	229	
Iron	12,000	160,000	mg/kg	78,330	77,792	59,779	69,585	71,179	68,757	76,564	54,697	
Cobalt	6.8	2,600	mg/kg	752	681	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Nickel	20	40,000	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Copper	32	20,000	mg/kg	1,628	1,648	1,652	3,124	859	1,176	965	2,509	
Zinc	47	170,000	mg/kg	105	83	<LOD	<LOD	47	77	64	<LOD	
Arsenic	5.8	7.6	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Selenium	0.41	2,600	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Rubidium	--	--	mg/kg	13	10	5	<LOD	13	25	25	14	
Strontium	--	330,000	mg/kg	115	106	106	158	75	77	137	71	
Zirconium	--	--	mg/kg	143	152	108	120	149	146	142	131	
Molybdenum	--	2,600	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Silver	1	2,500	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	85	<LOD	
Cadmium	1.2	550	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Tin	--	--	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Antimony	--	180	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Barium	75	37,000	mg/kg	<LOD	607	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Mecury	0.13	160	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Lead	21	400	mg/kg	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	
Aluminum	6,900	50,000	mg/kg	NT	NT	NT	NT	NT	NT	NT	NT	
Beryllium	--	410	mg/kg	NT	NT	NT	NT	NT	NT	NT	NT	
Lithium	9.8	4,200	mg/kg	NT	NT	NT	NT	NT	NT	NT	NT	

**Table 14 - AOI 14 XRF Screening and Laboratory Analytical Results
Torch Lake Site Assessment
September 10, 2007**

Parameter	Part 201 SDBL	Part 201 RDCC	Sample Name	GAY2-007
			Sampling Date	09/10/07
			Sample Matrix	Soil
			Sample Type	XRF
			Sample Number/ Location	Gay Sands
			Units	mg/kg
Metals				
Titanium	--	--	mg/kg	10,897
Chromium	18	790,000	mg/kg	262
Manganese	440	25,000	mg/kg	<LOD
Iron	12,000	160,000	mg/kg	91,425
Cobalt	6.8	2,600	mg/kg	<LOD
Nickel	20	40,000	mg/kg	<LOD
Copper	32	20,000	mg/kg	1,306
Zinc	47	170,000	mg/kg	47
Arsenic	5.8	7.6	mg/kg	<LOD
Selenium	0.41	2,600	mg/kg	<LOD
Rubidium	--	--	mg/kg	<LOD
Strontium	--	330,000	mg/kg	150
Zirconium	--	--	mg/kg	153
Molybdenum	--	2,600	mg/kg	<LOD
Silver	1	2,500	mg/kg	<LOD
Cadmium	1.2	550	mg/kg	<LOD
Tin	--	--	mg/kg	<LOD
Antimony	--	180	mg/kg	<LOD
Barium	75	37,000	mg/kg	<LOD
Mecury	0.13	160	mg/kg	<LOD
Lead	21	400	mg/kg	15
Aluminum	6,900	50,000	mg/kg	NT
Beryllium	--	410	mg/kg	NT
Lithium	9.8	4,200	mg/kg	NT

NOTES:

Screening conducted utilizing Innov-X-XRF (Model X-4000).

Results in shaded boxes exceed the MDEQ Part 201 Residential Direct Contact Criteria.

AOI - Area of Investigation

J – Data qualified as estimated based on data validation

LOD – Level of Detection for the Innov-X XRF Instrument

MDEQ – Michigan Department of Environmental Quality

mg/kg – Milligrams per kilogram. Laboratory sample results are on a dry weight basis.

NT – Not Tested

Part 201-RDCC – MDEQ Part 201 Residential Direct Contact Criteria

Part 201-SDBL – MDEQ Part 201 Statewide Default Background Level

XRF – X-Ray Fluorescence

"--" – Not listed in MDEQ Part 201 Tables

* – Analyte detected below quantitation limits

< – Less than



GAY-S1-24

GAY-S1-26

GAY-S1-27

GAY-S1-28

GAY-S1-29

GAY-S1-30

GAY-S1-31

GAY-S1-32

GAY2-007

GAY-S1-13

GAY-S1-14

GAY-S1-15

GAY-S1-16

GAY-S1-17

GAY2-006

GAY-S1-18

GAY-S1-19

GAY-S1-20

GAY2-005

GAY-S1-21

GAY2-004

GAY2-003

GAY-S1-22

GAY-S1-07

GAY-S1-06

GAY-S1-08

GAY-S1-09

GAY-S1-10

GAY-S1-11

GAY-S1-12

GayB-14 (09/10/07)
Arsenic: 132 mg/Kg
Lead: 698 mg/Kg

GayB-14 (09/10/07)
Arsenic: 58 mg/Kg
Lead: 850 mg/Kg

GayB-15 (09/10/07)
Arsenic: 46 mg/Kg
Iron: 367,120 mg/Kg

GayB-8 (09/10/07)
Arsenic: 325 mg/Kg
Copper: 596,985 mg/Kg
Iron: 268,277 mg/Kg
Silver: 2,646 mg/Kg

GayB-12 (09/10/07)
Arsenic: 27 mg/Kg

GayB-5 (09/10/07)
Arsenic: 325 mg/Kg
Copper: 450,143 mg/Kg
Iron: 296,329 mg/Kg

GayB-11 (09/10/07)
Arsenic: 370 mg/Kg
Copper: 286,596 mg/Kg

GayB-6 (09/10/07)
Arsenic: 409 mg/Kg
Copper: 653,430 mg/Kg
Iron: 368,539 mg/Kg
Silver: 2,941 mg/Kg

GayB-11 (09/10/07)
Arsenic: 670 mg/Kg
Copper: 430,000 mg/Kg

GayB-6 (09/10/07)
Arsenic: 350 mg/Kg
Copper: 320,000 mg/Kg



Site: Torch Lake Area Assessment

Photo Number: 21

Date: September 10, 2007

Direction: North

Photographer: Nancy Posavatz

Subject: Underground vault area at Former Houghton County Gas & Coke (AOI 15)



Site: Torch Lake Area Assessment

Photo Number: 22

Date: September 10, 2007

Direction: West

Photographer: Nancy Posavatz

Subject: Black, stained soils at Gay Stamp Sands (AOI 14)



Site: Torch Lake Area Assessment

Photo Number: 23

Direction: West

Subject: Building ruins at Gay Stamp Sands (AOI 14)

Date: September 10, 2007

Photographer: Nancy Posavatz



Site: Torch Lake Area Assessment

Photo Number: 24

Direction: West

Subject: Former conveyor belt at Gay Stamp Sands (AOI 14)

Date: September 10, 2007

Photographer: Nancy Posavatz



Site: Torch Lake Area Assessment

Photo Number: 25

Direction: North

Subject: Green-stained soils at Gay Stamp Sands (AOI 14)

Date: September 10, 2007

Photographer: Nancy Posavatz



Site: Torch Lake Area Assessment

Photo Number: 26

Direction: East

Subject: Smokestack at Gay Stamp Sands (AOI 14)

Date: September 10, 2007

Photographer: Nancy Posavatz



Site: Torch Lake Area Assessment
Photo Number: 27
Direction: Southeast
Subject: Gay Stamp Sands (AOI 14)

Date: September 10, 2007
Photographer: Nancy Posavatz



Site: Torch Lake Area Assessment
Photo Number: 28
Direction: West
Subject: Pile of asbestos-containing roofing material at Gay Stamp Sands (AOI 14)

Date: September 10, 2007
Photographer: Nancy Posavatz