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Engineering Evaluation/ Cost Analysis

Passage Island Light Station
Keweenaw County, Michigan

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Passage Island Light Station
Keweenaw County, Michigan

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Executive Summary

As provided in Executive Order 12580 and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), the U.S. Coast Guard (USCG) is acting as the lead agency in performing a removal site evaluation and impacted soil excavation and off-site disposal as non-hazardous waste under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), at the Passage Island Light Station located at Keweenaw County, Michigan (Site).

Passage Island is located three and one quarter miles off the northeastern tip of Isle Royale in Keweenaw County, Michigan. The USCG Passage Island Light Station is located on the southernmost portion of Passage Island and is adjacent to Lake Superior. The Site is in a remote area that is uninhabited by people. The lighthouse serves as a guide to ships travelling through to the Thunder Bay District in Ontario, Canada. The Site includes approximately 6.3 acres of land on which lie 12 structures: a lighthouse with attached keeper's dwelling, a fog signal building, a privy, a winch house, a former pump house, a paint storage shed, a steel rail tramway, a solar panel, a helicopter landing pad, an antenna tower, a former antenna tower, and a boat landing/dock. The Passage Island Light Station was constructed in 1882, in response to increased shipping from lakehead communities, such as Fort Williams/Port Arthur, Ontario, and Duluth, to the lower Great Lakes. The Passage Island Light was fully automated in December 1978. Its fourth order Fresnel Lens was powered by batteries.

Currently, the USCG owns and operates the lighthouse and surrounding site structures. The lighthouse is currently an active aid to navigation (ATON) and uses a solar panel to produce electricity to run the automated light.

A Phase I Environmental Site Assessment (ESA) was conducted in November 1997. The Phase I ESA included a site reconnaissance, records review, and interviews with USCG representatives, and review of historical aerial photographs and historical topographic maps. The Phase I ESA recommended further investigation to four on-site heating oil aboveground storage tanks (ASTs) areas, the septic tank area, and aboveground pipes at the keeper's dwelling. The Phase I ESA added that there is a high probability that lead-based paint (LBP) was used on the exterior of the structures.

A Phase II Environmental Site Assessment (SA) was conducted in June 2001. During the SA, seventy-one soil samples were collected. The SA analytical results indicated that lead is the only contaminant present at the Site at concentrations exceeding the Michigan Department of Environmental Quality (MDEQ) Part 201 Generic Residential Cleanup Criteria and Screening Levels criteria and soil remediation was recommended for the Site due to exceedances of criteria. The SA also added that based on available data, and the abundance of outcropping basalt bedrock, groundwater is not expected at the site and groundwater as an exposure pathway was determined to be incomplete.

Waste characterization sampling was completed by MWH in June 2004. The objective of the sampling was to determine if the lead-impacted soil found during the SA is to be disposed of as hazardous or non-hazardous waste. Two composite soil samples (WC-1 and WC-2) were collected for waste characterization. The samples were analyzed for specific gravity, total solids, free liquids (paint filter test), reactive cyanide, reactive sulfide, pH, flash point, toxicity characteristic leaching procedure (TCLP) metals, TCLP semi-volatile organic compounds (SVOCs), TCLP volatile organic compounds (VOCs), and polychlorinated biphenyls (PCBs). TCLP lead was detected in WC-1 at a concentration of 49.7 milligrams per liter (mg/L). This concentration exceeds the Resource Conservation and Recovery Act (RCRA) limit for TCLP lead of 5 mg/L; therefore, if the soil were to be disposed without additional treatment it would be classified as hazardous waste. Waste characterization sample results are summarized in Table 1.

A Cultural Resource Survey was conducted in August 2004. The survey was a combined archival research with pedestrian reconnaissance and subsurface testing and it determined that there are no significant prehistoric or historic period archaeological resources within the soils at Passage Island Light Station. The materials found at the Passage Island Light Station did not appear significant at the level that would elevate them to National Register of Historic Places eligibility. The survey of the property also determined that soil deposits were extremely thin and that artifacts included therein were largely limited to architectural debris, coal fragments and ash/cinder deposits.

Additional Site characterization activities were conducted by MWH in June 2005. The Site characterization was conducted to evaluate the leachability of impacted soil to surface water. Ten soil samples were collected from the site and submitted for Synthetic Precipitation Leaching Procedure (SPLP) lead analysis. This analysis is used to simulate the potential leachability of lead in the soil from precipitation. The analytical results of the SPLP lead samples were compared to the RCRA TCLP level for lead. The soil analytical results were less than the TCLP level indicating that the impacted soils are not leaching to the environment at concentrations considered to be hazardous.

Due to the limited depth of loose soil at the Site, the USCG has determined that the most cost-effective and technically-feasible remedy for the Site is removal and off-site disposal of soil above site-specific removal action objective (RAO) as non-hazardous waste, after in-situ treatment to stabilize the excavated soil with chemical fixating agent (MAECTITE process).

The RAO was identified by the USCG as 4,800 milligram per kilogram (mg/kg) based on the calculated site-specific recreational use data. Therefore, this criterion was identified as the site-specific RAO. Removal and off-site disposal of lead-impacted soil above the RAO as non-hazardous waste is consistent with the requirements of Section

300.415 of the NCP and state requirements, and eliminates unacceptable risks to human health, welfare, and the environment for current and anticipated future land uses.

Because the ultimate goal is divesture of the Site from the USCG inventory and its transfer to the NPS for use as a recreational property, soil removal is the most practical remedy. The proposed removal and off-site disposal of lead-impacted soil above the RAO, after treatment with chemical fixating agent (MAECTITE) to stabilize the soil, as non-hazardous waste is anticipated to be the final on-site action to address lead impacts in soil prior to divestment of the property.

The federal government currently owns the Site, and the USCG is acting as the lead agency as authorized under Executive Order 12580. As the lead agency, USCG is voluntarily seeking concurrence from the United States Environmental Protection Agency (USEPA) Region 5 that the site characterization and proposed removal and off-site disposal of lead-impacted soil above the RAO as non-hazardous waste are consistent with the provisions of the NCP and CERCLA Section 120(h).

1. Introduction

This Engineering Evaluation/Cost Analysis (EE/CA) was prepared by MWH Americas, Inc. (MWH) on behalf of the U.S. Coast Guard (USCG) for the Passage Island Light Station located at Keweenaw County, Michigan (Site). This EE/CA presents a summary of previous site characterization activities, a streamlined risk evaluation, identification of applicable or relevant and appropriate requirements (ARARs), analysis of the cost, implementability and effectiveness of removal action alternatives, selection and objectives of the proposed impacted soil excavation and off-site disposal as non-hazardous waste, and a conceptual plan for public involvement.

This EE/CA was developed in accordance with United States Environmental Protection Agency (USEPA) *Guidance for Conducting Non-Time-Critical Removal Actions Under Comprehensive Environmental Response, Compensation and Liability Act* (*CERCLA)*, OSWER 9360.0-32FS, USEPA/540/R-93/057 (United States Environmental Protection Agency 1993). The site location is illustrated on Drawing 7937, Sheet 1 of 4, and the site layout is presented on Drawing 7937, Sheet 2 of 4.

Previous characterization of the Site has indicated concentrations of lead in soil at concentrations above Michigan Department of Environmental Quality (MDEQ) Part 201 Generic Residential Cleanup Criteria and Screening Levels. The lead impacts in soil resulted from weathering (i.e., flaking/peeling) of historically applied lead-based paint (LBP) on the external surfaces of structures at the Site.

Lead impacted soil areas are around the septic tank area, the lighthouse and attached keeper's dwelling, the fog signal building, the paint storage shed, the privy, the antenna tower, the former shed, the winch house, and the former pump house (Drawing 7937, Sheet 2 of 4).

The federal government intends to divest the property to the National Park Service (NPS). The anticipated future use of the Site is recreational. Because the Site will be used for recreation purposes for a limited amount of time annually, the developed site-specific recreational land-use criterion of 4,800 milligram per kilogram (mg/kg) was found to be protective of human health and the environment. The USCG has selected the soil excavation and off-site disposal as non-hazardous waste as the site-specific removal action objection (RAO), and intends to implement a removal action for the soil impacted by lead above the RAO in accordance with Code of Federal Regulations (CFR) Sections 40 CFR 300.410 and 300.415 prior to the property divesture.

2. Site Characterization

2.1 Site Description and Background

2.1.1 Site Description

The Site is located three and one quarter miles off the northeastern tip of Isle Royale in Keweenaw County, Michigan (see Drawing 7937, Sheet 1 of 4). The Site occupies southernmost portion of Passage Island and is adjacent to Lake Superior in Section 9, T67N R32W in Houghton Township, Keweenaw County. The federal government currently owns the Site, which encompasses approximately 6.3 acres of land on which lie 12 structures: a lighthouse with attached keeper's dwelling, a fog signal building, a privy, a winch house, a former pump house, a paint storage shed, a steel rail tramway, a solar panel, a helicopter landing pad, an antenna tower, a former antenna tower, and a boat landing/dock

2.1.2 Site Background

The Passage Island Light Station was constructed in 1882, in response to increased shipping from lakehead communities, such as Fort Williams/Port Arthur, Ontario, and Duluth, to the lower Great Lakes. The Passage Island Light was fully automated in December 1978. Its fourth order Fresnel Lens was powered by batteries. Currently, the USCG owns and operates the lighthouse and surrounding site structures. The lighthouse is currently an active aid to navigation (ATON) and uses a solar panel to produce electricity to run the automated light.

2.1.2.1 *Summary of Historical Site Characterizations*

The following is a brief summary of historical characterizations performed at the Site. Each document where referenced is included as an appendix of this EE/CA.

- Phase I Environmental Site Assessment (ESA) conducted by Woodward-Clyde in November 1997. The Phase I ESA recommended further investigation of the areas of the aboveground storage tank (AST), the aboveground pipes at the keeper's dwelling, and around the buildings (Appendix A).

- Phase II Site Assessment (SA) conducted by MWH in December 2003. The SA analytical results indicated that lead is the only contaminant present at the site at concentrations exceeding MDEQ Part 201 Criteria and that based on available data, and the abundance of outcropping basalt bedrock,

groundwater is not expected at the site and groundwater as an exposure pathway was determined to be incomplete (Appendix B).

- Waste characterization completed by MWH in June 2004. Soil waste samples were analyzed for specific gravity, total solids, free liquids (paint filter test), reactive cyanide, reactive sulfide, pH, flash point, Toxicity Characteristic Leaching Procedure (TCLP) metals, TCLP semi-volatile organic compounds (SVOCs), TCLP volatile organic compounds (VOCs), and polychlorinated biphenyls (PCBs). TCLP lead was detected in one waste characterization sample at a concentration of 49.7 milligrams per liter (mg/L). This concentration exceeds the Resource Conservation and Recovery Act (RCRA) limit for TCLP lead of 5 mg/L; therefore, if the soil were to be disposed without additional treatment, it would be classified as hazardous waste. Waste characterization soil results are summarized in Table 1.

- Leachate and Total Lead Soil Sampling conducted by MWH in November, 2005. Soil samples were analyzed for lead Synthetic Precipitation Leaching Procedure (SPLP). SPLP results were less than the Resource Conservation and Recovery Act (RCRA) TCLP level for lead but exceeded the calculated groundwater to surface water interface (GSI) Protection Criteria for Surface Water Protected for Drinking Water Use (Appendix D).

- Cultural Resource Survey conducted by Great Lakes Research, Inc. in August, 2004. The survey was combined archival research with pedestrian reconnaissance and subsurface testing and determined that there are no significant prehistoric or historic period archaeological resources within soils at the Passage Island Light Station. The materials found at the Passage Island Light Station did not appear at a significant level that would elevate them to National Register of Historic Places eligibility. The survey of the property also determined that soils deposits were extremely thin and that artifacts included therein were largely limited to architectural debris, coal fragments and ash/cinder deposits (Appendix C).

2.2 Source, Nature and Extent of Contamination

2.2.1 Phase I Environmental Site Assessment

In November 1997, Woodward-Clyde, performed a Phase I ESA to identify any potential recognized environmental conditions at the Site. The Phase I included a site reconnaissance visit to observe current site conditions and identify potential sources of contamination and a review of readily available site records from public agencies to

assess the potential for current or past site usage to have resulted in environmental impact. The entire Phase I ESA Report is provided as Appendix A.

Based on visual observations and the age of the on-site buildings, the potential for LBP paint to be present on the buildings was determined to be high. The report concluded that soils surrounding the buildings could potentially contain elevated concentrations of lead resulting from the historical use of LBP.

Other results of the Phase I ESA are summarized as follows.

- Possible spills or releases to surficial soils may have occurred from four on-site heating oil ASTs.
- USCG personnel reported that oil sheen was observed in the septic tank.
- Miscellaneous aboveground pipes at the keeper's dwelling were observed during the Phase I ESA. The purpose and extent of the piping was not determined during the Phase I ESA. The piping was suspected to be former fuel supply/return lines.
- Based on visual observations and the age of the structures, asbestos containing materials (ACM) may be present on the exterior of the structures. Possible ACM included asphalt roofing shingles.

2.2.2 Phase II Environmental Site Assessment

Based on findings reported in the Phase I ESA, MWH performed a Phase II ESA of the Site in June 2001 to determine if lead impacts, resulting from the historical application of LBP to the buildings, were present in soil or groundwater at the Site. The complete Phase II ESA Report is provided in Appendix B. Results of the Phase II ESA are summarized as follows.

2.2.2.1 Soil Results

A total of seven soil samples, including duplicates, were collected in the former AST areas and analyzed during SA activities. A total of six soil samples, including duplicates, were collected in the former aboveground piping area and analyzed during SA activities. A total of six soil samples were collected and analyzed during the septic system tank soil investigation. A total of 43 soil samples, including duplicates, were collected and analyzed during the soil investigation for lead. A total of six soil samples, including duplicates, were collected and analyzed during the background metals investigation. Each soil boring was screened for the presence of organic vapors using

a photoionization detector (PID). No elevated PID readings were observed. Soil analytical results are summarized in Table 1 and in Drawing 7939, Sheet 3 of 4.

Soil analytical results from the former AST areas indicated several analytes were detected above the laboratory detection limits, but none of the constituents were detected above the MDEQ Part 201, Residential Generic Cleanup Criteria. TPH-DRO was detected above the target method detection limit; however, the target method detection limit is used for screening only and no Part 201 criterion has been established for TPH-DRO.

Soil analytical results from the former aboveground piping area indicated that no analytes were detected above the MDEQ Part 201, Residential Generic Cleanup Criteria.

Soil analytical results from the septic system tank area indicated that lead was detected in exceedance of the direct contact criteria of 400 mg/kg in all five soil borings. Lead in soil analytical results ranged from 417 mg/kg to 786 mg/kg. Due to the proximity of the lead detections in the septic tank area to the keeper's dwelling, the lead detections in this area are likely attributable to impacts from LBP from the exterior of the keeper's dwelling.

Soil analytical results from the 43 soil samples collected during the soil investigation for lead indicated that lead was detected at concentrations exceeding MDEQ Part 201 Direct Contact Criteria (400 mg/kg) in 36 soil borings. The soil borings exceeding criteria surround the following site structures: the lighthouse and attached keeper's dwelling, fog signal building, winch house, antenna tower, paint locker, and privy. Lead in soil concentrations ranged from 100 mg/kg to 41,040 mg/kg.

Soil analytical results for the background samples indicated that cadmium, chromium, and lead were not detected above criteria. Cadmium was not detected above laboratory detection limits. Chromium was detected above laboratory detection limits at concentrations ranging from 18.9 mg/kg to 33.9 mg/kg. Lead was also detected above laboratory detection limits at concentrations ranging from 19.8 mg/kg to 288 mg/kg.

Results of this site characterization indicate that surface and near-surface soils around the septic tank and around the site structures have been impacted by LBP from the external building surfaces (Final Site Assessment Report Former Storage Tank Areas and Soil Assessment for Lead, MWH December 2003)

2.2.2.2 Groundwater Results

No drinking water wells are located on-site and groundwater was not encountered during the SA activities. While the facility was operational, potable water was pumped from Lake Superior. In addition, according to USCG Civil Engineering Unit (CEU) Cleveland personnel, level foundations for the buildings were constructed by blasting away portions of the bedrock using explosives. The foundation of the lighthouse and Keeper's Dwelling is recessed approximately 8 feet into the bedrock. Groundwater was not encountered during the construction of the building foundations. Based on the available data and due to bedrock outcrops throughout the island and at the shoreline, groundwater is not expected to be present on the island. Therefore, direct contact and ingestion of groundwater through which constituents in the soil have leached are not considered complete exposure pathways.

2.2.3 Waste Characterization Activities

Two composite soil samples were collected for waste characterization by MWH in June of 2004. One composite sample was collected from three locations around the winch house. The second composite sample was collected from six discrete locations around the keeper's dwelling/lighthouse and fog signal building. The samples were analyzed for specific gravity, total solids, free liquids (paint filter test), reactive cyanide, reactive sulfide, pH, flash point, TCLP metals, TCLP SVOCs, TCLP VOCs, and PCBs.

2.2.3.1 Soil Results

The soil waste characterization results are summarized in Table 1. TCLP lead was detected in WC-1 at a concentration of 49.7 mg/l. This concentration exceeds the RCRA threshold for TCLP lead of <5 mg/l; therefore, if the soil were to be disposed without additional treatment, it would be classified as hazardous waste.

2.2.4 Additional Site Characterization Activities

Based on findings reported in the Phase II ESA, MWH performed additional Site characterization activities in June 2005 following recommendations from the MDEQ to provide data to evaluate the leachability of impacted soil to surface water. The Final Leachate and Total Lead Soil Sampling Summary Letter Report is provided in Appendix D. Results of the additional Site characterization activities are summarized as follows.

2.2.4.1 Soil Results

Ten soil samples were collected from the site and submitted for SPLP lead analysis. This analysis is used to simulate the potential leachability of lead in the soil from

precipitation. The locations of the soil samples were chosen to represent the array of the lead concentrations in the soil, based on the previous lead sampling analytical results from the SA performed in 2001. The analytical results of the SPLP lead samples were compared to the RCRA TCLP level for lead of 5,000 micrograms per liter (μg/l), as no SPLP lead criterion or action levels are available. The soil analytical results ranged from 5.27 μg/l to 166 μg/l, which is considerably less than the RCRA TCLP level of 5,000 μg/l. These results indicate that the impacted soils are not leaching to the environment at the Site at concentrations considered to be hazardous.

Of the ten soil samples collected, all exceeded the MDEQ Direct Contact Criteria of 400 mg/kg. Although the potential for a shallow aquifer to exist at the Site is highly unlikely, the groundwater cannot be ruled out as a pathway unless it is demonstrated to not be complete. All of these samples were located near site structures. Fine Fraction samples results were compared to Soil Particulate Inhalation Criteria, and no samples exceeded this criteria.

2.2.4.2 Groundwater Results

Shallow aquifers are highly unlikely to exist at the Site; groundwater was not encountered during any site investigation activity.

2.3 Streamlined Risk Evaluation

The USCG has occupied the Site since 1882, and the land was vacant prior to this. According to the Phase I ESA, four ASTs were identified on a 1996 plot plan. Two 4,000-gallon steel ASTs containing fuel oil were located near the Fog Signal Building, a fuel oil tank of unknown size was located near the Fog Signal Building, and a 1,800-gallon fuel oil AST was located near the boat landing. In 1996 the four ASTs, one underground septic tank, and one fiberglass chlorination holding tank were removed. According to a site survey report dated 1989, three 2,000-gallon fuel oil ASTs were installed in 1983. These tanks were installed to replace a 1977 bladder system that consisted of four 750-gallon poly-vinyl tanks stored on racks in the basement of the Fog Signal Building.

Soil analytical results from the Phase II SA from the former AST areas indicated no analytic was detected above the Part 201, Residential Generic Cleanup Criteria. TPH-DRO was detected above the target method detection limit; however, the target method detection limit is used for screening only and no Part 201 criterion has been established for TPH-DRO.

No use of chemicals or hazardous substances is known to have occurred on adjacent properties. LBP was used on the buildings, and weathering of the paint has resulted in

elevated lead concentrations in near-surface soils. Lead in soil was identified as the only constituent of concern (COC) based on historical information and site characterization data.

The current and future use of the Site is expected to be recreational. Due to the anticipated property divesture, the USCG acting as the lead agency has established a RAO for lead in soil based on a restricted land use.

2.3.1 Soil RAO

The USCG has selected a RAO for lead in soil at the Site of 4,800 mg/kg based on the calculated site-specific recreational use data (Appendix E). Non-residential adult exposure to lead in soil was evaluated using USEPA's Technical Review Workgroup model for lead (USEPA, 2003, 2009).

Under a current and anticipated future recreational use of the Site, the selected RAO is very conservative because the actual exposure frequency and duration is expected to be much lower than the assumptions used in calculating the site specific recreational criteria.

2.4 Regulatory Requirements

2.4.1 Agency Roles

Executive Order 12580 of January 23, 1987 titled *Superfund Implementation* delegates to federal agencies the authority and responsibility to implement provisions under CERCLA including, but not limited to, conducting hazardous substance response activities such as removal Site characterization and removal action. As provided in Executive Order 12580 and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), the USCG is acting as the lead agency for implementing the removal actions proposed at the Site.

The federal government intends to divest the Site following the USCG removal of soil impacted by lead above RAO and subsequent verification of the soil remediation. To that end, the USCG has contracted the preparation of this EE/CA. The USCG is seeking review of this EE/CA by the USEPA Region IV to obtain, in essence, USEPA's advisory opinion relating to the USCG's compliance with provisions of the NCP and CERCLA Section 120 (h).

The USCG solicited input from the MDEQ in evaluating potential ARARs and determining an RAO for the Site, but the MDEQ has not responded to the request for

state ARARs at this time. Potential federal and state ARARs are summarized in Appendix F.

2.4.2 Identification of Applicable or Relevant and Appropriate Requirements and To Be Considered Guidance

Section 121(d) of CERCLA as amended by the 1986 Superfund Amendments and Reauthorization Act (SARA) and Section 300.415(i) of the NCP require that removal actions attain ARAR's to the extent practical considering the exigencies of the situation. Federal ARARs are to be considered in formulating a removal action. Where state requirements are promulgated, more stringent than federal requirements, and identified by the state; they are also to be considered to the extent practical given the exigencies of the situation.

Both federal and state statutes and regulations have been considered in the analysis of potential ARARs included in this EE/CA. ARARs can include cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, removal action, location, or other circumstance at a Site. Non-promulgated advisories, criteria or guidance issued by federal or state governments are not legally binding, but can be referenced as to be considered (TBC) if they are useful in interpreting ARARs and in evaluating and selecting removal action criteria.

The USCG reviewed federal statutes and regulations to identify ARARs and TBCs for the removal action. In addition, the USCG submitted a letter to the MDEQ on May 25, 2011, requesting identification of ARARs to address lead-impacted soil at the Site, but the MDEQ have not respond to the request for state ARARs at this time.

The ARARs and TBCs are divided into three categories: chemical-specific, location-specific, and action-specific requirements.

- Chemical-specific requirements set health- or risk-based concentration limits or ranges for specific hazardous substances in various environmental media. Chemical-specific ARARs provide site cleanup levels or a basis for calculating cleanup levels.

- Location-specific requirements set restrictions on the types of removal activities that can be performed based on specific site characteristics or location. Location-specific ARARs provide a basis for assessing restrictions during the formulation and evaluation of site-specific remedies. Removal actions may be restricted or precluded based on siting laws for hazardous

waste facilities and based on proximity to wetlands, floodplains, or man-made features such as landfill, disposal area, and/or local historic buildings.

- Action-specific requirements set controls or restrictions on the design, implementation, and performance of removal actions. Action-specific ARARs specify performance levels, actions, or technologies and specific levels for discharge of residual chemicals.

The site-specific ARARs and TBCs identified for the removal action at the Site are presented in Table [2a], Table [2b] and Table [2c]. Table [2a] identifies potential federal and state chemical-specific ARARs and TBC guidance, Table [2b] identifies potential location-specific ARARs and TBC requirements, and Table [2c] identifies potential action-specific ARARs and TBC requirements

2.4.3 Compliance with National Historic Preservation Act

In accordance with Section 106 of the National Historic Preservation Act (NHPA), the USCG contracted the completion of an Archeological Cultural Resources Survey for the Site to determine if the planned site characterization activities and potential remedies could affect culturally significant resources, if present at the Site. A copy of the Archeological Cultural Resources Survey is provided in Appendix C.

The survey included historical records research, a visual survey of the Site and shovel tests to identify any culturally significant artifacts. The survey determined that there are no significant prehistoric or historic period archaeological resources within the Site and hence the proposed activities are not expected to affect significant cultural or historical resources.

2.4.4 Compliance with Endangered Species Protection Requirements

The Michigan State listed species within the footprint of the USCG Passage Island Light Station are the Rock Whitlow-grass (Draba arabisans), which is a species of concern, and the Prickly saxifrage (Saxifraga tricuspidata), which is a state threatened Species. These two species were identified by the NPS. The MDEQ (formerly Michigan Department of Natural Resources) issued an Endangered Species Permit (Permit #1615) to conduct scientific activities (soil excavation) on the threatened/endangered species (Appendix G). The permit was only valid for the areas of lead contamination around the former USCG Passage Island Light Station. The permit allowed the collection and off-site disposal of state threatened or endangered plants occurring within the area of lead contamination. A representative from the NPS will be at the Site during the mobilization stage to flag the areas of state-listed plants outside the contamination area. Foot traffic, equipment operation and equipment

staging will be minimized in areas where state-listed plants to occur outside of the project foot print.

3. Identification of Removal Action Objectives

The primary objective of the proposed removal action is to protect the public health, welfare and the environment, thereby facilitating the transfer of the property from the federal inventory to the NPS. As indicated in Section 2.3, the only COC identified at the Site is lead in soil.

The anticipated future use of the Site is for recreational purposes and access to the Site is limited to boat visitors. Therefore, removal of soil exceeding site-specific recreational criterion of 4,800 mg/kg would be protective of human health and the environment.

The residual lead in soil above the RAO has been defined horizontally and vertically as detailed in Section 2.2 and appears confined to surface and near-surface soil in proximity to the existing structures at the Site. This is consistent with the conceptual site model that indicates the soil lead impacts are derived from weathering of historically applied lead-based paint to the external surface of the site structures

As detailed in Section 2.2, leaching of lead impacted soil into the groundwater was not identified as an issue at the Site. No other potential sources of soil or groundwater contamination have been identified at the Site.

4. Removal Action Alternative Analysis and Selection

In accordance with the USEPA guidance on conducting non-time critical removal actions under CERCLA (USEPA 1993), a limited number of potential alternatives to achieve the Site RAO and comply with ARARs have been identified and assessed.

4.1 Identification and Analysis of Alternatives

Potential alternatives to achieve the site RAO and comply with ARARs include no further action, restrictive covenants, risk assessment/exposure pathway evaluation, monitored natural attenuation, capping, soil stabilization, chemical extraction, phytoremediation, soil washing, in-situ chemical precipitation, and soil removal. Each of these potential alternatives was evaluated with respect to the extent of impacts, the Site-specific RAO, and current and anticipated future land use. Table 3 provides a summary of the analysis of each alternative with respect to effectiveness, implementability (i.e., technical and administrative feasibility) and estimated cost.

- No Action

  Under this alternative, the impacted soil would remain in place with no effort to reduce concentrations or address potential exposure or migration pathways. The no action alternative would require a 5-year review into perpetuity, but is technically feasible, and the cost of implementing this alternative is relatively low (Table 3). However, this alternative is not effective or administratively feasible and would not comply with ARARs. Because current soil conditions at the Site are not protective of human health and the environment, this option was not considered for further evaluation for this Site.

- Restrictive Covenants

  This alternative would require the application of deed restrictions limiting or prohibiting the use or disturbance of soil at the Site and restricting access to areas of the Site with soil impacts above the RAO. This alternative may be technically feasible and could be effective in reducing the risk of exposure but does not by itself address potential migration pathways. The restrictive covenants would accompany the property deed into perpetuity. Continued verification of the land use and compliance with land-use restrictions would be required, including annual inspections and 5-year reviews, which makes this alternative relatively costly (Table 3). This alternative was not retained for further evaluation because the cost of implementing this alternative is relatively high.

- Risk Assessment/Exposure Pathway Evaluation

  This alternative involves a more comprehensive evaluation of potential migration and exposure pathways, and assessment of the potential risks associated with each pathway with respect to the anticipated future land use. Risks associated with the soil direct contact exposure pathway can be evaluated with respect to specific areas or exposure units. This evaluation could include calculation of a higher RAO (i.e., site-specific cleanup level) based on an appropriate exposure scenario for property with restricted access where the residential exposure assumptions are not applicable. A statistical analysis of data to evaluate the soil direct contact pathway could also be performed by calculating an upper confidence level (UCL) for the mean concentration in soil within an exposure unit.

  This alternative may be effective in characterizing the risks associated with specific migration and exposure pathways. However, by itself this alternative would not comply with ARARs or facilitate property divestment without implementing additional measures such as administrative or engineered exposure controls. Therefore, a risk assessment/exposure pathway evaluation was not retained for further evaluation at the Site.

- Capping

  This alternative involves constructing an exposure barrier or “cap” to eliminate the soil direct contact exposure pathway. This alternative is both effective and technically feasible for reducing the risk of human exposure to impacted soils but does not by itself effectively address potential migration pathways. The costs associated with construction of a soil cap are relatively low. However, long-term annual inspections and monitoring and continual 5-year reviews would be required into perpetuity to verify the integrity of the exposure barrier. Therefore, the total cost of this alternative is relatively high (Table 3). This alternative was not retained for further evaluation for this Site.

- Soil Stabilization

  This alternative involves the addition of chemical stabilizers to the impacted soils to reduce the mobility of the contaminants. This alternative could be effective in reducing potential exposure to soil lead impacts and effectively addresses the potential migration of soil impacts. Additional costs associated with this option would include a treatability study, as well as post-treatment verification testing to confirm RAOs have been met. Long-term performance monitoring may also be required to determine if conditions change and constituents could be remobilized. Because this alternative does not effectively eliminate the long-term risk of human

exposure by itself, and does not facilitate divesture of the property it was not retained for further evaluation for this Site.

- Chemical Extraction

  This alternative involves excavation of soils impacted by lead above the RAO and onsite treatment of the excavated material. The soil is treated by adding a chemical extractant in which the lead in the soil dissolves. The extractant is then disposed of accordingly and the treated soil can be reused for restoration of the Site. Restoration will consist of returning the land surface and vegetation similar to pre-excavation conditions. This alternative is effective and technically feasible for reducing the risk of human exposure and addresses potential migration pathways. While many of the costs associated with chemical extraction are similar to those of soil removal (Table 3), the additional costs of a treatability study, the chemical extractant and disposal of the waste steam along with additional labor make the cost of this alternative relatively high. This alternative also may not be effective in removing paint chips from the soil matrix. Therefore this alternative was not retained for further evaluation for this Site.

- Phytoremediation

  This alternative involves the planting of vegetation which take up lead through bioaccumulation from the soil and store it in the tissues of the plants. This alternative is effective and technically feasible for reducing the risk of human exposure to impacted soils. The costs associated with the initial planting of the phytoremediation system are relatively low. However, harvesting and maintenance, including any necessary re-plantings and proper disposal of the plants after remediation would be required. This alternative does not address paint chips that could be present in the soil matrix. Further, multiple rounds of verification of soil remediation sampling would likely be required during remediation to demonstrate the effectiveness of the phytoremediation at meeting the RAO. Additional administrative and/or engineering controls may also be required during the remediation process. Therefore, the total cost of this alternative is relatively high (Table 3). Additionally, the NPS has indicated they would not allow this alternative due to the requirement that non-native species of plants would need to be introduced to the island. This alternative was not retained for further evaluation for this Site.

- Soil Washing

  This alternative involves excavation of soils impacted by lead above the RAO and on-site treatment of the excavated material. Soil washing is an aqueous based

system in which smaller particles for which lead has a greater affinity are separated from larger soil particles. The contaminated material is disposed of off-site and the remaining larger soil particles can be reused for restoration of the Site. Restoration would consist of returning the land surface and vegetation similar to pre-excavation conditions and may require importing additional clean soil backfill. This alternative is effective and technically feasible for reducing the risk of human exposure and addresses potential migration pathways. While many of the costs associated with soil washing are similar to those of soil removal (Table 3), the additional costs of a treatability study, mobilization and setup of soil washing equipment, and potential secondary treatment and/or disposal of the waste steam make the cost of this alternative relatively high. This alternative also may not be effective in removing paint chips, since paint chips would be retained with the coarser soil fractions that are returned to backfill the removal areas. Therefore, this alternative was not retained for further evaluation for this Site.

- Soil Removal

  Soil removal includes excavation and off-site disposal of soils impacted by lead above the RAO. The removal of impacted soil effectively eliminates the direct contact exposure pathway and removes paint chips along with the impacted soil. In addition, soil removal is both technically and administratively feasible. Soil removal eliminates the need for long-term inspection and/or 5-year reviews. The cost of the soil removal and off-site disposal is relatively low compared to the other alternatives (Table 3). This alternative is cost effective, provides effective protection for human health and the environment, and can be implemented to facilitate property divestment.

The following alternatives to address the soil impacts (i.e., no further action, restrictive covenants, capping, soil stabilization, chemical extraction, phytoremediation and soil washing) were initially considered but eliminated from further evaluation because they are not effective at protecting human health and the environment, are not implementable, and/or are not cost effective. Soil removal represents the most effective, implementable, and cost-effective action for the Site and is recommended as the protective and cost-effective alternative consistent with the requirements of the NCP. This selected remedy is based on restricted land use as recreational by the NPS.

4.2 Removal Action

The following sections describe the soil excavation and off-site disposal as non-hazardous waste proposed for the Site.

4.2.1 Description

4.2.1.1 Lead-Based Paint Abatement

Loose LBP from the exterior walls of the buildings within reach from the ground without ladders or scaffolding will be wet scraped, collected and containerized in 5-gallon buckets. Only loose paint chips will be scraped off using wetting methods

4.2.1.2 Soil Removal Action

The recommended remedy for soil includes excavation and off-site disposal of soils impacted by lead above the RAO as provided in Section 300.415 of the NCP. Details of the proposed soil removal action are provided in the Removal Action Work Plan (RAWP) and summarized as follows.

Soil impacted with lead above the RAO will be excavated, stabilized, and transported to appropriately licensed and screened landfills for disposal. Site characterization sampling indicates the lead impacts above the RAO criterion are in the surface and near-surface soils around the septic tank and around the site structures.

Approximately 85 tons of characteristically hazardous soil will be removed from the area around the Lighthouse and Fog Signal Buildings, the Winch House and the Former Fuel Oil AST northeast of the Fog Signal Building. Soil from this area will be removed, stabilized and transported to a licensed landfill for disposal as characteristically non-hazardous soil. The proposed soil removal extent is identified in Drawing 7937, Sheet 4 of 4

Removal and off-site disposal of soil impacted by lead from weathered paint on the structures meets the requirements of Section 300.410 and Section 300.415 of the NCP and eliminates unacceptable risks to human health, welfare and the environment for current and anticipated future land uses. Because the ultimate goal is divesture of the Site from the federal inventory, the removal of the impacted soil above the RAO is the most practical remedy. This EE/CA and the RAWP will be made available for public review and comment as described in Section 5.

Institutional controls were selected as part of the remedy. These controls would include land use controls, deed restrictions, and required signage for the Site. Land use controls would prevent use of the Site for anything other than recreational uses. Any disturbances or use of the soil would require prior USEPA approval. Deed restrictions would prevent property transfers without continued land use controls. Signage requirements would warn site visitors or trespassers of the contamination present.

Compliance to these restrictions would be documented in annual site reviews for protectiveness of the environment and human health.

4.2.2 Effectiveness

The removal of impacted soil above the RAO effectively eliminates the soil direct contact exposure pathway. Soil removal also addresses any characteristically hazardous soils (if present), and provides effective protection for human health and the environment and facilitates property divesture.

4.2.3 Cost

The estimated costs for the proposed removal action, including soil excavation, stabilization, transportation & off-site disposal (as non-hazardous) are presented in Table 4 and in details in Appendix H. Based on the rates and estimated quantities, the total present worth of the proposed removal action is estimated to be $1,010,790.53.

4.2.4 Implementability

Appropriate contractors, equipment, and disposal facilities have been identified to complete the proposed soil removal action in a timely and efficient manner. The depth and extent of the proposed excavations are limited, which will further facilitate the cost-effective and efficient removal, verification sampling, and surface restoration activities.

4.3 Removal Verification Sampling

During the soil removal, appropriate verification samples will be collected as described in the Field Sampling Plan (FSP) for the Site (FSP, MWH, March 2011) to verify the effective and complete removal of soil impacted above the RAO. Appropriate quality assurance/quality control (QA/QC) samples will also be collected in accordance with the QAPP for the Site.

4.4 Removal Action Schedule

The proposed project schedule is provided as Table 5. Preparation of the final EE/CA and, will occur after the USEPA review and comment on the draft documents. Work on the Site, including review of all documents, completion of the proposed soil removal activities and subsequent soil remediation verification sampling, is anticipated to be completed by September 2013.

5. Plan for Public Participation

Pursuant to public participation provisions described in Section 300.415(m), of the NCP, the USCG has prepared the following plan for facilitating public involvement in the Site soil removal action under CERCLA.

Pursuant to public participation provisions described in Section 300.415(m), of the NCP, the USCG has prepared the following plan for facilitating public involvement in the Site soil removal action under CERCLA. To date, communication with local stakeholders and the public has included MDEQ, and the NPS.

A public notice regarding the proposed soil removal action will be posted in the local newspaper, in Houghton, Michigan. Documents generated during the CERCLA process for the Site including this EE/CA and RAWP will be made available for public viewing. The documents will be posted electronically at http://www.d9.uscgnews.com/go/doctype/4007/117211. Each of the final documents will also be reproduced in full hardcopy and provided to the Houghton Library in Houghton, Michigan for public viewing. Consistent with requirements of the NCP, the USCG will consider appropriate relevant comments received within the 30-day review period.

6. References

Comprehensive Environmental Response, Compensation, and Liability Act, December 11, 1980 as amended by Superfund Amendments and Reauthorization Act of October 17, 1986.

Executive Order 12580. 1987. Superfund Implementation. January 23, 1987.

Great Lakes Research, Inc. 2004. Cultural Resource Survey, Passage Island Lighthouse (20IR202), Keweenaw County, Michigan. August 2004.

MDEQ, accessed 2011. Soil: Residential and Commercial, Part 201 Generic Cleanup Criteria and Screening Levels (http://www.michigan.gov/deq/0,1607,7-135-3311_4109_9846_30022-251790--,00.html). Developed under the authority of the Natural Resources and Environmental Protection Act, 1994 PA 451 as amended. March 2011.

MWH Americas, Inc. 2003. Final Site Assessment Report, Former Storage Tank Areas and Soil Assessment for Lead, Passage Island Light Station, Keweenaw County, Michigan. December 2003.

MWH Americas, Inc. 2005. Final Leachate and Total Lead Soil Sampling Summary, Passage Island Light Station, Keweenaw County, Michigan. November 2005.

MWH Americas, Inc. 2012. Field Sampling Plan for Soil Delineation and Removal Confirmation Sampling, Passage Island Light Station, Keweenaw County, Michigan. March, 2012.

National Historic Preservation Act of 1966, as Amended.

National Oil and Hazardous Substances Pollution Contingency Plan; Final Rule. 40 Code of Federal Regulations, Part 300. March 8, 1990.

Natural Resources and Environmental Protection Act, Public Act 451 of 1994, as Amended.

United States Environmental Protection Agency 1992. *Supplemental Guidance to RAGS: Calculating the Concentration Term*. May 1992.

United States Environmental Protection Agency 1993. *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA,* EPA540-R-93-057. August 1993.

United States Environmental Protection Agency 1993*. Guidance on Conducting Non-Time–Critical Removal Actions Under CERCLA*.,EPA540-R-93-057. August 1999.

United States Environmental Protection Agency 1994. Office of Solid Waste and Emergency Response. *Memorandum: Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities*. From Elliott Laws, Assistant Administrator. To: Regional Administrators I-X. EPA/540/F-94/043. August 1994.

United States Environmental Protection Agency, Office of Solid Waste and Emergency Response. 1994. *Memorandum: Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities*. From Elliott . Laws, Assistant Administrator. To: Regional Administrators I-X. EPA/540/F-94/043. August 1994.

Woodward-Clyde, 1997. Phase I Environmental Site Assessment , Passage Island Light, Keweenaw County, Michigan Contract Number DTCG47-96-D-3EFK09/TOK09-0019. November 1997.

Tables

TABLE 1
Soil Analytical Results - Lead in Soil
USCG Passage Island Light Station
Keweenaw County, Michigan

Sample ID	Depth (inches bgs)	Lead mg/kg	TCLP Lead mg/l
SB-01	**(0-3")**	2,513	
SB-02	**(0-3")**	17,712	
SB-03	**(0-3")**	1,218	
SB-04	**(0-6")**	3,385	
SB-05	**(0-2")**	3,526	
SB-06	**(0-3")**	2,778	
SB-07	**(0-4")**	2,812	
SB-08	**(0-3")**	8,718	
SB-09	**(0-4")**	422	
SB-10	**(0-3")**	1,029	
SB-11	**(0-4")**	1,125	
SB-12	**(0-4")**	1,376	
SB-13	**(0-4")**	2,302	
SB-14	**(0-6")**	1,386	
SB-15	**(0-3")**	4,722	
SB-16	**(0-6")**	778	
SB-17	**(0-3")**	1,450	
SB-18	**(0-4")**	585	
SB-19	**(0-2")**	691	
SB-20	**(0-3")**	382	
SB-21	**(0-3")**	1,294	
SB-22	**(0-4")**	1,466	
SB-23	**(0-3")**	834	
SB-24	**(0-4")**	2,347	
SB-25	**(0-4")**	1,660	
SB-26	**(0-4")**	1,230	
SB-27	**(0-2")**	6,610	
SB-28	**(0-3")**	7,597	
SB-29	**(0-3")**	41,040	
SB-30	**(0-4")**	6,287	
SB-31	**(0-3")**	6,807	
SB-32	**(0-4")**	648	
SB-33	**(0-2")**	436	
SB-34	**(0-2")**	5,333	
SB-35	**(0-3")**	812	
SB-36	**(0-3")**	23,826	
SB-37	**(0-4")**	453	
SB-38	**(0-3")**	103	
SB-39	**(0-3")**	338	
SB-40	**(0-3")**	100	
WC-1			49.7
WC-2			<5.0

CRITERIA[a]	
Removal Action Objective (RAO)	4,800
Residential Direct Contact	400
Indoor Air	NLV
Inhalation	100,000
Statewide Default Background	21
RCRA Threshold	5
Calculated Background	538

NOTES:
1. mg/kg: milligrams per kilogram
2. mg/l: milligrams per liter
3. TCLP: Toxicity Characteristic Leaching Procedure
4. Highlighted cells indicate an exceedance of Residential Direct Contact Criterion
5. Boxed cells indicate an exceedance of RAO
6. Undelined cells indicate an exceedance of the Resource Conservation and Recovery Act (RCRA) Threshold
7. inches bgs: inches below ground surface

CRITERIA:
Criteria is Michigan Department of Environmental Quality (MDEQ), Part 201 of the Natural Resources and Environmental Protection Act, 1994 Public Act 451, as amended, Residential Generic Cleanup Criteria and Screening Levels

1. Indoor Air: Soil Volatilization to Indoor Air Inhalation Criteria
2. Inhalation: Particulate Soil Inhalation Criteria
3. NLV: Criteria not available under MDEQ Part 201, hazardous substance is not likely to volatize under most conditions
4. Calculated Background: Calculated site-specific background concentrations, represent upper limit
5. RCRA Threshold for 40 CFR 261.24 Table 1

Table 2a
Potential Federal and State Chemical-Specific ARARs
To Be Considered Guidance
USCG Passage Island Light Station
Keweenaw County, Michigan

Constituent of Concern and Media	Authority	Act	Statute, Regulation, Administrative Code, or Guidance Document	Status	Synopsis of Requirement, Criteria, or Guidance
	Federal Requirements and/or Criteria.				
Lead in Soil	Federal Advisories, Guidance, and Training Material.	NA	Recommendations of the Technical Review Workgroup (TRW) for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil. TRW for Lead, Washington, D.C. (United States Environmental Protection Agency 1996.)	To Be Considered.	This is non-promulgated guidance that describes a methodology for assessing risks associated with nonresidential adult exposures to lead in soil.
	State Requirements and/or Criteria.				
	Waste and Hazardous Materials Division	Natural Resources and Environmental Protection Act (NREPA)	Part 111, Hazardous Waste Management, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA). (MCL 324.111, et seq.) Michigan Administration Code: R 299.9202-9208, R 299.9212, R299.9228,R 299.9301-9312, R 299.9401-9413, R 299.9501-9523, R299.9601-9634, R 299.9701-9713, R 299.9801-9816, and R 299.11001-11008, et. seq. Part 1: General Provisions; Part 2: Identification and Listing of Hazardous Waste; Part 3: Generators of Hazardous Waste; Part 4: Transporters of Hazardous Waste; Part 5: Construction Permits and Operating Licenses; Part 6: Owners and Operators of Hazardous Waste treatment, Storage and Disposal Facilities; Part 7: Financial Capability; Part 8: Management of Specific hazardous Wastes, Specific Types of Hazardous Waste Part 9: Hazardous Waste Service Fund; Part 10: Availability of Referenced Materials Formerly known as Act 64 (1979)	Potentially Applicable	Defines hazardous waste and establishes requirements for hazardous waste generators, transporters, and treatment/storage/disposal facilities. It is the implementing statue for the federally delegated program under the Resource Conservation and Recovery Act (RCRA), as amended by the Hazardous Waste Amendments (HSWA). Regulates the generation, transport, treatment, storage, and disposal of hazardous wastes from site remediation. Regulates closure, post-closure, and corrective action for hazardous waste treatment, storage, and disposal facilities. Note: The State of Michigan has authorization to administer Federal RCRA Subtitle C in the State. - Must be com-plied with by persons engaging in activities, which would generate, transport, treat, store, or dispose of hazardous waste in this state. Administrative Rules define hazardous waste based on analytical procedures, usage, and process of generation. Response activities may generate waste residuals that may be classified as hazardous waste. Used for characterizing and identifying hazardous wastes and determining appropriate treatment and disposal.
	Air Quality Division	NREPA	Part 55, Air Pollution Control of the Natural Resources and Environmental Protection Act, 1994 Pa 451, as amended (NREPA). (MCL 324.55, et seq.)	Potentially Applicable	Defines air quality standards for potential air emission sources. Prohibits the emissions of air contaminants in quantities that cause injurious effects to human health, animal life, plant life of significant economic value, and/or property or that interfere with the enjoyment of life or property in the state. Applicable for remedial alternatives that would generate air emissions ,i.e., dust, fumes, gas, mist, odor, smoke, vapor, or any combination thereof. For Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) remedial actions that take place entirely on-site, discharge requirements could be identified through the issuance of a Substantive Requirements Document.
	Remediation and Redevelopment Division	NREPA	Part 201, Environmental Remediation, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA). (MCL 324.201, et seq.)	Potentially Applicable	In part, protects the environment and natural resources of the state; regulates the discharge of certain substances into the environment; regulates the use of certain lands, waters, and other natural resources of the state; and prescribes the powers and duties of certain state and local agencies and officials. Establishes cleanup criteria for sites of environmental contamination based on current and future land use. Regulates cleanup of releases of hazardous substances in concentrations that constitute a facility as that term is defined in Section 2010(o) of Act 451 to soil and groundwater.

Notes:
ARARs = Applicable or Relevant and Appropriate Requirements
CERCLA = Comprehensive Environmental Response, Compensation and Liability Act
CFR = Code of Federal Regulations
HSWA = Hazardous Waste Amendments
MCL = Michigan Compiled Laws
NREPA = Natural Resources Environmental and Protection Act
RCRA = Resource Conservation and Recovery Act
TRW = Technical Review Workgroup

Table 2b
Potential Federal and State Location-Specific ARARs
To Be Considered Requirements
USCG Passage Island Light Station
Keweenaw County, Michigan

Constituent of Concern and Media	Authority	Act	Statute, Regulation, Administrative Code, or Guidance Document	Status	Synopsis of Requirement, Criteria, or Guidance
	Federal Requirements and/or Criteria.				
The Site is located three and one quarter miles off the northeastern tip of Isle Royale in Keweenaw County, Michigan and has the following specifics: • Federally owned property • Habitat for Threatened Species	Federal Regulatory Requirement.	Endangered Species Act of 1973.	Endangered Species 16 United States Code (USC) 1531-1544. 16 USC Chapter 35 Endangered and Threatened Wildlife and Plants (50 CFR Part 17) 50 CFR 17 Cooperation of Endangered and Threatened Species of Fish, Wildlife, and plants – Cooperation with the States (50 CFR Part 81) 50 CFR 81 Designated Critical Habitat (50 CFR 226) 50 CFR 226 Interagency Cooperation Endangered Species Act of 1973 (50 CFR 402) 50 CFR 402	Potentially Relevant and Appropriate	These rules require federal agencies to ensure that their actions do not jeopardize the continued existence of any threatened or endangered species or adversely modify the habitat of such species. For non-major construction, a request for determination of whether any listed species or habitat are in the project area is required, and based on that determination, a biological assessment may be also required.
	State Requirements and/or Criteria.				
	All DEQ Divisions	Natural Resources Environmental and Protection Act of 1994, Public Act 451 as amended (NREPA).	Part 17, Environmental protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA). (MCL 324.17, et seq.) Michigan Administrative Code: R 324.1701, et. seq. Formerly known as Act 127 (1970)	Relevant and Appropriate	Provides the protection of natural resources. The protection of state resources prohibits any action that pollutes, impairs, or destroys the state's natural resources due to any activities conducted at a site of environmental contamination.
	Land and Water Management	NREPA	Part 91, Soil erosion and Sedimentation Control, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA). (MCL 324.9101, et seq.) Michigan Administrative Code: R 336.1701, et. seq. Formerly known as Act 347 (1972)	Relevant and Appropriate	Requires a soil erosion control and sedimentation plan for any earth charges of one or more acres and/or any earth changes within 500 feet of a lake or stream. Establishes rules prescribing soil erosion and sedimentation control plans, procedures, and measures.
	Remediation and Redevelopment Division	NREPA	Part 201, Environmental Remediation, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA). (MCL 324.20101, et seq.) Michigan Administrative Code: R 299.5511 (3)(a), et. seq. Formerly known as Act 307 (1982)	Relevant and Appropriate	In part, protects the environment and natural resources of the state; regulates the discharge of certain substances into the environment; regulates the use of certain lands, waters, and other natural resources of the state; and prescribes the powers and duties of certain state and local agencies and officials. Establishes cleanup criteria for sites of environmental contamination based on current and future land use. Regulates cleanup of releases of hazardous substances in concentrations that constitute a facility as that term is defined in Section 2010(o) of Act 451 to soil and groundwater.
	Land and Water Management Division	NREPA	Part 323, Shore lands Protection and Management, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA). (MCL 324.32301, et seq.) Michigan Administrative Code: R 281.21, et. seq. Formerly Known as Act 245 (1970)	Relevant and Appropriate	Regulates the alteration of the soil and vegetation within a great Lakes shore land environmental area without a permit. Regulates activities in high-risk erosion areas and flood risk areas (administered by local units of government through the federal flood insurance program) as well as environmental areas. May be applied to environmental sites of contamination that may affect the protection and management of Great Lake shore land areas.
	Office of the Great Lakes	NREPA	Part 329, Great Lakes Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA). (MCL 324.32901, et seq.) Michigan Administrative Code: R 324.32901, et. seq.	Potentially Relevant and Appropriate	Careful management of the Great Lakes will permit the rehabilitation and protection of the lakes, their waters, and their ecosystems, while continuing and expanding their use for industry, food production, transportation and recreation. May be applied to site remediation that would affect the Great Lakes.
	Department of Natural Resources	NREPA	Part 365, Endangered Species Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA) (MCL 324.365 et seq) Michigan Administrative Code: R 324.41101, et. seq. Formerly known as Act 203 (1974)	Potentially Relevant and Appropriate	Establishes rules to provide for conservation, management, enhancement, and protection of species either endangered or threatened with extinction. Habitat listed on the Michigan Natural Features Inventory and Part 365 will need to be protected. The rules contain a listing of the fish, wildlife, and the plant species they have been determined to be endangered or threatened. Remedial action may take place and adversely impact endangered species and other habitat.
	Department of Natural Resources	NREPA	Part 479,Fisheries Contamination, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA). (MCL 324.479, et seq.) Michigan Administrative Code: R 324.47903-47905, et. seq.	Potentially Relevant and Appropriate	Used to ensure the protection of aquatic species within waters of the state. A person shall not put into any stream, pond, or lake sandy sand, coal, cinders, ashes, log slabs, decayed wood, bark, sawdust, or fish. May be applied to site remediation to protect and/or restore aquatic life.

Notes:
ARARs = Applicable or Relevant and Appropriate Requirements
CFR = Code of Federal Regulations
MCL = Michigan Compiled Laws
NREPA = Natural Resources Environmental and Protection Act
USC = United States Code

Table 2c
Potential Federal and State Action-Specific ARARs
To Be Considered Requirements
USCG Passage Island Light Station
Keweenaw County, Michigan

Constituent of Concern and Media	Authority	Act	Statute, Regulation, Administrative Code, or Guidance Document	Status	Synopsis of Requirement, Criteria, or Guidance
	Federal Requirements and/or Criteria.				
Excavation of lead-impacted soil and implementation of Institutional Controls (ICs)	Federal Regulatory Requirement.	Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by the 1986 Superfund Amendments and Reauthorization Act (SARA).	Federal Facilities 42 United States Code (USC) 9620 42 USC 9620 Reporting Hazardous Substance Activity When Selling or Transferring Federal Real Property (Title 40 Code of Federal Regulations [CFR] 373) 40 CFR 373	Potentially Applicable	These rules require notifications related to hazardous substances prior to the sale or transfer of real property owned by the federal government. This is applicable if a property with residual contamination is transferred.
		CERCLA as amended by the 1986 SARA.	National Contingency Plan (42 USC 9605). 42 USC 9605 National Contingency Plan (40 CFR Section 300.400 through 300.415).	Applicable	These promulgated rules require performing a Removal Site Evaluation and a Removal Action including preparing certain documents (a Quality Assurance Project Plan [QAPP], a field sampling plan [FSP], and an engineering evaluation and cost assessment [EE/CA]), considering federal and state ARARs, soliciting community involvement, and providing notifications prior to the removal action.
		Executive Order 12580 of January 23, 1987, Superfund Implementation.	Executive Order 12580-Superfund Implementation Executive Order 12580	Applicable	The Executive Order provides federal agencies, including the United States Coast Guard, the authority to carry out their CERLCA responsibilities under the National Contingency Plan as a lead agency.
		Resource Conservation and Recovery Act of 1976 (RCRA).	Identification and Listing of Hazardous Waste 42 USC 6921. 42 USC 6921 Identification and Listing of Hazardous Waste (40 CFR 261). 40 CFR 261 Land Disposal Restrictions 40 Part 268. 40 CFR 268	Applicable	These regulations establish requirements for identifying any hazardous wastes that may be generated in the course of the removal action.
		RCRA.	Standards Applicable to Generators of Hazardous Waste 42 USC 6922. 42 USC 6922 Standards Applicable to Generators of Hazardous Waste (40 CFR 262). 40 CFR 262 Standards Applicable to Transporters of Hazardous Waste (40 CFR 263). 40 CFR 263	Potentially Applicable	These regulations establish requirements for the on-site management of any hazardous wastes that may be generated in the course of the remedial action.
		RCRA.	Standards Applicable to Generators of Hazardous Waste. (42 USC 6923). 42 USC 6921 Standards Applicable to Transporters of Hazardous Waste (40 CFR 263). 40 CFR 263 Standards for Universal Waste Management (40 CFR 273). 40 CFR 273	Potentially Applicable	These regulations establish requirements for the off-site transportation of any hazardous wastes that may be generated in the course of the remedial action.
		Hazardous Materials Transport Act (HMTA) as Amended by the Hazardous Materials Transport Uniform Safety Act of 1990.	Transportation of Hazardous Materials (49 USC 5101-5127). 49 USC Chapter 51 Hazardous Materials Regulations -General Information, Regulations and Definitions (49 CFR 171). 49 CFR 171 Hazardous Materials Regulations Hazardous Materials Regulations - Hazardous materials table, special provisions, hazardous materials communications, emergency response information, and training requirements (49 CFR 172). 49 CFR 172 Hazardous Materials Regulations Shippers – General Requirements for Shipments and Packages (49 CFR 173) 49 CFR 173	Potentially Applicable	These regulations establish requirements for the off-site transportation of any hazardous wastes that may be generated in the course of the remedial action.
		Clean Air Act of 1970.	National primary and secondary ambient air quality standards 42 USC 7409. 42 USC 7409 National Primary and Secondary Ambient Air Quality Standards (40 CFR 50) 40 CFR 50	Potentially Relevant and Appropriate	Engineering controls are required to reduce emissions associated with excavation and transportation, as needed, to maintain ambient air quality standards.
		Clean Water Act (CWA).	Water Pollution Prevention and Control, Standards and Enforcement, 33 USC 1313 through 1314. USC 33 National Pollution Discharge Elimination System (NPDES) (40 CFR 122 – 125). 40 CFR Parts 122-125	Potentially Applicable	This regulation establishes requirements for storm-water discharges associated with industrial activity, including waste disposal areas. Soil remediation may require consideration of storm-water regulations.

Table 2c
Potential Federal and State Action-Specific ARARs
To Be Considered Requirements
USCG Passage Island Light Station
Keweenaw County, Michigan

Constituent of Concern and Media	Authority	Act	Statute, Regulation, Administrative Code, or Guidance Document	Status	Synopsis of Requirement, Criteria, or Guidance
	Federal Requirements and/or Criteria.				
		Occupational Safety & Health Administration Act (OSHA) of 1970.	Occupational Safety & Health Administration Act (Public Law 91-596 84 STAT. 1590). PL 91-596 OSHA Occupational Safety & Health Administration (29 CFR 1910). 29 CFR 1910	Potentially Applicable	These regulations specify requirements for health and safety protection for workers potentially exposed to contaminants during hazardous waste site remediation.
		OSHA.	Occupational Safety & Health Administration Act (Public Law 91-596 84 STAT. 1590). PL 91-596 OSHA ACT Occupational Safety & Health Administration (29 CFR 1926). 29 CFR 1926	Applicable	These regulations specify requirements for health and safety protection for workers at construction sites.
	State Requirements and/or Criteria.				
	Michigan State Police Motor Carrier Division	NA	Michigan Motor Carrier Safety Code Public Act 181 of 1963, as amended. (MCL 480.11, et seq.) Michigan transportation Code: Transportation of Hazardous Materials (R 480.11-21).	Potentially Relevant and Appropriate	Rules governing the transportation of hazardous materials. Used to protect the public, first responders to hazardous incidents and the environment from hazardous materials.
	Michigan Department of Transportation Michigan State Police Motor Carrier Division	Public Act 300	Michigan Vehicle Code Public Act 300 of 1949, as amended. (MCL 257.722, et seq.) Michigan Administrative Code: Size, Weight and Load (R 257.716-726).	Potentially Relevant and Appropriate	Rules governing the reduction of maximum axle loads during springtime frost periods. Maximum Gross Vehicle Weight (GVW) is not to exceed 25-35% of normal GVW. County road jurisdiction- County Road Commission and state roads and highway Jurisdiction- MDOT. Motor Carrier enforces the above. Used to prevent vehicular damage to roadways from transporting heavy materials and equipment. Remedial action and construction may require heavy loads of equipment, fill dirt, contaminated media, etc. to be transported over roadways; however, this is not allowed during frost periods.
	Michigan Department of Energy, Labor and Economic growth		The Michigan Occupational Safety and Health Act (MIOSHA) Public Act 154 of 1974, as amended. Michigan Administrative Code: -Safety Standards for General Industry; Safety Standards for General Industry; - Health Standards for general Industry; - Safety Standards for Construction; - Health Standards for Construction; - Administrative Rules for General Industry, Construction Health and Agricultural Operations (R 408.1001-1094).	Relevant and Appropriate	Occupational safety and health standards adopted to provide safe and healthful employment or places of employment, which may include medical monitoring. Provides safety standards for hazards, air contaminants, physical hazards, health hazard control measures, illumination, sanitation, employee right-to-know, and others. Regulations containing worker health and safety standards for construction and general industry operations and requirements for worker training specifically "Hazardous Waste Operations and Emergency response (HAZWOPER)" This is the statute adopted by Michigan from the Federal OSHA Rules contain a list of permissible (HAZWOPER). This is the statute adopted by Michigan from the Federal OSHA. Rules contain a list of permissible exposure limits in the work place for more than 600 chemical compounds. On-site remedial actions have the potential to expose workers to contaminants found in affected material, i.e., soil, air, and water. Construction, excavation and other site actions may present potential health hazards to nearby workers. Such activities are governed by worker safety and health standards under this act and are applicable to all site actions and activities.
	All DEQ Divisions	Natural Resources and Environmental Protection Act (NREPA)	Part 17, Environmental protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA). (MCL 324.17, et seq.) Michigan Administrative Code: R 324.1701, et. seq. Formerly known as Act 127 (1970)	Relevant and Appropriate	Provides the protection of natural resources. The protection of state resources prohibits any action that pollutes, impairs, or destroys the state's natural resources due to any activities conducted at a site of environmental contamination. Applied in remedial Investigation, remedial design, response activity and remedial action activities.
	Air Quality Division	NREPA	Part 55. Air Pollution Control, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA). (MCL 324.55, et seq.) Michigan administration Code: R 324.5501, R 336.1101, R336.1123, R 336.1127, R 336.1201-1207, R 336.1209-1229, R 336.1230-1241, R 336.1278-1290, and R 336.1299 (Part 2 Air Use Approval), R 336.1301-1331, R 336.1370-1372(Part 3 Emissions Limitations and Prohibitions), R 336.1701-1702, R 336.1901, R 336.2001-2007, et. seq. Formerly Known as Act 348 (1965)	Potentially Relevant and Appropriate	Requires permitting for air emission sources and air monitoring during activities that may cause contaminant releases to air. Remedial actions may introduce contaminants into the air. Prohibits the emissions of air contaminants from wastes on site in quantities, which cause injurious effects to human health, animal life, plant life of significant economic value, and/or property. Applicable for remedial alternatives that generate air emissions (soil excavation) where fugitive dust or air emissions may adversely affect human health and the environment. Requires air emissions to have "non-injurious effects" and is enforced though permitting and monitoring of air pollution sources such as site work when airborne contaminants or dust can be released. These rules address air use, particulate emission limitations, sulfur-bearing compound limitations, volatile organic emissions, and several miscellaneous prohibitions. It also addresses testing, sampling, etc. Requires the issuance of a permit prior to installation or constructions of equipment which may be a source of air contamination. The regulations provide for permit application requirements, air quality modeling, and permit exemptions and waivers. For CERCLA remedial actions taking place entirely on-site, requirements may be identified through issuance of a Substantive Requirements Document (SRD). Defines and describes the general provisions for new sources of volatile organic compound emissions The regulations contain the criteria for conducting performance tests and include detailed emission test

Table 2c
Potential Federal and State Action-Specific ARARs
To Be Considered Requirements
USCG Passage Island Light Station
Keweenaw County, Michigan

Constituent of Concern and Media	Authority	Act	Statute, Regulation, Administrative Code, or Guidance Document	Status	Synopsis of Requirement, Criteria, or Guidance
	State Requirements and/or Criteria.				
	Land and Water Management	NREPA	Part 91, Soil erosion and Sedimentation Control, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA). (MCL 324.9101, et seq.) Michigan Administrative Code: R 336.1901, et. seq. Formerly known as Act 347 (1972)	Applicable	Requires a soil erosion control and sedimentation plan for any earth charges of one or more acres and/or any earth changes within 500 feet of a lake or stream. Establishes rules prescribing soil erosion and sedimentation control plans, procedures, and measures. Remedial action may involve capping, construction of a discharge pipe, etc. Consideration of soil erosion and sedimentation control will be necessary to prevent sediment impacts to waters of the state more than 1 acre in area or within 500 feet of a lake or stream, and preserve topsoil loss. May be applied to site activity where earthwork is conducted.
	Waste and hazardous Materials Division	NREPA	Part 111, Hazardous Waste Management, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA). (MCL 324.111, et seq.) Michigan Administration Code: R 299.9202-9208, R 299.9212, R299.9228,R 299.9301-9312, R 299.9401-9413, R 299.9501-9523, R299.9601-9634, R 299.9701-9713, R 299.9801-9816, and R 299.11001-11008, et. seq. Part 1: General Provisions; Part 2: Identification and Listing of Hazardous Waste; Part 3: Generators of Hazardous Waste; Part 4: Transporters of Hazardous Waste; Part 5: Construction Permits and Operating Licenses; p g Part 6: Owners and Operators of Hazardous Waste treatment, Storage and Disposal Facilities; Part 7: Financial Capability; Part 8: Management of Specific hazardous Wastes, Specific Types of Hazardous Waste Management facilities, and Used Oil; Part 9: Hazardous Waste Service Fund; Part 10: Availability of Referenced Materials Formerly known as Act 64 (1979)	Potentially Relevant and Appropriate	Defines hazardous waste and establishes requirements for hazardous waste generators, transporters, and treatment/storage/disposal facilities. Regulates the generation, transport, treatment, storage, and disposal of hazardous wastes from site remediation. Regulates closure, post-closure, and corrective action for hazardous waste treatment, storage, and disposal facilities. Remedial action may generate hazardous waste and involve management of hazardous waste. May be applied to off-site disposal of hazardous waste. Used for determining how and in what type of disposal facility contaminated media may be removed to. May be applied to construction and operation of on-site treatment, storage or disposal units relative to requirements for characterization and handling of hazardous waste. Applied to the excavation of certain contaminated media. Note: The State of Michigan has authorization to administer Federal RCRA Subtitle C in the State.
	Waste and Hazardous Materials Division	NREPA	Part 115, Solid Waste Management, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA). (MCL 324.115, et seq.) Michigan State Administrative Code: R 324.11501, et. seq. Formerly known as Act 641 (1978)	Relevant and Appropriate	Addresses solid waste management including general landfill design requirements as promulgated in the administrative rules of the Michigan Solid Waste Management Regulations. Regulates the construction and operations of sanitary landfills, solid waste transfer facilities and solid waste processing plants. Specifies liner and capping requirements for solid waste landfills. Requirements for the operation and closure of non-hazardous waste treatment, storage, and disposal and groundwater quality performance standards. Also imposes geographic limitations on where non-hazardous solid waste can be disposed. Regulates the disposal of non-hazardous solid waste. Provides requirements for closure and post-closure of non-hazardous solid waste treatment, storage and disposal facilities. Provides groundwater quality performance standards. Remedial action may produce non- hazardous solid waste, which must be disposed of in accordance with Part 115. Used for determining the process and type of disposal facility that solid waste or contaminated media may be removed to. May serve as a basis of design for containment of non-hazardous solid waste on-site.
	Remediation and Redevelopment Division	NREPA	Part 201, Environmental Remediation, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA). (MCL 324.201, et seq.) Michigan Administrative Code: R 299.5109, R 299.5505, R 299.5511, R 299.5513, R 299.5515, R 299.5519, R 299.55601, et. seq. Formerly known as Act 307 (1982)	Relevant and Appropriate	In part, protects the environment and natural resources of the state; to regulate the discharge of certain substances into the environment; to regulate the use of certain lands, waters and other natural resources of the state; and to prescribe the powers and duties of certain state and local agencies and officials. Applies to response activities taken at sites of environmental contamination which are facilities as that term is defined in Section 20101(o) of Act 451. Provides risk based site cleanup criteria based on land-use, and other factors necessary to protect the public health, safety, welfare and the environment.
	Department of Natural Resources	NREPA	Part 365, Endangered Species Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA). (MCL 324.365, et seq.) Michigan Administrative Code: R 324.61501, et. seq. Formerly known as Act 203 (1974)	Potentially Relevant and Appropriate	Establishes rules to provide for conservation, management, enhancement, and protection of species either endangered or threatened with extinction. Remedial action may take place and adversely impact endangered species and other habitats.

Notes:
ARARs = Applicable or Relevant and Appropriate Requirements
CERCLA = Comprehensive Environmental Response, Compensation and Liability Act
CFR = Code of Federal Regulations
CWA = Clean Water Act
EE/CA = Engineering Evaluation/Cost Assessment
FSP = Field Sampling Plan
GVW = Gross Vehicle Weight
HAZWOPER = Hazardous Waste Operations and Emergency response
HMTA = Hazardous Materials Transport Act
IC = Institutional Controls
MCL = Michigan Compiled Laws
NA = Not applicable
NREPA = Natural Resources and Environmental Protection Act
OSHA = Occupational Safety & Health Administration Act
QAPP = Quality Assurance Project Plan
RCRA = Resource Conservation and Recovery Act
SARA = Superfund Amendments and Reauthorization Act
SRD = Substantive Requirements Document
USC = United States Code

Table 3
Identification and Analysis of Alternatives
USCG Passage Island Light Station
Keweenaw County, Michigan

Alternative	Description	Effectiveness	Implementability		Estimated cost	Assumptions
			Technical feasibility	Administrative feasibility		
No Action	Impacted soil remains in place without any response actions to reduce potential exposure to human health or the environment.	Not Effective. Does not address exposure pathways under current or future land use scenarios.	Yes. Does not require any construction or operational requirements.	Would not comply with ARARs, does not facilitate property transfer.	Relatively low cost.	Assumes no actions would be completed.
Restrictive Covenants	Application of deed restrictions limiting or prohibiting the use or disturbance of soil at the Site, and restricting access to areas of the Site with soil impacts above residential direct contact criteria.	Could be effective for limiting the potential direct contact or ingestion exposure pathways.	Yes. Does not require any construction or operational requirements.	Would not comply with ARARs without additional response actions, requires restrictive covenants that would accompany the property deed into perpetuity, continued verification of the land use and compliance with land use restrictions would be required, may complicate property transfer.	Relatively low cost.	Assumes effort to develop and implement the use restrictions and only the first 30 years of annual inspections and 5 year reviews.
Risk Assessment / Pathway Evaluation	Comprehensive evaluation of migration and exposure pathways and characterization of risk associated with each potential pathway.	Could be effective in characterizing the risks associated with specific pathways or determining a more appropriate Site-specific cleanup level for the exposure scenarios considered. Would not specifically reduce the risks but only provide the risks and their probable pathways.	Yes. Approach is technically feasible.	Would not comply with ARARs and RAOs without additional response actions, depends on anticipated land use and potential exposure scenarios, depends on regulatory acceptance of pathway evaluations.	Relatively low cost.	Assumes existing Site characterization data are of sufficient quality and quantity to perform evaluations.
Capping	Construction of an exposure barrier or "cap" at the Site to eliminate the soil direct contact exposure pathway.	Could be effective for limiting the potential direct contact exposure pathway for recreational use.	Yes. Soil capping is an implementable technology and would contribute to achieving RAOs. However, it's construction would damage habitat in the island. Potential complications due to limited site accessibility on remote island.	Would present public perception issues or interfere with current land use, require restrictive covenants that would accompany the property deed into perpetuity. Continued inspection of the cap, Verification of the land use, and compliance with land use restrictions would be required.	Relatively high cost	Assumes effort to install cap on areas exceeding site-specific recreational criteria, develop and implement the use restrictions, and only the first 30 years of annual inspections and 5 year reviews.
Soil Stabilization	Addition of chemical stabilizers to soils impacted by lead above the RAO to decrease the mobility of the contaminants.	Could be effective in reducing exposure to lead. Long-term effectiveness is questionable due to possibility of immobilized contaminants resolubilizing.	Yes. Soil stabilization is an implementable technology. However, may affect re-growth of vegetation and site use as a wildlife refuge.	May not be acceptable for anticipated property use, dependent on regulatory acceptance, and public perception.	Medium cost	Assumes effort to complete soil stabilization, develop and implement long-term monitoring, verification sampling, and only the first 30 years of annual inspections and 5 year reviews.
Chemical Extraction	Excavation of soils impacted by lead above the RAOs, followed by treatment of impacted soils with a chemical extractant to remove the lead. The treated soil is used for Site restoration and the extractant is disposed of accordingly.	Could be effective at reducing the overall concentration of contaminant.	Yes. Chemical extraction is an implementable technology. However, transport and setup of extraction equipment and chemicals, management and disposal of waste stream, accessibility of Site, and disturbances to sensitive habitat would make implementation technically difficult.	May be dependent on regulatory acceptance and public perception.	Extremely high Cost	Assumes effort to remove and treat soil, replace treated soil, costs for purchase and transport of extractant and disposal of wastestream, Site restoration costs, verification sampling, and only the first 30 years of annual inspections and 5 year reviews.

Table 3
Identification and Analysis of Alternatives
USCG Passage Island Light Station
Keweenaw County, Michigan

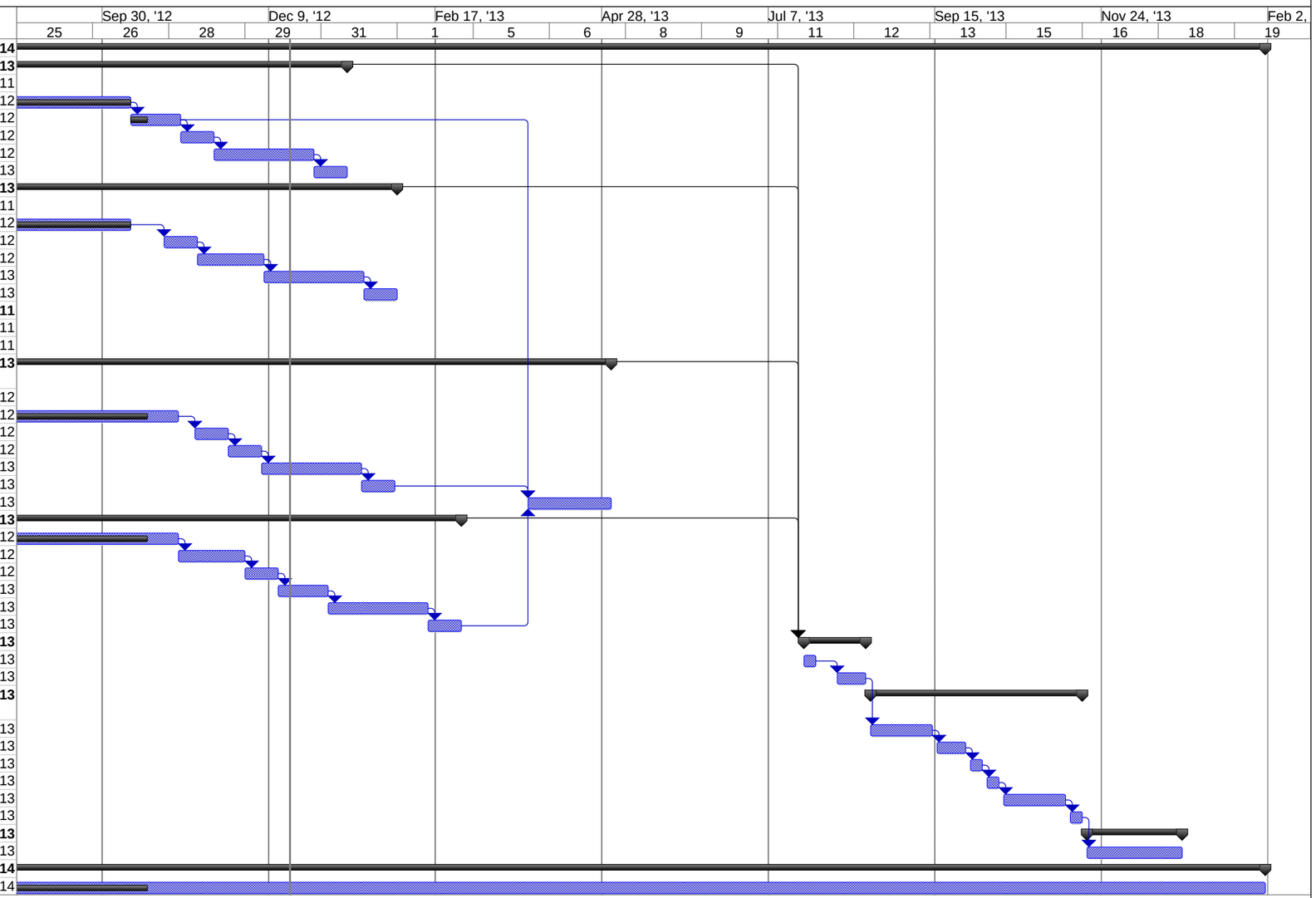
Alternative	Description	Effectiveness	Implementability		Estimated cost	Assumptions
			Technical feasibility	Administrative feasibility		
Phytoremediation	Planting of vegetation in the area of soils impacted by lead above the RAO to uptake the lead from the soil to the plant tissues.	Could be effective at reducing the overall concentration of contaminant. However, its effectiveness will vary with length of growing season, climate and soil conditions.	Yes. Phytoremediation is an implementable technology but not well suited for the cool climate and shorter growing season. The remoteness of the site make it difficult to maintain the watering and fertilizing of the plants. Transporting plants to and harvesting of the plants is not easily performed.	May not achieve RAOs within an acceptable timeframe without other control measures and dependent on regulatory acceptance.	Relatively high cost.	Assumes effort to plant and harvest, cost of the plants, maintenance of the plants for 10 years, repeated performance monitoring/verification sampling costs, disposal of plants, and only the first 30 years of annual inspections and 5 year reviews.
Soil Washing	Excavation of soils impacted by lead above the RAO, followed by treatment within an aqueous-based system where smaller soil particles for which lead has a greater affinity are separated from larger soil particles. Larger soil particles are used for restoration and the separated contaminated soil is disposed of accordingly.	No, would not be effective at reducing the concentration of contaminants. The lead would be easily separated through simple soil washing.	Yes. Soil washing is an implementable technology. However, transport and set up of the soil washing equipment would be difficult. Obtaining and handling water and wash water would be difficult due to accessibility of Site and sensitive habitat.	Dependent on regulatory acceptance and public perception. Would require permit to withdrawal water from Lake Superior for use in the soil washing process.	Extremely high Cost	Assumes effort to remove and wash soil, replace cleaned soil, disposal of impacted soil and wastewater for treatment, Site restoration, and verification sampling costs, and only the first 30 years of annual inspections and 5 year reviews.
Soil Removal	Excavation and off-site disposal of soils impacted by lead above the RAO criterion. Restoration of land surface and vegetation similar to existing conditions.	Yes. Soil removal effectively eliminates the potential direct contact exposure pathway for recreational use at the Site.	Yes. Soil removal is an implementable technology and would contribute to achieving RAOs.	Soil removal effectively eliminates the potential recreational direct contact exposure pathway, achieves RAOs and ARARs, and therefore, would facilitate future property transfer.	Medium to high cost.	Removal and off site disposal of approximately X cubic yards of soil, backfilling to grade, seeding, and only the first 30 years of annual inspections and 5 year reviews.

TABLE 4
Cost Estimate for Soil Removal
USCG Passage Island Light Station
Keweenaw County, Michigan

Site Name: Passage Island Light Station Proj. Name: CERCLA Removal Action *TASK*	*TASK DESCRIPTION*	*Subtotal All Costs*	*G&A*	*Profit*	*Total Task Price*
5	Removal Action Work Plan (RAWP)	$11,586.97	$2,027.72	$1,361.47	$14,976.16
5A	Draft RAWP				
5B	RTCs on Draft RAWP				
5C	Draft Final RAWP				
5D	RTCs on Draft Final RAWP				
5E	Final RAWP				
6	Removal Action	$663,530.52	$116,117.84	$77,964.84	$857,613.19
6A	MWH Mob/Demob				
6B	Soil Removal and Disposal				
7	Removal Action Completion Report (RACR)	$10,387.48	$1,817.81	$1,220.53	$13,425.81
7A	Draft RACR				
7B	RTCs on Draft RACR				
7C	Draft Final RACR				
7D	RTCs on Draft Final RACR				
7E	Final RACR				
8	Adminstrative Record (AR)	$4,773.16	$835.30	$560.85	$6,169.31
8A	AR compilation				
9	Project Management	$41,332.46	$7,233.18	$4,856.56	$53,422.20
9A	Kickoff Meeting				
9B	Monthly Progress Reports				
9C	Status Meetings - 24 monthly meetings				
9D	Project Schedule				
9E	Invoicing				
9F	Closeout				
10	Contingency	$54,000.00	$9,450.00	$6,345.00	$69,795.00
10A	Contingency				
	TOTALS:	$782,042.96	$136,857.52	$91,890.05	$1,010,790.53

Table 5 - Project Schedule
USCG CEU Cleveland
Passage Island Light Station - CERCLA Removal Action
TO HSCG83-11-J-PCL217
UPDATED October 18, 2012

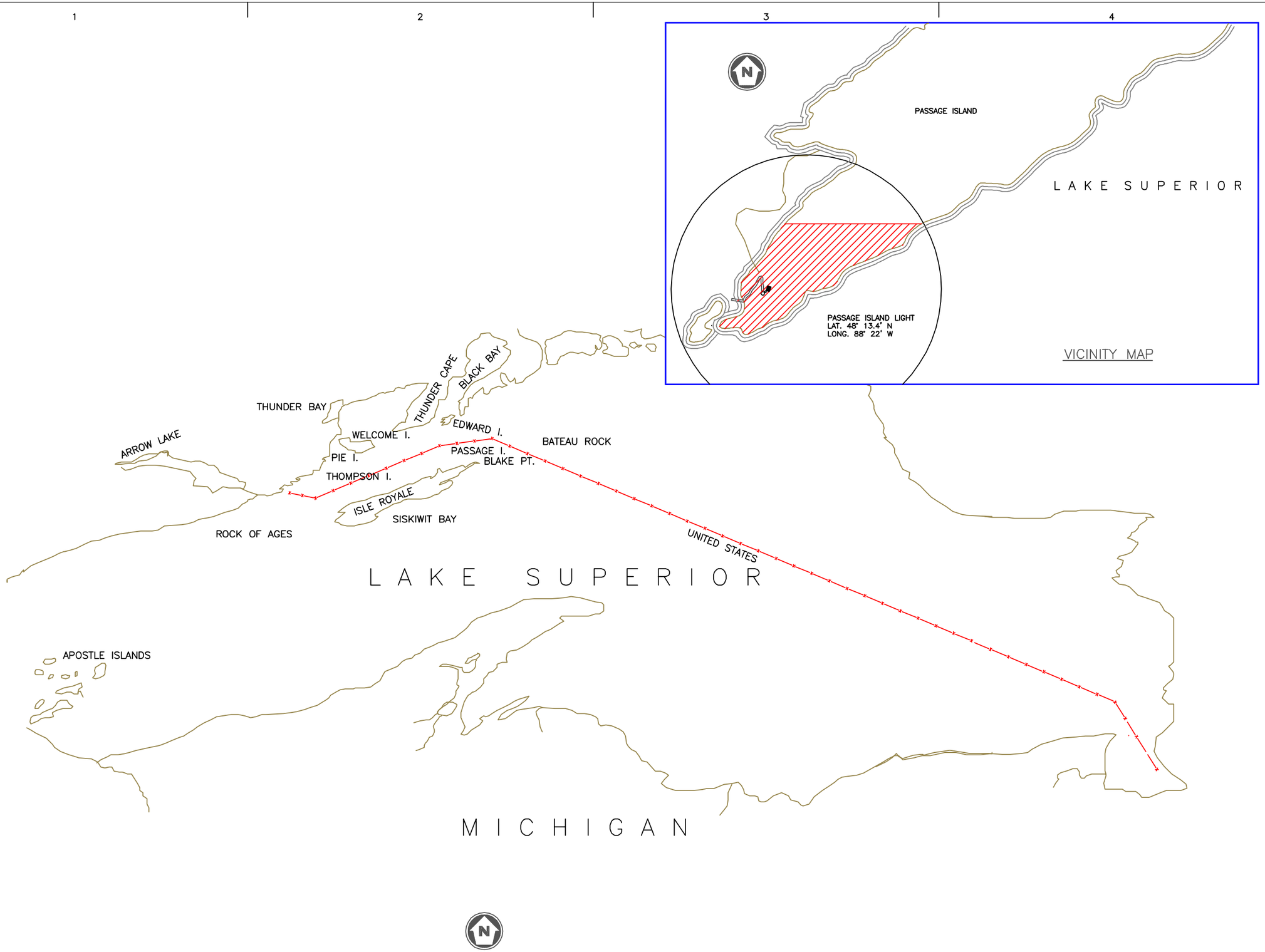
ID	Task Name	Duration	Start	Finish
1	**Passage Island Remedial Action**	**655 days**	**Mon 8/1/11**	**Fri 1/31/14**
2	**Task 1 - Field Sampling Plan (FSP)**	**319 days**	**Mon 10/24/11**	**Thu 1/10/13**
3	Draft FSP	1 wk	Mon 10/24/11	Fri 10/28/11
4	USCG review and comment	47.8 wks	Mon 11/14/11	Thu 10/11/12
5	RTCs on Draft FSP	3 wks	Fri 10/12/12	Thu 11/1/12
6	Draft Final FSP	2 wks	Fri 11/2/12	Thu 11/15/12
7	USEPA review and comment	6 wks	Fri 11/16/12	Thu 12/27/12
8	Final FSP	2 wks	Fri 12/28/12	Thu 1/10/13
9	**Task 2 - Quality Assurance Project Plan (QAPP)**	**334 days**	**Mon 10/24/11**	**Thu 1/31/13**
10	Draft QAPP	1 wk	Mon 10/24/11	Fri 10/28/11
11	USCG review and comment	47.8 wks	Mon 11/14/11	Thu 10/11/12
12	RTCs on Draft QAPP	2 wks	Fri 10/26/12	Thu 11/8/12
13	Draft Final QAPP	4 wks	Fri 11/9/12	Thu 12/6/12
14	USEPA review and comment	6 wks	Fri 12/7/12	Thu 1/17/13
15	Final QAPP	2 wks	Fri 1/18/13	Thu 1/31/13
16	**Task 3 - Bidders Site Walk**	**10 days**	**Mon 8/1/11**	**Fri 8/12/11**
17	Site Walk	1 wk	Mon 8/1/11	Fri 8/5/11
18	Response to Bidders Questions	1 wk	Mon 8/8/11	Fri 8/12/11
19	**Task 4 - Engineering Evaluation/Cost Analysis (EE/CA)**	**383 days**	**Mon 11/14/11**	**Wed 5/1/13**
20	Draft EE/CA	13 wks	Mon 11/14/11	Fri 2/10/12
21	USCG review and comments	35.6 wks	Mon 2/27/12	Wed 10/31/12
22	RTCs on Draft EE/CA	2 wks	Thu 11/8/12	Wed 11/21/12
23	Draft Final EE/CA	2 wks	Thu 11/22/12	Wed 12/5/12
24	USEPA review and comment	6 wks	Thu 12/6/12	Wed 1/16/13
25	Final EE/CA	2 wks	Thu 1/17/13	Wed 1/30/13
26	30 Day Public Comment Period	5 wks	Thu 3/28/13	Wed 5/1/13
27	**Task 5 - Removal Action Work Plan (RAWP)**	**217 days**	**Tue 5/1/12**	**Wed 2/27/13**
28	Draft RAWP	26.4 wks	Tue 5/1/12	Wed 10/31/12
29	USCG review and comment	4 wks	Thu 11/1/12	Wed 11/28/12
30	RTCs on Draft RAWP	2 wks	Thu 11/29/12	Wed 12/12/12
31	Draft Final RAWP	3 wks	Thu 12/13/12	Wed 1/2/13
32	USEPA review and comment	6 wks	Thu 1/3/13	Wed 2/13/13
33	Final RAWP	2 wks	Thu 2/14/13	Wed 2/27/13
34	**Task 6 - Removal Action**	**20 days**	**Mon 7/22/13**	**Fri 8/16/13**
35	Soil stabilizer application and sample collection	5 days	Mon 7/22/13	Fri 7/26/13
36	Soil Removal and Disposal	10 days	Mon 8/5/13	Fri 8/16/13
37	**Task 7 - Removal Action Completion Report (RACR)**	**65 days**	**Mon 8/19/13**	**Fri 11/15/13**
38	Draft RACR	4 wks	Mon 8/19/13	Fri 9/13/13
39	USCG Review and Comment	2 wks	Mon 9/16/13	Fri 9/27/13
40	RTCs on Draft RACR	1 wk	Mon 9/30/13	Fri 10/4/13
41	Draft Final RACR	1 wk	Mon 10/7/13	Fri 10/11/13
42	USEPA review and comment	4 wks	Mon 10/14/13	Fri 11/8/13
43	Final RACR	1 wk	Mon 11/11/13	Fri 11/15/13
44	**Task 8 - Administrative Record**	**30 days**	**Mon 11/18/13**	**Fri 12/27/13**
45	AR Compilation	30 days	Mon 11/18/13	Fri 12/27/13
46	**Task 9 - Project Management**	**610 days**	**Mon 10/3/11**	**Fri 1/31/14**
47	Monthly Progress Reports (1 per month)	30.5 mons	Mon 10/3/11	Fri 1/31/14



Project: Passage Island Light Station C
Date: Tue 12/18/12

Task | Split | Milestone | Summary | Project Summary | External Tasks | External Milestone | Inactive Task | Inactive Task | Inactive Milestone | Inactive Summary | Manual Task | Duration-only | Manual Summary Rollup | Manual Summary | Start-only | Finish-only | Progress | Deadline

Figures



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CONSULTANTS

U. S. COAST GUARD
CIVIL ENGINEERING UNIT
CLEVELAND

USCG, CEU CLEVELAND
1240 EAST 9TH STREET
CLEVELAND, OH 44199-2060

ISSUE

MARK	DATE	DESCRIPTION

A/E PROJECT NO: j:uscg\2008\711\EECA\CAD
CAD FILE NAME: C7937C01
DESIGNED BY: SAB
DRAWN BY: SAB
EDITED BY: SAB
CHECKED BY: AJP

SCALE: AS SHOWN PLOT SCALE:

SHEET TITLE

ENG. EVALUATION/COST ANALYSIS
PASSAGE ISLAND LIGHT STATION
KEWEENAW COUNTY MICHIGAN

SITE LOCATION MAP

REVIEWED BY:	REVIEWED BY:	REVIEWED BY:
PROJECT ENG.	BRANCH CHIEF	CONTRACTING KO

APPROVING OFFICER DATE

PROJECT NUMBER	DRAWING NUMBER
09-C01052	7937
DISCIPLINE/SHT NO	
C-01	SHEET 1 OF 4

LAKE SUPERIOR

LAKE SUPERIOR

PIER

PUMP HOUSE

SUMP HOUSE

FORMER AST FUEL OIL TANK

FORMER AST FUEL/OIL STORAGE TANKS

FORMER FUEL/OIL STORAGE TANK

TRAM WAY

WINCH HOUSE

ANTENNA

FORMER FENCE

FORMER SHED

PAINT STORAGE SHED

FOG SIGNAL BUILDING

LIGHT TOWER

KEEPER'S DWELLING

PRIVY

SEPTIC TANK

APPROX. TOP OF BANK

72' ROHN CRANKUP ANTENNA

FORMER ANTENNA TOWER

40' SQ. HELICOPTER LANDING PAD

FOOT PATH

SITE PLAN

SCALE: 1" = 20'-0"

MWH
FARMINGTON HILLS, MICHIGAN
(248) 522-8333

CONSULTANTS

U. S. COAST GUARD

CIVIL ENGINEERING UNIT CLEVELAND

USCG, CEU CLEVELAND
1240 EAST 9TH STREET
CLEVELAND, OH 44199-2060

ISSUE

MARK	DATE	DESCRIPTION

A/E PROJECT NO: j:uscg\2008\711\EECA\CAD
CAD FILE NAME: C7937C02
DESIGNED BY: SAB
DRAWN BY: SAB
EDITED BY:
CHECKED BY:

SCALE: AS SHOWN PLOT SCALE: 1" = 20'

SHEET TITLE

ENG. EVALUATION/COST ANALYSIS
PASSAGE ISLAND LIGHT STATION
KEWEENAW COUNTY MICHIGAN

SITE LAYOUT MAP

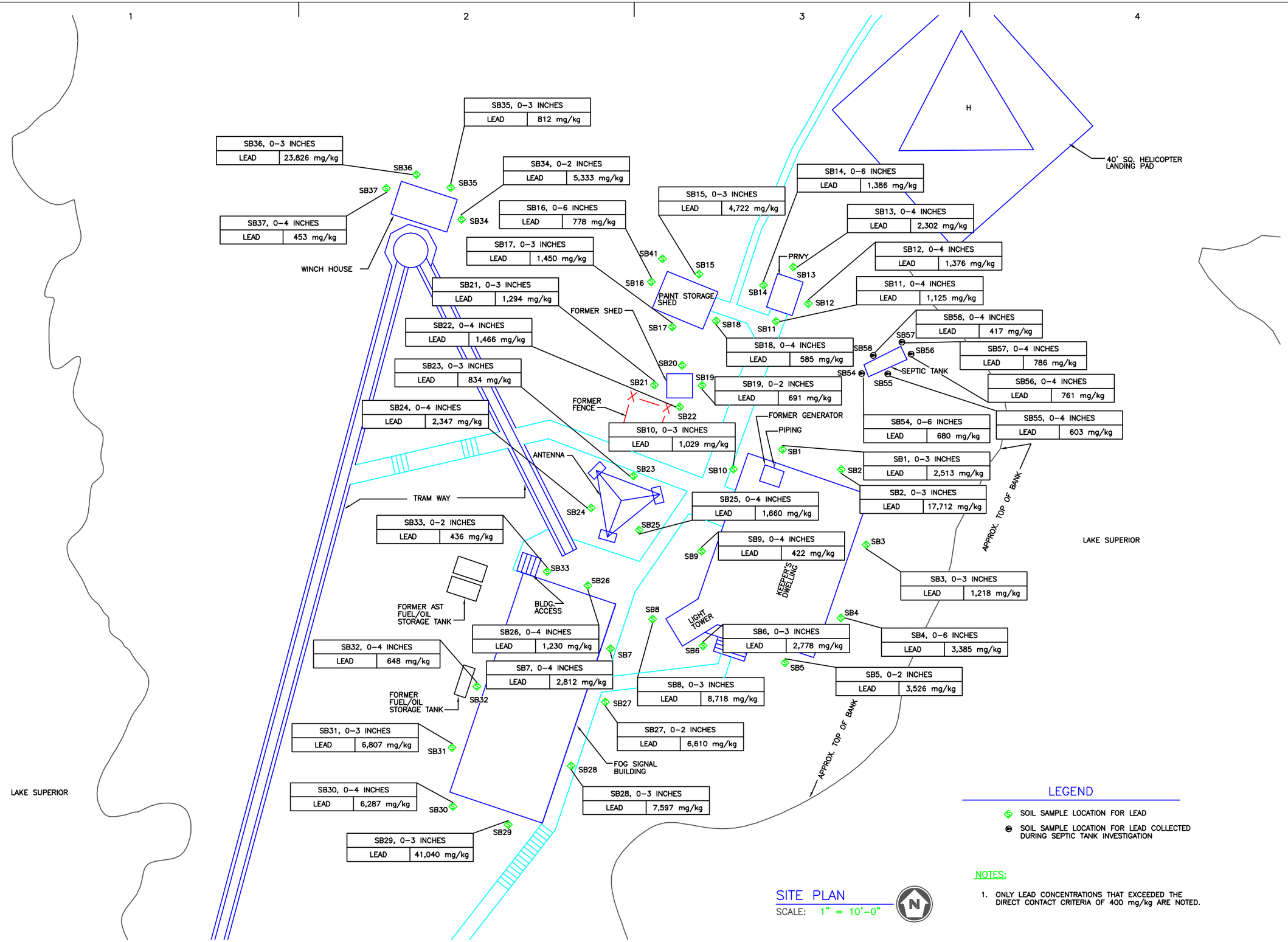
REVIEWED BY:	REVIEWED BY:	REVIEWED BY:
PROJECT ENG.	BRANCH CHIEF	CONTRACTING KO

APPROVING OFFICER DATE

PROJECT NUMBER	DRAWING NUMBER
09-C01052	7937

DISCIPLINE/SHT NO C-02

SHEET 2 OF 4



LEGEND

- SOIL SAMPLE LOCATION FOR LEAD
- SOIL SAMPLE LOCATION FOR LEAD COLLECTED DURING SEPTIC TANK INVESTIGATION

NOTES:

1. ONLY LEAD CONCENTRATIONS THAT EXCEEDED THE DIRECT CONTACT CRITERIA OF 400 mg/kg ARE NOTED.

SITE PLAN

SCALE: 1" = 10'–0"

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CLEVELAND

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ISSUE

MARK	DATE	DESCRIPTION

A/E PROJECT NO: j:uscg\2008\711\EECA\CAD
CAD FILE NAME: C7937C03
DESIGNED BY: SAB
DRAWN BY: SAB
EDITED BY:
CHECKED BY:

SCALE: AS SHOWN PLOT SCALE: 1" = 10'

SHEET TITLE

ENG. EVALUATION/COST ANALYSIS
PASSAGE ISLAND LIGHT STATION
KEWEENAW COUNTY MICHIGAN

SOIL SAMPLE LOCATIONS AND
SOIL ANALYTICAL RESULTS

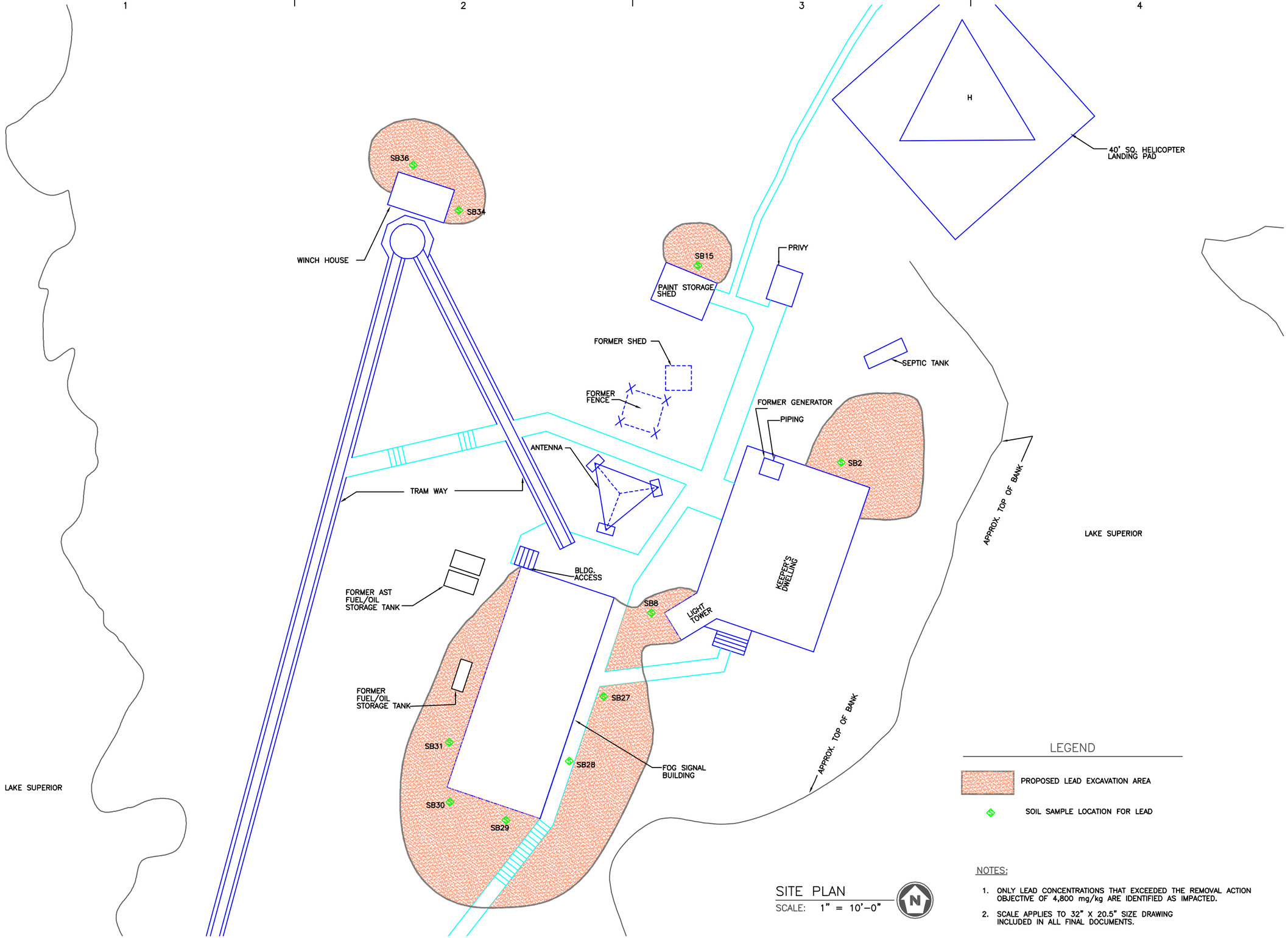
REVIEWED BY:	REVIEWED BY:	REVIEWED BY:
PROJECT ENG.	BRANCH CHIEF	CONTRACTING KO

APPROVING OFFICER DATE

PROJECT NUMBER	DRAWING NUMBER
09–C01052	7937

DISCIPLINE/SHT NO
C–03

SHEET 3 OF 4



SITE PLAN

SCALE: 1" = 10'-0"

LEGEND

PROPOSED LEAD EXCAVATION AREA

SOIL SAMPLE LOCATION FOR LEAD

NOTES:

1. ONLY LEAD CONCENTRATIONS THAT EXCEEDED THE REMOVAL ACTION OBJECTIVE OF 4,800 mg/kg ARE IDENTIFIED AS IMPACTED.
2. SCALE APPLIES TO 32" X 20.5" SIZE DRAWING INCLUDED IN ALL FINAL DOCUMENTS.

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ISSUE

MARK	DATE	DESCRIPTION

A/E PROJECT NO: j:uscg\2008\711\EECA\CAD
CAD FILE NAME: C7937C04
DESIGNED BY: SAB
DRAWN BY: SAB
EDITED BY:
CHECKED BY:

SCALE: AS SHOWN PLOT SCALE: 1" = 10'

SHEET TITLE

ENG. EVALUATION/COST ANALYSIS
PASSAGE ISLAND LIGHT STATION
KEWEENAW COUNTY MICHIGAN

PROPOSED SOIL
EXCAVATION AREA

REVIEWED BY:	REVIEWED BY:	REVIEWED BY:
PROJECT ENG.	BRANCH CHIEF	CONTRACTING KO

APPROVING OFFICER | DATE

PROJECT NUMBER	DRAWING NUMBER
09-C01052	7937

DISCIPLINE/SHT NO: C-04

SHEET 4 OF 4

Appendix **A**

Phase I Environmental Site Assessment

FINAL REPORT

PHASE I ENVIRONMENTAL SITE ASSESSMENT:

PASSAGE ISLAND LIGHT KEWEENAW COUNTY, MICHIGAN

Contract Number: DTCG47-96-D-3EFK09/TOK09-0019

Prepared for
United States Coast Guard
Facilities Design And Construction Center, Atlantic
5505 Robin Hood Road, Suite K
Norfolk, Virginia 23513-2431

November 26, 1997

Woodward-Clyde

Woodward-Clyde Federal Services
200 Orchard Ridge Drive, Suite 101
Gaithersburg, MD 20878

FINAL REPORT

PHASE I ENVIRONMENTAL SITE ASSESSMENT:

PASSAGE ISLAND LIGHT KEWEENAW COUNTY, MICHIGAN

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1.1 PURPOSE AND SCOPE

Woodward-Clyde (W-C) was retained by United States Coast Guard (USCG) Facilities Design and Construction Center, Atlantic (FDCC-LANT) to conduct an Environmental Site Assessment (ESA) of the Passage Island Light is located three and one quarter miles off the northeastern tip of Isle Royale in Keweenaw County, Michigan (Figure 1). Currently, there are 15 structures at the facility: a lighthouse with attached keeper's dwelling, an oil storage shed, a paint locker, a winch house, a pump house, partial sump house, a fog signal building, a steel rail tramway, solar panels, a helicopter pad, an antenna tower, former antenna tower, a boat landing, a catwalk, and a privy (Figure 2).

The purpose of the ESA is to attempt to identify past or existing areas of environmental concern at the facility. W-C conducted a site evaluation and background evaluation of the facility in accordance with Phase I Environmental Site Assessment Process and Environmental Site Assessments: Transaction Screen Process, ASTM E 1527 - 94 and ASTM E 1528 - 93, respectively. W-C attempted to identify "recognized environmental conditions" that may exist on the facility. ASTM Practice E 1527, Standard Practice for Environmental Site Assessments: Phase I Site Assessment Process, defines recognized environmental conditions as "the presence or likely presence of any hazardous substances or petroleum products on a facility under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the facility."

To evaluate this facility, an assessment of the subject facility was performed which consisted of the following tasks: performing a site reconnaissance, conducting interviews, reviewing available files and records, and preparing a report that summarized our findings. Descriptions of these tasks are presented below. This assessment also included a visual inspection for suspect asbestos containing building materials (ACBM), lead-based paint and probability of radon gas. This ESA did not include any sampling of soil, water, air, suspected asbestos, or suspected lead-based paint.

The scope of services conducted for this ESA consisted of the following tasks:

- Site Reconnaissance - A site reconnaissance was conducted by a W-C staff member experienced in hazardous materials surveys. Surface conditions and current activities on the subject facility were observed. An inventory of potential contaminant sources on the facility was completed on the basis of visual observations.
- Records Review and Interviews - During the records review, information was obtained from public agencies (federal, state and local) through a subcontractor Environmental Risk Information & Imaging Services (ERIIS) to assess whether current and/or past facility usage within the study area may have created a potential for contamination of the facility. Our study area for the records review is based on the following:
    - Federal NPL site list: 1 mile
    - Federal CERCLIS list: 0.5 mile
    - Federal RCRA TSD facilities list: 1 mile
    - Federal RCRA generators list: property and adjoining properties

- Federal ERNS list: property
- State list of hazardous waste sites: 1 mile
- State landfill and solid waste site list: 0.5 mile
- State leaking UST sites: 0.5 mile
- State registered UST list: property and adjoining properties

- Evaluation, Analysis and Report - Information collected during the above activities was evaluated and analyzed. This report addresses our findings and presents conclusions and recommendations.

1.2 LIMITATIONS

We have performed our services for this project in accordance with Contract No. DTCG47-96-D-3EFK09/TOK09-0019, and W-C Revised Fee Proposal for IAS (currently ESA) Reports at 31 Lighthouse Facilities, dated July 17, 1997, and with ASTM Practice E 1527 for ESA investigations, except a title search; no guarantees are either expressed or implied. The records search was limited to information available from public sources; this information is changing continually and is frequently incomplete. Unless we have actual knowledge to the contrary, information obtained from interviews or provided to us by the United States Coast Guard has been assumed to be correct and complete. We do not assume any liability for misrepresentation of information or for items not visible, accessible, or present on the facility at the time of the site visit.

There is no investigation which is thorough enough to preclude the presence of materials at the facility which presently, or in the future, may be considered hazardous. Because regulatory evaluation criteria are constantly changing, concentrations of contaminants present and considered to be acceptable may, in the future, become subject to different regulatory standards and require remediation.

Opinions and judgments expressed herein, which are based on our understanding and interpretation of current regulatory standards, should not be construed as legal opinions. This document and the information contained herein have been prepared solely for the use of the United States Coast Guard. Any reliance on this report by third parties shall be at such party's sole risk.

2.1 LOCATION

The subject facility is located three and one quarter miles off the northeastern tip of Isle Royale in Keweenaw County, Michigan.

2.2 SUBJECT SITE DESCRIPTION

Passage Island Light was constructed in 1882. The 44-foot high octagonal tower has an 11-foot by 11-foot square base. The foundation, structure, arches, and sills are built of rubble stone. The tower is attached to the keeper's dwelling at the northwest corner. A front gable roof with overhanging eaves, wood brackets, and other wood detailing covers the keeper's dwelling. Only the trim is painted white. An interior chimney is located on the east facade at the rear of the building.

The rubble stone tower is topped by an octagonal beacon with a domical cast iron roof. A catwalk and polygon shaped cast-iron gallery surrounds the beacon. A fourth order Fresenel Lens has been mounted on a brass clockwork pedestal for almost a century. The passageway to the tower is by a circular cast-iron staircase with no railing. There are two landings and a lantern floor. Massive swinging iron doors can seal off the tower from the keeper's dwelling. The keeper's dwelling is composed of seven rooms and a basement.

Today there are the following structures besides the lighthouse and attached keeper's dwelling on the subject property:

- A wood weatheredboard-sided frame fog signal building with a gable roof topped by a gabled cupola, located southwest of the lighthouse.
- A hip-roofed, concrete-block oil storage shed, located southwest of the helicopter pad.
- A wooden weatheredboard-sided, gabeled-roofed privy is located north of the keeper's dwelling.
- A steel radio tower that is no longer used located 22-feet northwest of the lighthouse.
- The current radio tower antenna is adjacent to the keeper's dwelling.
- A wooden-decked helicopter landing pad, located 80-yards from the lighthouse.
- A steel rail tramway runs 90-feet north from the fog signal building to a steel turntable; the tramway then turns south, southwest and runs down a steep incline 170-feet to the base of a concrete boat landing.
- A concrete foundation, frame pump house and remnants of a concrete foundation sump house, located 90-feet southwest of the fog signal building.
- A winch house northwest of the fog signal building.
- A catwalk that connects the southwestern shoreline to the oil storage shed.
- A large, steel "I" beam-mounted solar panel erected in 1989, located 14-feet south of the keeper's dwelling.

2.3 CURRENT VICINITY CHARACTERISTICS

The subject property is immediately surrounded by Lake Superior. The lighthouse is in a remote area uninhabited by people. The facility is located across the channel from the northeastern tip of Isle Royale, the lighthouse serves as a guide to ships to the Thunder Bay District in Ontario, Canada. A passenger ferry also provides tours to the Passage Island Lighthouse and to Isle Royale National Park from Grand Portage, Minnesota.

2.4 HISTORICAL SIGNIFICANCE

According to the U.S. Department of the Interior, National Park Service, Cultural Resources 1994 Inventory of Historic Light Stations, Passage Island Light is not listed in the National Register of Historic Places.

3.1 GENERAL LIGHTHOUSE HISTORY

Site history information was obtained by conducting interviews, by reviewing historical topographic maps, and by reviewing historical texts.

The first lighthouse, an aid to navigation for coastal traffic, was built on the North American continent in 1715-1716. The Bureau of Lighthouses was established to maintain the lighthouses in 1789. From the 1830s through the 1850s, the Bureau of Lighthouses sent inspectors to investigate and increase efficiencies of light stations throughout the country. The U.S. Lighthouse Board was formed in October 1852 and was given the task of modernizing and setting new standards of operation for the navigational aids. In 1910, the Bureau of Lighthouses replaced the Lighthouse Board. In 1939 the U.S. Coast Guard was assigned the Bureau of Lighthouse duties (Bachelder).

Lighthouse construction varied depending on the importance of the light and foundation conditions. Unattended lights typically were constructed of framed timber or steel skeletal towers and attended lights contained combined towers and dwellings of timber or brick construction. The foundations varied from concrete slab on grade, level or stepped rock, or caissons based on the lighthouse location (i.e., ends of breakwaters, pierheads, and ledges of rocks). Caissons were built on cast-iron plates, sunk by dredging or pneumatic process, and once set at the desired depth, the caissons were filled with concrete.

The illumination of the lighthouses was usually produced by open coal or wood fires; however, other inflammable materials such as pitch were used. In the mid 1700s, lighthouses typically used lamps burning fish or whale oil. The use of whale oil with parabolic reflectors and magnifiers was introduced in the early 1800s. The Fresnel lens which concentrates the source light using prisms was developed by a French Physicist, Augustin Fresnel, in 1822. These lens were in wide spread use by 1841 and are classified according to their order. The order of the lens describes the size and is defined as the measure of the inside radius or focal distance of the lens. The orders are summarized below:

Order	Inside Radius (millimeters)	Inside Radius (inches)
First	920	36.2
Second	700	27.6
Third	500	19.7
Three-and-a-half	325	14.7
Fourth	250	9.8
Fifth	187.5	7.4
Sixth	150	5.9

Whale oil continued to be used with the Fresnel lenses until the mid 1860s when the scarcity of whales caused a change in standards to the use of lard. In the late 1870s, kerosene came into use and became the principal illuminate until electricity was introduced in the early 1900s.

According to Dr. Robert Browning, USCG Historian, mercury was once used in lighthouse operations. Due to the weight of lenses (up to several tons), lenses were historically floated in a pool of mercury. The mercury was used as a lubricant to enable the lenses to be easily turned. The mercury was typically used with Fresnel lenses before World War II. After this time, the use of mercury was discontinued as lights and turning mechanisms were connected to electrical power.

Bells and cannons were used as early fog signals in the 1700s. In the 1850s, trumpet sounds using compressed air were implemented. These sounding devices were replaced with steam whistles which were developed into the sound signals in use today: air diaphone horns powered by compressed air, electricity, or steam.

3.2 PASSAGE ISLAND LIGHT

Passage Island Light was constructed in 1882, in response to increased shipping from lakehead communities, such as Fort William/Port Arthur, Ontario and Duluth, to the lower Great Lakes. The lighthouse was temporarily fitted with a fixed red light with an oil-burning wick lamp. In 1885, a steam fog bell was installed. By 1897, a flashing white light was installed. The light was electrified in 1928, while the keeper's dwelling was still heated by coal until 1958.

Passage Island was fully automated on December 20, 1978. Its lens, a fourth order Fresenel Lens was powered by batteries. Currently, the light uses a solar panel to produce electricity to run the automated light still functioning as an aid to navigation. The lighthouse building is still owned by the USCG. There are no current plans for adaptive use of this building. During the summer, the National Park Service conducts interpretive tours to Passage Island, with the lighthouse being the highlight of the tour. Participants are not allowed in the keeper's dwelling or the lighthouse tower.

3.3 AERIAL PHOTOGRAPHS REVIEW

W-C obtained historical aerial photographs of the facility in order to compare surface features over time. Readily available photographs with coverage of the facility were available for May 1955, October 1978, and August 1986 (Appendix A). The 1955, 1978, and 1986 aerial photograph shows the island much as it appears today. The scale of the photographs makes individual buildings indiscernible.

3.4 HISTORICAL TOPOGRAPHIC MAPS

Two topographic maps were reviewed for 1895 and 1985 that are included in Appendix B. No changes can be determined between the 1895 topographic map and the 1985 topographic map. The island has remained undeveloped except for the lighthouse facility.

4.1 USCG CIVIL ENGINEERING UNIT-CLEVELAND AND USCG GROUP SAULT STE. MARIE

On August 13, 14, and 20, 1997 Mr. Daniel G. Fousek of W-C performed a file review of records at the USCG Civil Engineering Unit (CEU) Cleveland, Ohio. These records included board of survey files, real property files, and historical drawings. Ms. Heidi Fredericks of W-C performed a file review on September 12, 1997, of ATON records at USCG Group Sault Ste. Marie, Michigan. These records included engineering files, inspection reports, real property files and historical restoration plans.

Mr. Fousek conducted a interview on August 14, 1997, with Mr. James Woodward, Environmental Protection Specialist of the CEU-Cleveland. Mr. Woodward stated that the site has a septic tank and that a oil sheen was observed in the tank. Mr. Woodward also stated, that the site has a waste oil pit. According to the CEU file review, the waste oil pit was to be cleaned out in 1995. No other information was found during the file review regarding the waste oil pit. W-C tried to contact Mr. Woodward regarding the cleanup of the waste oil pit but was unsuccessful.

In addition, four aboveground storage tanks (ASTs) were identified on a 1966 plot plan. Two 4,000-gallon steel ASTs containing fuel oil were located near the fog signal building, fuel oil tank of unknown size was located near the fog signal building, and an 1,800-gallon fuel oil AST was located near the boat landing.

A letter dated May 9, 1995, to Admiral R.K. Peschel of the CEU-Cleveland from the National Park Service stated that the onsite privy was cleaned out, repaired and repainted. The letter further stated that water is collecting in the basement of the lighthouse and that it is an ongoing problem. A sump pump was installed to take care of the water infiltration. Repairs that were made to some of the structures at the subject facility consisted of interior walls being gutted, and cement being used to patch the exterior of onsite buildings. The letter also stated that an underground pit full of waste oil and water was left on-site along with three large fuel ASTs.

According to a biennial lighthouse inspection, on August 2, 1995, Fuel Tank Maintenance, Inc. was contracted to remove the contents of four ASTs, one underground septic tank, and one fiberglass chlorination holding tank onsite. A letter, dated September 7, 1995, contracted Fuel Tank Maintenance, Inc., to remove the tanks from the premises.

According to a site survey report of Passage Island Light dated September 21, 1989, three 2,000 -gallon fuel oil ASTs were installed in 1983. These tanks were installed to replace a 1977 bladder system that consisted of four 750-gallon poly-vinyl tanks stored on racks in the basement of the fog signal building. During the site visit W-C could not access the basement of the fog signal building to identify any staining that might have occurred due to this system.

An environmental inspection was performed on July 11, 1996, by Mr. James Woodward CEU-Cleveland. The inspection report stated that the three 2,000-gallon fuel oil ASTs were still

located adjacent to the fog signal building and that the ASTs had been removed as of August 27, 1996.

Based on review of documents at CEU-Cleveland, information was discovered that would indicate the presence, or likely presence of waste oil, and petroleum due to possible spills, and/or leaks of ASTs that were once located onsite.

4.2 PHYSICAL SETTING

According to the U.S. Geological Survey, the subject property is located approximately north 48° 14' 01.4" and west 088° 21' 09.3" at an elevation of approximately 601 feet above mean lake level. The property is located on exposed pre-Pleistocene bedrock which is devoid of glacial or post glacial cover.

4.3 SENSITIVE RECEPTORS, ENDANGERED AND THREATENED SPECIES

According to the Board of Survey files, there are no sensitive receptors such as wellhead protection areas or sole source aquifers. According to a letter dated December 1, 1995, from Charles Wooley of the U. S. Department of the Interior (DOI), no Federally-listed threatened, endangered, or proposed species were identified within the subject area. In addition, the letter stated that according to National Wetlands Inventory Maps, wetlands do not appear to be present on Passage Island. The letter also stated that the USCG should contact the Michigan Department of Environmental Quality (MDEQ) prior to conducting any proposed projects to ensure that any necessary state permits are obtained.

4.4 STANDARD FEDERAL AND STATE ENVIRONMENTAL DATABASE RESOURCES

The purpose of the database resources review is to assess the potential presence of hazardous substance contamination on the facility as a result of activities conducted on properties within the study area defined in the Purpose and Scope section of this report. Many of these state and federal database listings were searched by ERIIS, an independent information service (Appendix C).

4.5 FINDINGS FROM DATABASE REVIEW

According to the review, there are no NPL sites, CERCLIS sites, RCRA treatment, storage or disposal (TSD) sites or corrective action sites, sites listed for the civil enforcement dockets, spill sites, open dump sites, Michigan potential hazardous waste sites, active recovery sites, leaking underground storage tanks, solid waste sites, or spill sites located within the search area for the database described in the ERIIS report in Appendix C.

4.6 LOCAL RECORDS SEARCH

According to Jim Callahan, the National Park Service does not have any records of petroleum product storage on Passage Island. According to Mr. Oelfke of the National Park Service, there are no underground storage tanks (USTs) on Passage Island however, there were ASTs at the subject property that were removed in 1996 (Appendix D). In addition, Mr. Oelfke informed W-C that there was a ship wreck off the coast of Passage Island in 1996. The wreck spilled approximately 300 gallons of diesel fuel in Lake Superior that reached the shore line of Passage Island. He said most of the diesel fuel has evaporated, however, debris from the wreck is still visible and it will be cleaned up by the Park Service.

According to Ms. Alexander, of the Michigan Department of Environmental Quality, the agency does not have any records of USTs or any records of environmental violations (Appendix D).

5.1 SITE RECONNAISSANCE

On September 8, 1997, Ms. Heidi Fredericks of W-C conducted a site reconnaissance of Passage Island Light. Appendix E contains the ESA Checklist used for the site reconnaissance. The site reconnaissance was performed to identify current site uses and potential sources of hazardous substances on the subject property. During the visit, Ms. Fredericks was accompanied by Mr. Jim Shogren USCG Group Sault Ste. Marie and Mr. Don McMillin of USCG Group Portage. The results of the interviews and site reconnaissance are summarized below. Ms. Fredericks also interviewed Mr. McMillin and Mr. Shogren regarding past and present usage of the subject property.

Fifteen structures were observed at the facility: a lighthouse with attached keeper's dwelling, an oil storage shed, a paint locker, a winch house, a pump house, partial sump house, a fog signal building, a steel rail tramway, solar panels, a helicopter pad, an antenna tower, former antenna tower, a boat landing, a catwalk, and a privy. A site plan depicting the subject property is presented on Figure 2.

During the site reconnaissance the following were noted:

- Keeper's dwelling basement had six to eight inches of water
- Nine by nine-inch brown floor tile in the keeper's dwelling
- Two by four-inch fiberboard ceiling tile in the keeper's dwelling
- Drywall in the keeper's dwelling was peeling due to assumed water damage
- Diesel odors in the side entrance of the keeper's dwelling and yellow piping suspected to be former fuel supply/return lines
- Two yellow handled covers located near the keeper's dwelling and suspected septic tank ports
- Construction debris, electrical wires, and pipe leading to the basement in the rear of the keeper's dwelling
- Electric cable leading to lighthouse
- Chipped paint and stained concrete floor in the fog signal building
- Oil stained wooden floor in the fog signal building
- Gray painted galvanized steel walls that were chipping in the fog signal building
- Slight oil staining on the concrete floor of the winch house
- A wooden helicopter pad
- Three concrete supports for the former antenna tower located north of the helicopter pad
- A concrete AST saddle located near the boat landing

5.2 INTERVIEWS

On August 18, 1997, Mr. Don McMillin was interviewed regarding present and past waste generation and disposal practices on the subject property. A copy of the ESA questionnaire completed by Mr. McMillin is included in Appendix G.

Briefings were given to the USCG escorts prior to conducting the site reconnaissance to inform them of the purpose and scope of the site reconnaissance. After the site reconnaissance was completed, the escorts were briefed on findings of the reconnaissance. Ms. Fredericks also briefed Commander Rooth of the USCG Sault St. Marie Group of her findings on September 12, 1997. Appendix H contains topics covered during the In/Out-Briefings.

5.3 POTENTIAL SOURCES OF CONTAMINATION

Potential sources of historical contamination consists of coal, and other flammable materials such as oil, which were used as the principal illuminant. As mentioned previously, these materials were abandoned in 1928, as electricity was introduced and the lighthouse was converted to electrical power. The keeper's dwelling was heated with coal until 1958. In addition, suspected ACBM and LBP in existing site structures are potential sources of contamination, also contents the fuel oil that was spilled during the shipwreck along the shore.

Based on visual observations, interviews, and records search, the potential for underground storage tanks at this facility is low.

Based on visual observations and the age of the facility ACBM may be present in onsite structures. Possible ACBM include, but are not limited, to drywall, four types of nine by nine-inch floor tiles, floor tile mastic, and asphalt roofing shingles.

Based on the age of the subject facility, there is a high probability that lead-based paints were used inside and outside of onsite structures. Significant amounts of peeling and chipped paint were observed during the site reconnaissance. There is also a possibility that soils immediately surrounding the structures may contain elevated concentrations of lead from former use of lead-based paints.

According to the ERIIS report, the facility is in EPA Radon Zone Level 2. EPA receives radon levels for specific geographic areas from local authorities. EPA collects, tabulates, and distributes the reported values to various entities that include ERIIS. Zone 2 has a predicted average indoor screening level greater than 2 pCi/L and less than 4 pCi/L. EPA recommends that homes with levels of 4 pCi/L or higher be modified to reduce exposure to acceptable levels. Since the facility is not used as a residence, W-C believes that testing is not needed to evaluate the radon level.

The discussions and conclusions presented below are based on the site reconnaissance and records review conducted for this facility.

- The facility consists of approximately 6.3 acres of land on an uninhabited island. There are 15 structures at the facility: a lighthouse with attached keeper's dwelling, an oil storage shed, a paint locker, a winch house, a pump house, partial sump house, a fog signal building, a steel rail tramway, solar panels, a helicopter pad, an antenna tower, former antenna tower, a boat landing, a catwalk, and a privy.

- Historical land use information indicates that the site was developed as an aid to navigation in 1882. The light tower was originally illuminated with oil. The site was powered by electricity in 1928. Currently, the site uses solar power to maintain lighthouse operations.

- Based on the age of the facility, LBP is suspected to be present in the light tower, and possibly in soil surrounding the existing structures at the facility. This material, if present, could pose a hazard if not managed properly.

- During the site reconnaissance, suspect ACBM was identified in onsite structures.

- Possible spills of petroleum products to surficial soils may have occurred from on-site ASTs.

- Further investigation of the location of the reported waste oil pit is needed.
- Identification of the oil sheen that is in the septic tank may be warranted.

We have performed an ESA of Passage Island Light, the facility, in conformance with the scope and limitations of ASTM Practice E 1527, except for a title search. This assessment has revealed no evidence of recognized environmental conditions except as noted in the following Section 11, Environmental Site Assessment Certification Statement.

SECTIONELEVEN Environmental Site Assessment Certification Statement

I certify that I have performed a site visit and physical investigation of the facility known as Passage Island Light. The findings in this report are based upon my site visit, physical inspection of the site, and analysis of available environmental and facility records. This Environmental Assessment was performed in conformance to the scope and limitations of ASTM Practice E-1527, where applicable. Information contained in this statement is required under the authority of regulations promulgated under section 120(h) of the Comprehensive Environmental Response, Compensation, and Liability Act.

This assessment has revealed no evidence of recognized hazardous wastes, materials or substances regulated by the Toxic Substance Control Act (PL 94-469) (including friable asbestos, lead paint, radon, and PCBs) and the Resource Conservation and Recovery Act (PL 94-580) in connection with the facility except for the following:

1. No sampling and analysis of any materials have been performed during this ESA. All comments and recommendations have been based on visual observations, limited interviews and record searches.
2. Based on the age of the facility and observations, lead-based paint has likely been applied to the interior and exterior of existing, and demolished structures. Therefore, we recommend sampling to identify lead-based paint be performed prior to conducting any modifications to the existing structure that would cause paint fragments to be released to the environment. In addition, caution should be exercised during excavation of soil adjacent to structures where lead-based paints may have been used.
3. Asbestos containing building materials (ACBM) are assumed to be present in existing structures and as well as roofing materials. Caution should be exercised when disturbing these materials.
4. According to the ERIIS report, the facility is in EPA Radon Zone Level 2. Zone Level 2 has a predicted average indoor screening level greater than 2 pCi/L and less the 4 pCi/L. Since the subject property is not occupied by residents it is not recommended that sampling be conducted.
5. Additional information is needed to determine if possible contamination occurred to soil in the vicinity of the waste oil pit, to determine the location, contents, and condition of the septic tank system, and where the miscellaneous pipes that lead from the keeper's dwelling end.

Heidi Fredericks

Heidi Fredericks / November 25, 1997

Senior Staff Scientist

Woodward-Clyde

Batchelder, Peter Dow. The Lighthouse and Lightships of Casco Bay. First Provincial Press Edition: 1995

Environmental Risk Information & Imaging Services Report Number 186983A. August 22, 1997.

Farrand, W.R. Quaternary Geology of Michigan. State of Michigan Department of Natural Resources Geological Survey: 1982.

Holden, Thom. Above and Below Lighthouses and Shipwrecks of Isle Royale. Isle Royale Natural History Association: 1985.

Hyde, Charles K. Northern Lights Lighthouses of The Upper Great Lakes. Two Peninsula Press: 1986.

Penrose, Laurie. Michigan Lighthouses: A Traveler's Guide to 116 Michigan Lighthouses. Friede Publications: 1992

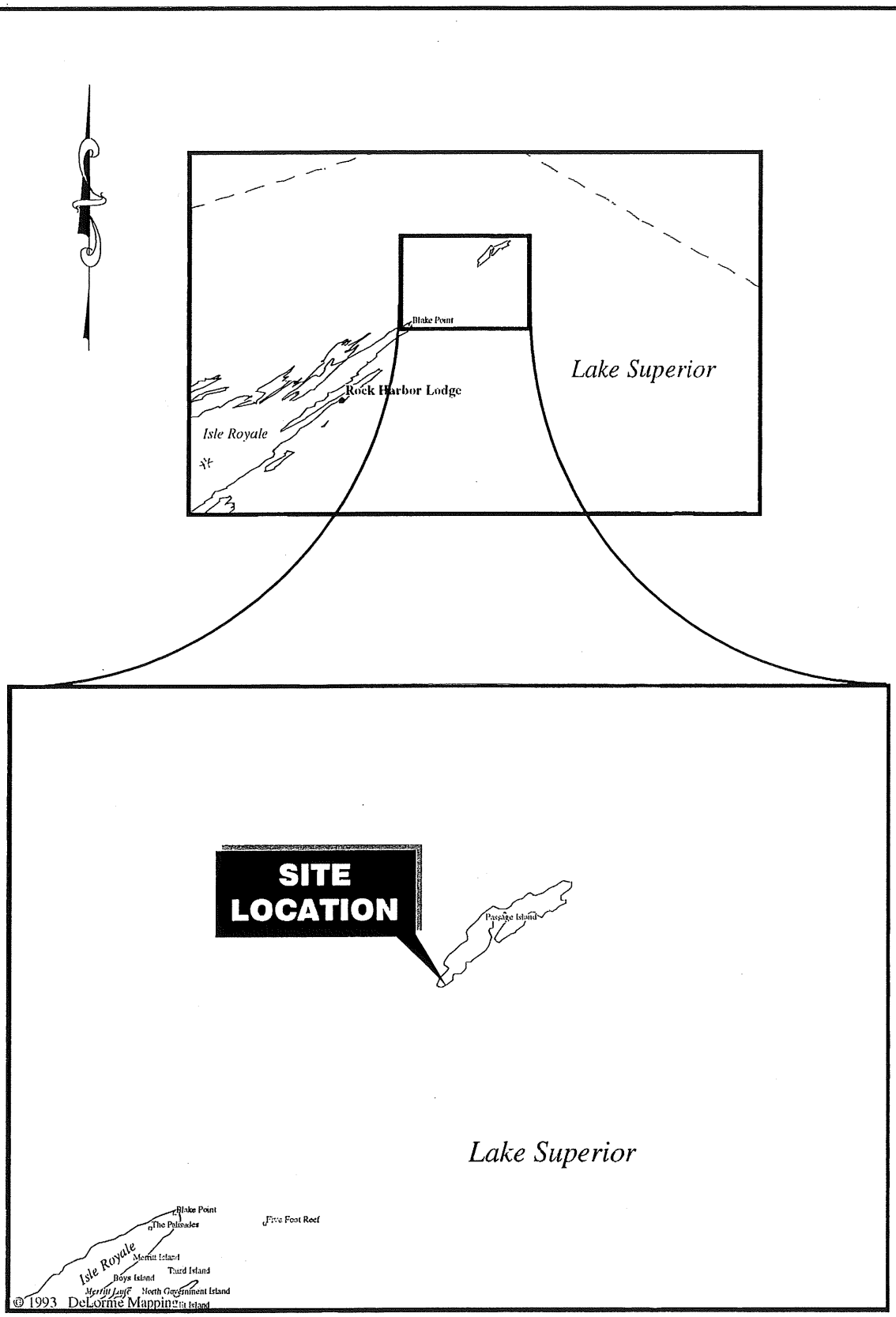
U.S. Coast Guard, Aid to Navigation Team, Group Sault Ste. Marie. Woodward-Clyde file review on September 12, 1997.

U.S. Coast Guard Civil Engineering Unit (CEU) Cleveland, Ohio. Woodward-Clyde file review on August 13, 14, and 20, 1997.

U.S. Coast Guard Light List Vol. 7 Great Lakes. U.S. Government Printing Office: 1996

U.S. Geological Survey. 1895 and 1985, Topographic Map Quadrangle for Passage Island, MI.

Figures



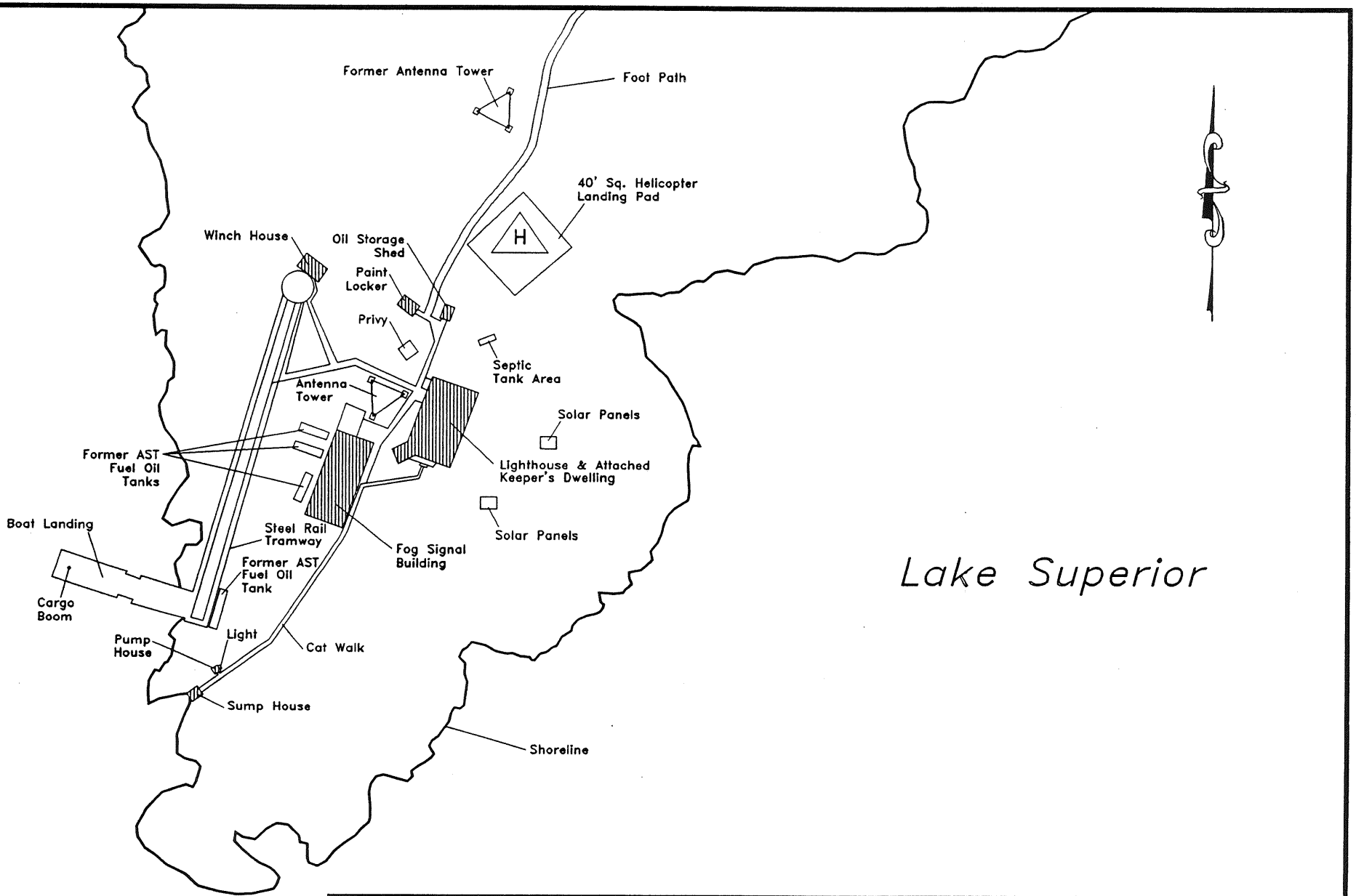
CLIENT	USCG			
PROJ	Environmental Site Assessment			
REVISION NO		DES BY		
SCALE	NOT TO SCALE	DR BY	DML	11-20-97
FILE	DRAWINGS\R96819\PASS\LOC-PASSPPT	CHK BY	GH	11-20-97

TITLE SITE LOCATION MAP
PASSAGE ISLAND, KEWEENAW COUNTY, MICHIGAN

Woodward-Clyde

PROJ NO R96819

FIGURE 1



CLIENT USCG				
PROJ Environmental Site Assessment				
REVISION NO 1 11-21-97	DES BY			
SCALE NOT TO SCALE	DR BY	DML	11-20-97	
FILE DRAWINGS\R96819\PASS\PASS.DWG	CHK BY	CC	11-21-97	

TITLE SITE PLAN
PASSAGE ISLAND, KEWEENAW COUNTY, MI.

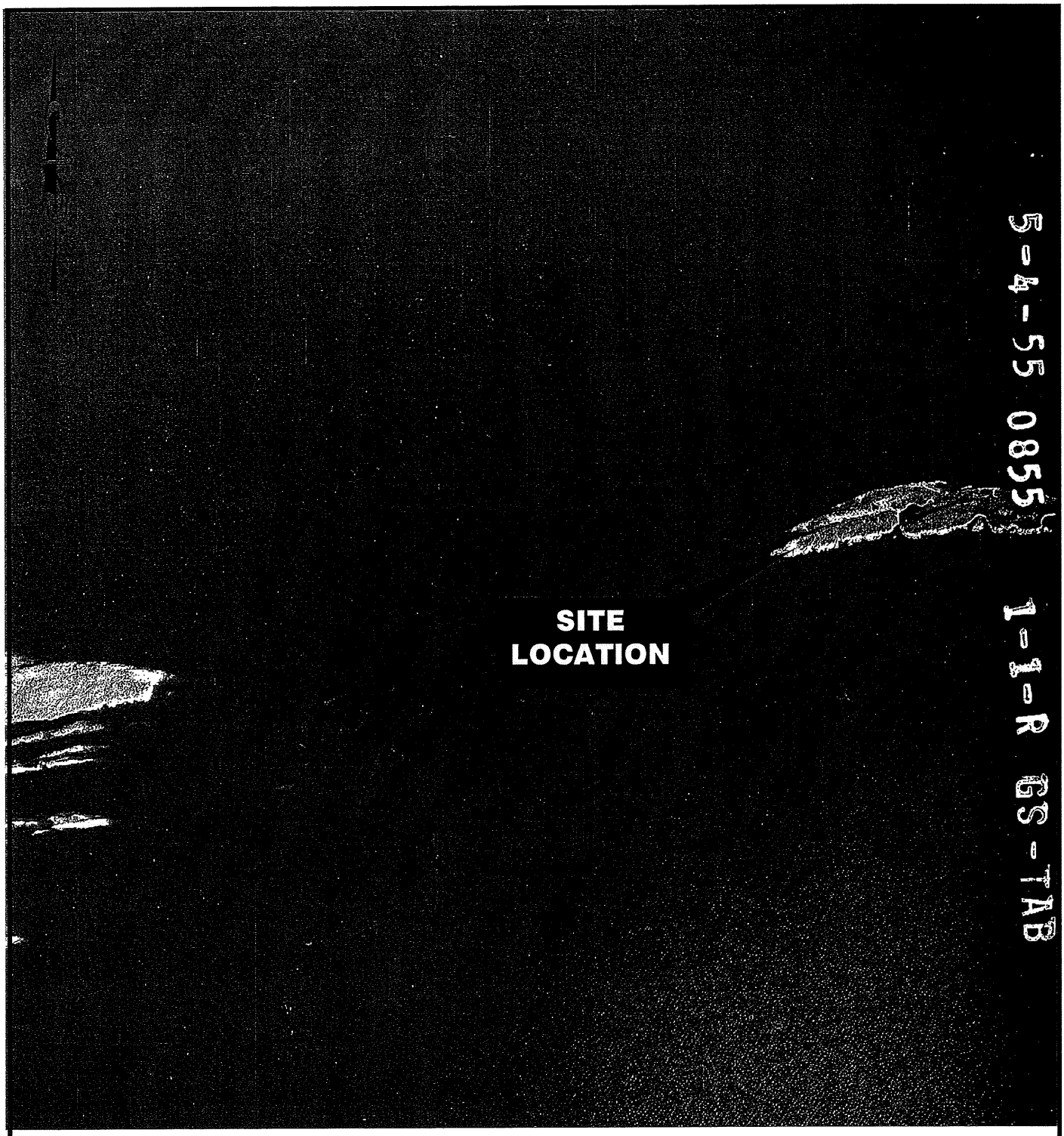
Woodward-Clyde

PROJ NO R96819

FIGURE 2

Appendix A

Aerial Photographs



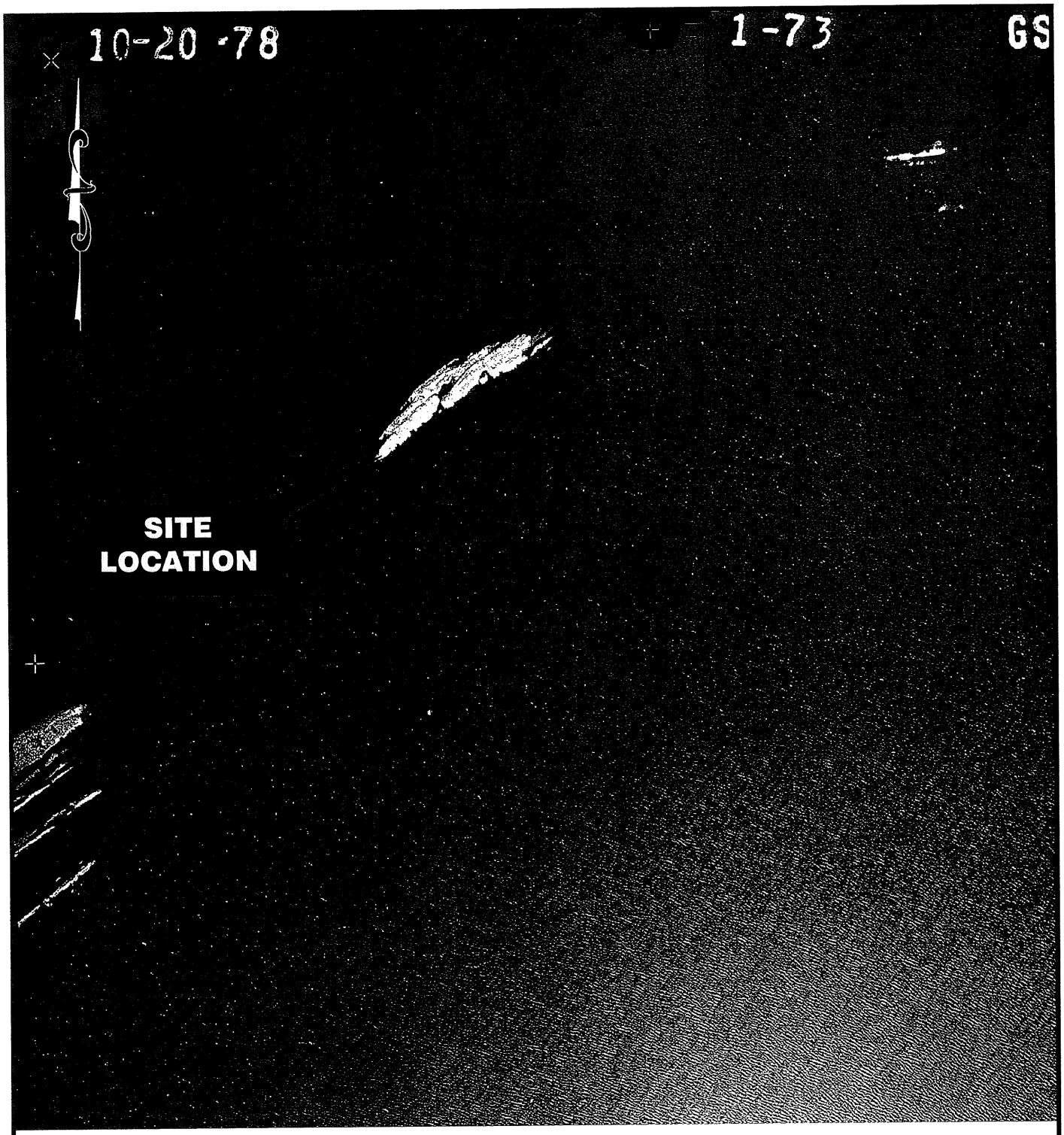
CLIENT	USCG			
PROJ	Environmental Site Assessment			
REVISION NO		DES BY		
SCALE	NOT TO SCALE	DR BY	DML	11-21-97
FILE	DRAWINGS\R96819\PASS\AERIAL55.PPT	CHK BY	CC	11-21-97

TITLE **AERIAL PHOTOGRAPH, MAY 4, 1955**
PASSAGE ISLAND LIGHT, KEWEENAW COUNTY, MI.

Woodward-Clyde

PROJ NO R96819

FIGURE **A-1**



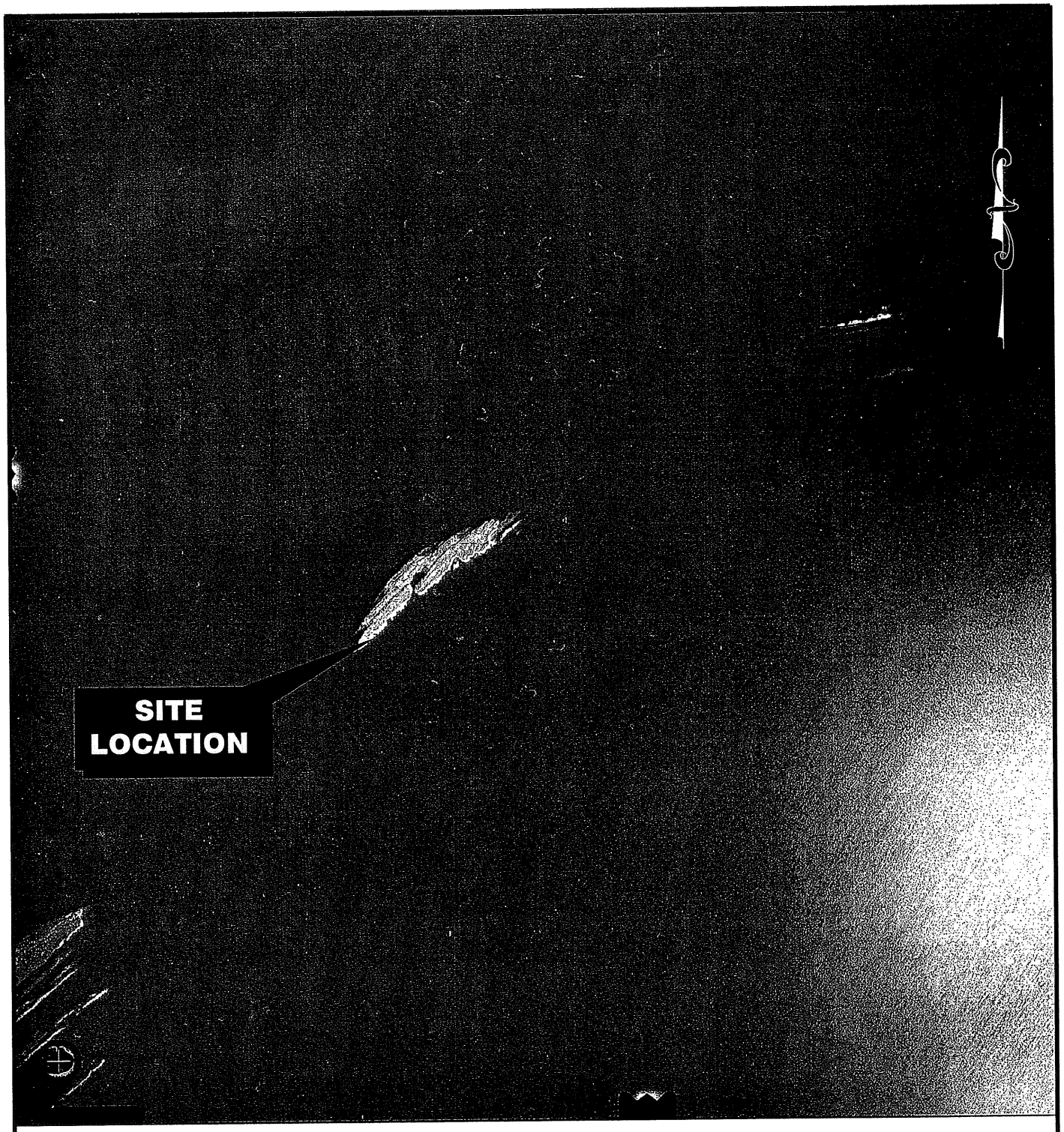
CLIENT	USCG			
PROJ	Environmental Site Assessment			
REVISION NO		DES BY		
SCALE	NOT TO SCALE	DR BY	DML	11-21-97
FILE	DRAWINGS\R96819\PASS\AERIAL78.PPT	CHK BY	CC	11-21-97

TITLE **AERIAL PHOTOGRAPH, OCTOBER 20, 1978**
PASSAGE ISLAND LIGHT, KEWEENAW COUNTY, MI.

Woodward-Clyde

PROJ NO R96819

FIGURE **A-2**



CLIENT	USCG			
PROJ	Environmental Site Assessment			
REVISION NO		DES BY		
SCALE	NOT TO SCALE	DR BY	DML	11-21-97
FILE	DRAWINGS\R96819\PASS\AERIAL86.PPT	CHK BY	CC	11-21-97

TITLE **AERIAL PHOTOGRAPH, AUGUST 12, 1986**
PASSAGE ISLAND LIGHT, KEWEENAW COUNTY, MI.

Woodward-Clyde

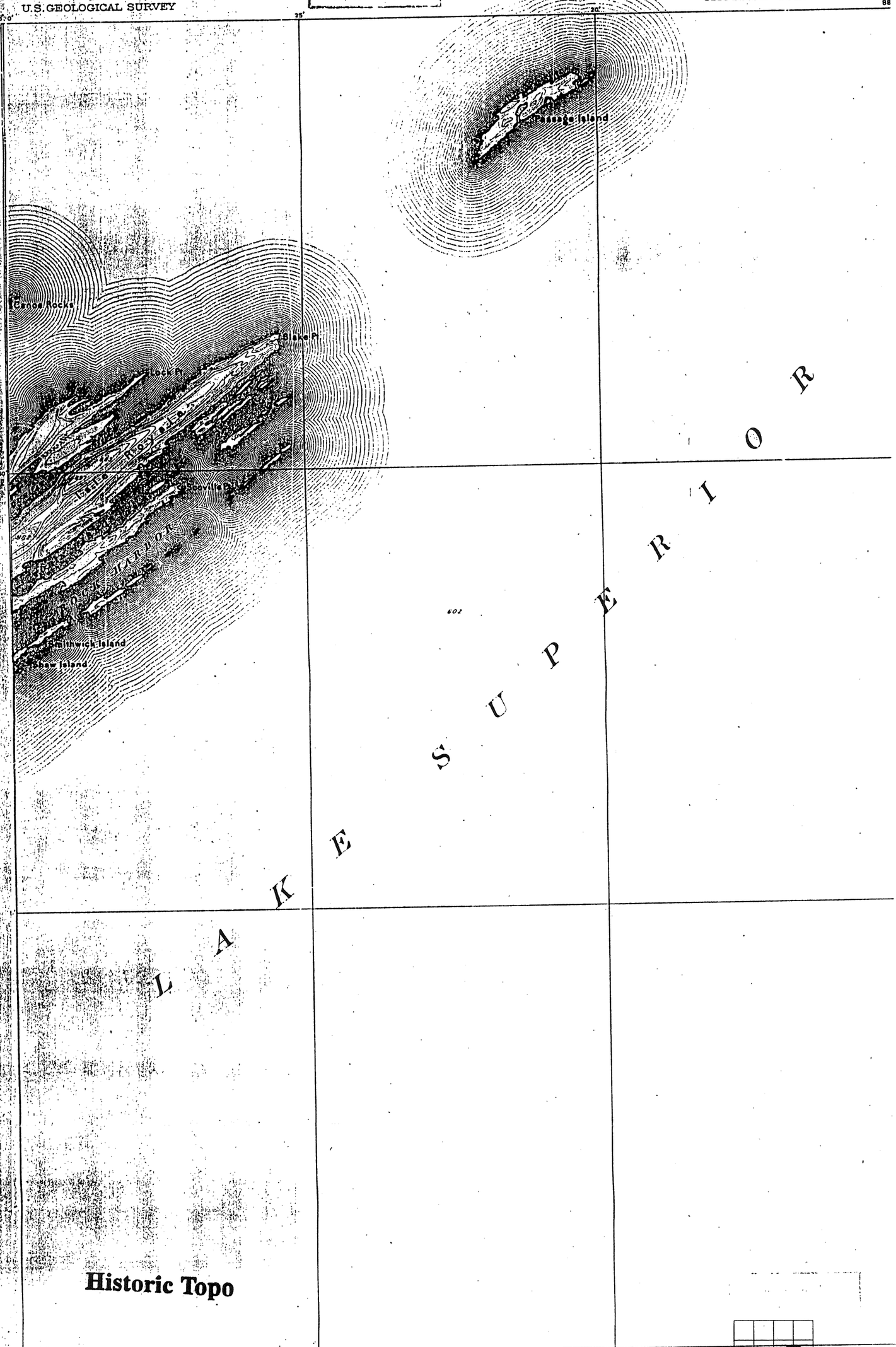
PROJ NO R96819

FIGURE **A-3**

Appendix B
Historical Topographic Maps

DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

MICHIGAN
(KEWEENAW CO)
PASSAGE ISLAND SHEET



Henry Gannett, Chief Topographer.

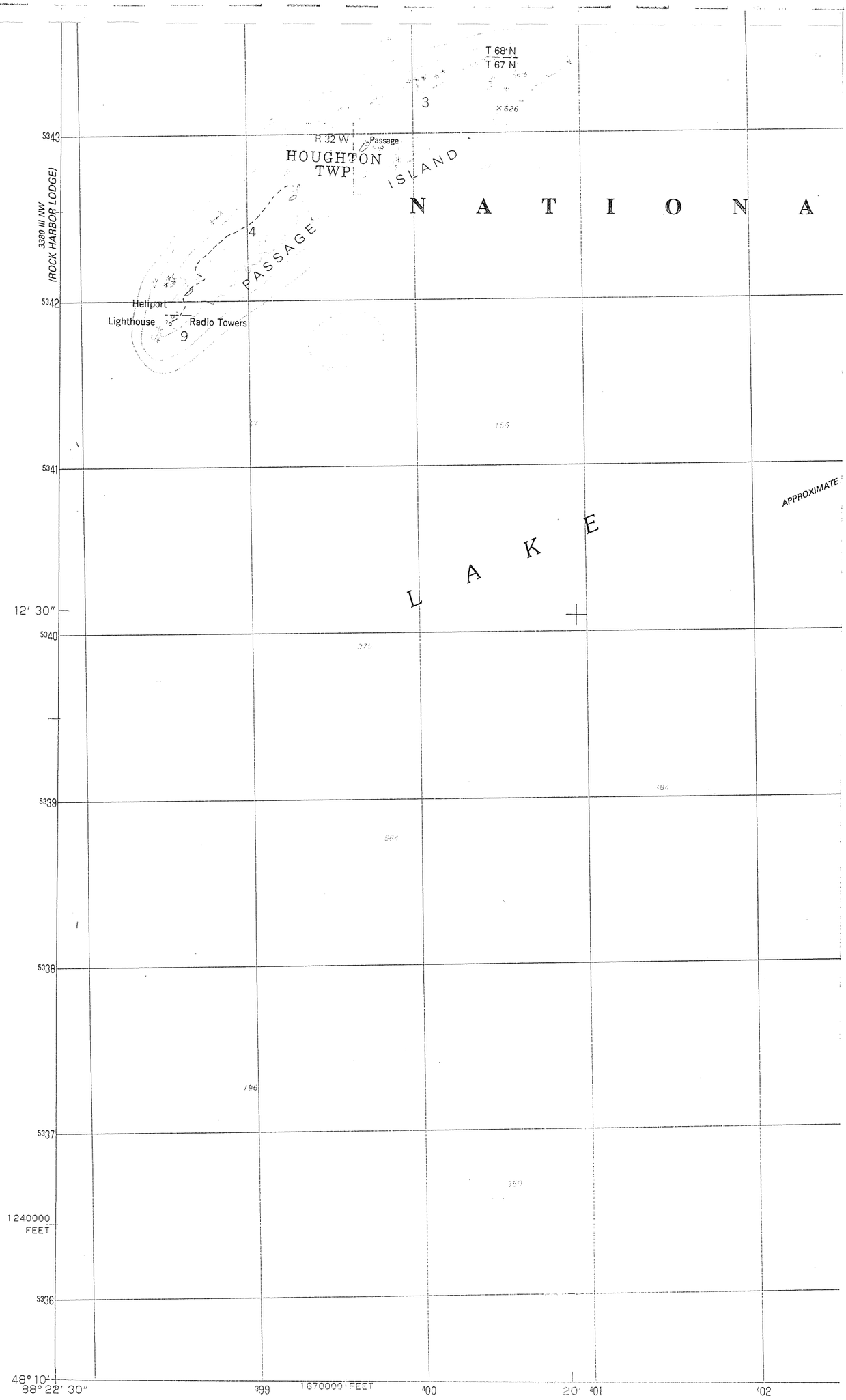
Historic Topo

Environmental Risk Information & Imaging Services
505 HUNTMAR PARK DRIVE, SUITE 200 • HERNDON, VA 20170 • 703•834•0600 • 1•800•989•0403 • FAX: 703•834•0606
ERIIS

MICH.
PASSAGE ISLA

THE REPRODUCTION OF THE SANBORN FIRE INSURANCE MAPS HAS BEEN MADE BY PERMISSION OF EDR SANBORN, INC., THE COPYRIGHT HOLDER, IN ACCORDANCE WITH THE TERMS [illegible] INFORMATION & IMAGING SERVICES AND EDR SANBORN, INC. DATED AUGUST 1, 1991. EDR SANBORN, INC. MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND EXPRESS OR IMPLIED WITH RESPECT TO THE SANBORN MAPS, INCLUDING WITHOUT LIMITATION WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. SANBORN AND SANBORN MAPS ARE TRADEMARKS OF EDR SANBORN, INC. THE MANUFACTURERS' MUTUAL MAPS ARE THE PROPERTY OF THE EDISON INSTITUTE, DEARBORN, MIC[illegible] FURTHER REPRODUCED WITHOUT PERMISSION.

1895



(ROCK HARBOR LODGE)
3380 III NW

Mapped, edited, and published by the Geological Survey
Control by USGS and NOS/NOAA
Topography by photogrammetric methods from aerial photographs taken 1955. Revised from aerial photographs taken 1981
Field checked 1984. Map edited 1985
Selected hydrographic data compiled from NOS chart 14968 (1979)
This information is not intended for navigational purposes
Projection and 10,000-foot grid ticks: Michigan coordinate system, north zone (Lambert conformal conic)
1000-meter Universal Transverse Mercator grid, zone 16
1927 North American Datum
To place on the predicted North American Datum 1983, move the projection lines 2 meters north and 4 meters east as shown by dashed corner ticks
Isle Royale National Park extends 4½ miles from the shoreline of Isle Royale and the immediately surrounding islands
There may be private inholdings within the boundaries of the National or State reservations shown on this map

MN
GN
2°
36 MILS
0°59′
17 MILS

UTM GRID AND 1985 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:

1 ½ 0
1000 0 1000 2000 3000
1 .5 0

CONTOUR INTER
NATIONAL GEODETIC VER
DEPTH CURVES AND SOUNDINGS IN FEE

THIS MAP COMPLIES WITH NATIO
FOR SALE BY U. S. GEOLOGICAL S
AND GEOLOGICAL
MICHIGAN DEPARTMENT OF NATURAL R
A FOLDER DESCRIBING TOPOGRAPHIC MAPS

Appendix C
ERIIS Report

PERTAINING TO:
PASSAGE ISLAND
MI 27055

REPORT NUMBER:
186983A

PREPARED ON:
08/22/1997

ON BEHALF OF:
Woodward-Clyde
200 Orchard Ridge Drive
Suite 101
Gaithersburg, MD 20878

If you have any questions or comments regarding this report, please contact ERIIS Customer Service at 1-800-989-0403, locally at 703-834-0600, or fax us at 703-834-0606. Thank you for your order.

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ERIIS REPORT OVERVIEW

The following features are available for an ERIIS report:

* Database Report
    * Statistical Profile
    * Database Records
* Related Maps
    * Digital Custom Plotted Map
    * Sanborn Fire Insurance Map(s)
    * Topographical Map(s)

Statistical Profile

The statistical profile is an at-a-glance numeric summary of the databases searched for your ERIIS Report.

Database Records

The detailed federal and state database information indicates potential and actual environmental threats within the study radius. These records are sorted by their distance from the study site.

Digital Custom Map

The digital custom map is cross referenced with the database records. The cross-in-circle in the center of the map represents the study site. The red circles represent distances from the study site. The plottable sites in the report are distinguished on the map by symbols of different shape and color.

Historic Fire Insurance Maps

The ERIIS collection of historical Sanborn Fire Insurance Maps covers 14,000 cities and towns. These maps may indicate prior use of the study site. If no maps are available for the study site, a notice to that effect is included. This notice should serve as evidence of due diligence.

Topographical Map

USGS topographical maps show natural and man-made features as well as the shape and elevation of the terrain. The 7.5 minute quad maps are produced at a scale of 1:24,000, or one inch represents 2,000 feet.

If you have any questions about this report,
please contact ERIIS Customer Service at 1-800-989-0403

ERIIS ASTM STATISTICAL PROFILE
State: MI

ERIIS Report #186983A Aug 22, 1997

Site: PASSAGE ISLAND
, MI 27055

Latitude: 48.223352
Longitude: -88.366849

Database	Radius (Mi)	Target Area**	Property-1/4	1/4-1/2	1/2-1	>1	TOTAL
NPL	1		0	0	0		0
RCRIS_CA	1		0	0	0		0
RCRIS_TS	.5		0	0			0
CERCLIS	.5		0	0			0
NFRAP	.5		0	0			0
RCRIS_LG	.25		0				0
RCRIS_SG	.25		0				0
ERNS	.05		0				0
HWS	1		0	0	0		0
LRST	.5		0	0			0
SWF	.5		0	0			0
RST	.25		0				0
			0	0	0	0	0

TOPO QUAD: Passage Island (digital)

Radon Zone Level: 2

Zone 2 has a predicted average indoor screening level > = 2 pCi/L and < = 4 pCi/L

A Radon Zone should not be used to determine if individual homes need to be tested for radon.
The EPA's Office of Radiation and Indoor Air (202/233-9320) recommends that all homes be tested for radon, regardless of geographic location or the zone designation in which the property is located.

**A target area is defined as a .02 mile buffer around the site's latitude and longitude.

A blank radius count indicates that the database was not searched by this radius per client instructions.

NR in a radius count indicates that the database cannot be reported by this search criteria due to insufficient and/or inaccurate addresses reported by a federal/state agency.

NPL
Date of Data: 06/06/1997
Release Date: 06/13/1997
)ate on System: 06/27/1997
IS Environmental Protection Agency
)ffice of Solid Waste and Emergency Response
/03/603-8881

National Priorities List

The NPL Report is an EPA listing of the nation's worst uncontrolled or abandoned hazardous waste sites. NPL sites are targeted for possible long-term remedial action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980. In addition, the NPL Report includes information concerning cleanup agreements between EPA and Potentially Responsible Parties (commonly called Records of Decision, or RODS), any liens filed against contaminated properties, as well as the past and current EPA budget expenditures tracked within the Superfund Consolidated Accomplishments Plan (SCAP).

CRIS_CA
)ate of Data: 04/04/1997
elease Date: 06/02/1997
Date on System: 08/08/1997
US Environmental Protection Agency
Office of Solid Waste and Emergency Response
00/424-9346

Resource Conservation and Recovery Information System - TSD's Subject to Corrective Action

The RCRIS_CA Report contains information pertaining to hazardous waste treatment, storage , and disposal Facilities (RCRA TSD's) which have conducted, or are currently conducting, a corrective action(s) as regulated under the Resource Conservation and Recovery Act. The following information is included within the RCRIS_CA Report:
- Information pertaining to the status of facilities tracked by the RCRA Administrative Action Tracking System (RAATS)
- Inspections & evaluations conducted by federal and state agencies
- All reported facility violations, the environmental statute(s) violated, and any proposed & actual penalties
- Information pertaining to corrective actions undertaken by the facility or EPA
- A complete listing of EPA regulated hazardous wastes which are generated or stored on-site

CRIS_TS
Date of Data: 04/04/1997
Release Date: 06/02/1997
Date on System: 08/15/1997
IS Environmental Protection Agency
)ffice of Solid Waste and Emergency Response
00/424-9346

Resource Conservation and Recovery Information System - Non-Corrective Action TSD Facilities

The RCRIS_TS Report contains information pertaining to facilities which either treat, store, or dispose of EPA regulated hazardous waste. The following information is also included in the RCRIS_TS Report:

- Information pertaining to the status of facilities tracked by the RCRA Administrative Action Tracking System (RAATS)
- Inspections & evaluations conducted by federal and state agencies
- All reported facility violations, the environmental statute(s) violated, and any proposed & actual penalties
- A complete listing of EPA regulated hazardous wastes which are generated or stored on-site

ERCLIS
)ate of Data: 06/06/1997
Release Date: 06/13/1997
Date on System: 06/27/1997
US Environmental Protection Agency
)ffice of Solid Waste and Emergency Response
03/603-8881

Comprehensive Environmental Response, Compensation, and Liability Information System

The CERCLIS Database is a comprehensive listing of known or suspected uncontrolled or abandoned hazardous waste sites. These sites have either been investigated, or are currently under investigation by the U.S. EPA for the release, or threatened release of hazardous substances. Once a site is placed in CERCLIS, it may be subjected to several levels of review and evaluation, and ultimately placed on the National Priorities List (NPL). In addition to site events and milestone dates, the CERCLIS Report also contains financial information from the Superfund Consolidated Accomplishments Plan (SCAP).

NFRAP
Date of Data: 04/01/1997
Release Date: 05/06/1997
)ate on System: 05/23/1997
US Environmental Protection Agency
Office of Solid Waste and Emergency Response
703/603-8881

No Further Remedial Action Planned Sites

The No Further Remedial Action Planned Report (NFRAP), also known as the CERCLIS Archive, contains information pertaining to sites which have been removed from the U.S. EPA's CERCLIS Database. NFRAP sites may be sites where, following an initial investigation, either no contamination was found, contamination was removed quickly without need for the site to be placed on the NPL, or the contamination was not serious enough to require federal Superfund action or NPL consideration.

RCRIS_LG
)ate of Data: 04/04/1997
elease Date: 06/02/1997
)ate on System: 08/08/1997
US Environmental Protection Agency
Office of Solid Waste and Emergency Response
800/424-9346

Resource Conservation and Recovery Information System - Large Quantity Generators

The RCRIS_LG Report contains information pertaining to facilities which either generate more than 1000kg of EPA regulated hazardous waste per month, or meet other applicable requirements of the Resource Conservation And Recovery Act. The following information is also included in the RCRIS_LG Report:
- Information pertaining to the status of facilities tracked by the RCRA Administrative Action Tracking System (RAATS)
- Inspections & evaluations conducted by federal and state agencies
- All reported facility violations, the environmental statute(s) violated, and any proposed & actual penalties
- Information pertaining to corrective actions undertaken by the

facility or EPA
- A complete listing of EPA regulated hazardous wastes which are generated or stored on-site

CRIS_SG
Date of Data: 04/04/1997
Release Date: 06/02/1997
Date on System: 08/08/1997
S Environmental Protection Agency
ffice of Solid Waste and Emergency Response
00/424-9346

Resource Conservation and Recovery Information System - Small Quantity Generators

The RCRIS_SG Report contains information pertaining to facilities which either generate between 100kg and 1000kg of EPA regulated hazardous waste per month, or meet other applicable requirements of the Resource Conservation And Recovery Act. On advice of the U.S. EPA, ERIIS does not report so-called "RCRA Protective Filers." Protective Filers, commonly called Conditionally Exempt Small Quantity Generators (CESQG's), are facilities that have completed RCRA notification paperwork, but are not, in fact, subject to RCRA regulation. The determination of CESQG status is made by the U.S. EPA. The following information is also included in the RCRIS_SG Report:
- Information pertaining to the status of facilities tracked by the RCRA Administrative Action Tracking System (RAATS)
- Inspections & evaluations conducted by federal and state agencies
- All reported facility violations, the environmental statute(s) violated, and any proposed & actual penalties
- Information pertaining to corrective actions undertaken by the facility or EPA
- A complete listing of EPA regulated hazardous wastes which are generated or stored on-site

ERNS
Date of Data: 06/11/1997
Release Date: 06/13/1997
ate on System: 06/27/1997
S Environmental Protection Agency
ffice of Solid Waste and Emergency Response
202/260-2342

Emergency Response Notification System

ERNS is a national computer database system that is used to store information concerning the sudden and/or accidental release of hazardous substances, including petroleum, into the environment. The ERNS Reporting System contains preliminary information on specific releases, including the spill location, the substance released, and the responsible party. Please note that the information in the ERNS Report pertains only to those releases that occured between January 1, 1997 and June 11, 1997.

HWS
Date of Data: 09/25/1996
elease Date: 10/07/1996
ate on System: 11/15/1996
ll Dept. of Environmental Quality
nvironmental Response Division - Act 307
517/373-9540

Michigan Environmental Contamination List (Act 307)

The Michigan Environmental Contamination List contains summary information pertaining to sites that are deemed potentially hazardous by the Michigan Department of Natural Resources.

RST
Date of Data: 03/05/1997
Release Date: 05/01/1997
Date on System: 08/08/1997
ll Dept. of Environmental Quality
ST Division
17/335-7279

Michigan Leaking Underground Storage Tank Report

The Michigan Leaking Underground Storage Tanks Report is a comprehensive listing of all reported active and inactive leaking underground storage tanks located within the State of Michigan. ERIIS' LUST Report consists of the listings maintained by the Michigan Department of Natural Resources (LUST Section and Environmental Response Division) and the Michigan Department of State Police (Fire Marshal's Division).

WF
Date of Data: 03/18/1997
Release Date: 05/12/1997
Date on System: 06/13/1997
ll Dept. of Environmental Quality
Vaste Management Division - Solid Waste
17/335-4035

Michigan Solid Waste Facilities

The Michigan Solid Waste Facilities Report is a comprehensive listing of all active and inactive solid waste landfills and processing facilities located within the State of Michigan.

Transfer Stations - 02/22/95
Active Facilities - 03/02/95
Processing Plants - 02/23/95

ST
Date of Data: 02/04/1997
Release Date: 03/31/1997
Date on System: 04/18/1997
ll Dept. of Environmental Quality
ST Division
17/335-7279

Michigan Facility and Tank Data Report

The Michigan Facility and Tank Data Report is a comprehensive listing of all registered active and inactive underground storage tanks located within the State of Michigan.

ERIIS LIST OF STREETS IN THE RADIUS

IIS Report #186983A Aug 22, 1997

STREET NAME
ISLE ROYALE NATIONAL PARK

ENVIRONMENTAL RISK INFORMATION & IMAGING SERVICES
AERIAL PHOTOGRAPH SEARCH REPORT

The following sources have reported aerial photo coverage for the subject site USGS topoquad.
For site-specific photo availablity and ordering, please call the individual source agency or call
AIC at 1-800-945-9509 or fax this page to AIC at 512-478-5215.

ERIIS Report #186983A

VENDOR NAME	STREET	STATE	ZIP	PHONE
U S FOREST SERVICE REGION 8 & 9 AERIAL PHOTOGRAPHY FIELD OFFICE	P O BOX 30010	UT	84130-0010	(801) 975-3503

DATE OF COVERAGE	SENSOR CLASS	PROJECT CODE	SCALE	FOCAL LENGTH	FILM TYPE	CLOUD COVER	QUADRANGLE COVERAGE	REMARKS
1963	VERTICAL CARTO (IMPLIES STEREO)	EMP	15840	8.25in OR 210mm	B&W IR	0%	100%	UPPER PENIN MICH

VENDOR NAME	STREET	STATE	ZIP	PHONE
NATIONAL OCEAN SERVICE NOAA/COAST AND GEODETIC SURVEY SUPPORT	OAA/COAST AND GEODETIC SURVEY S	MD	20910-3282	(301) 713-2692

DATE OF COVERAGE	SENSOR CLASS	PROJECT CODE	SCALE	FOCAL LENGTH	FILM TYPE	CLOUD COVER	QUADRANGLE COVERAGE	REMARKS
1978 SEP 28	VERTICAL CARTO (IMPLIES STEREO)	78E-1	40000	6.00in OR 152mm	COLOR	0%	60%	100-PQ 2314-2323
1978 SEP 28	VERTICAL CARTO (IMPLIES STEREO)	78E-2	40000	6.00in OR 152mm	COLOR	0%	20%	100-PQ 2246-2251
1978 SEP 28	VERTICAL CARTO (IMPLIES STEREO)	78E-2	40000	6.00in OR 152mm	COLOR	0%	60%	100-PQ 2290-2297
1978 SEP 28	VERTICAL CARTO (IMPLIES STEREO)	78EC	40000	6.00in OR 152mm	COLOR	0%	60%	100PQ 2284-2297
1978 SEP 28	VERTICAL CARTO (IMPLIES STEREO)	78EC-1	40000	6.00in OR 152mm	COLOR	0%	60%	100PQ 2314-2323
1978 SEP 28	VERTICAL CARTO (IMPLIES STEREO)	78EC-2	40000	6.00in OR 152mm	COLOR	0%	20%	100PQ 2324-2329
1978 SEP 28	VERTICAL CARTO (IMPLIES STEREO)	78EC-2	40000	6.00in OR 152mm	COLOR	0%	30%	100PQ 2246-2251

VENDOR NAME	STREET	STATE	ZIP	PHONE
J S AIR FORCE DEPT OF THE AIR FORCE EDC				(800) USA-MAPS

DATE OF COVERAGE	SENSOR CLASS	PROJECT CODE	SCALE	FOCAL LENGTH	FILM TYPE	CLOUD COVER	QUADRANGLE COVERAGE	REMARKS
1966 APR 21	VERTICAL CARTO (IMPLIES STEREO)	66082	20000	UNKOWN	B&W	0%	100%	1 0811463

VENDOR NAME	STREET	STATE	ZIP	PHONE
J S GEOLOGICAL SURVEY RESTON ESIC	507 NATIONAL CENTER	VA	22092	(703) 648-5920

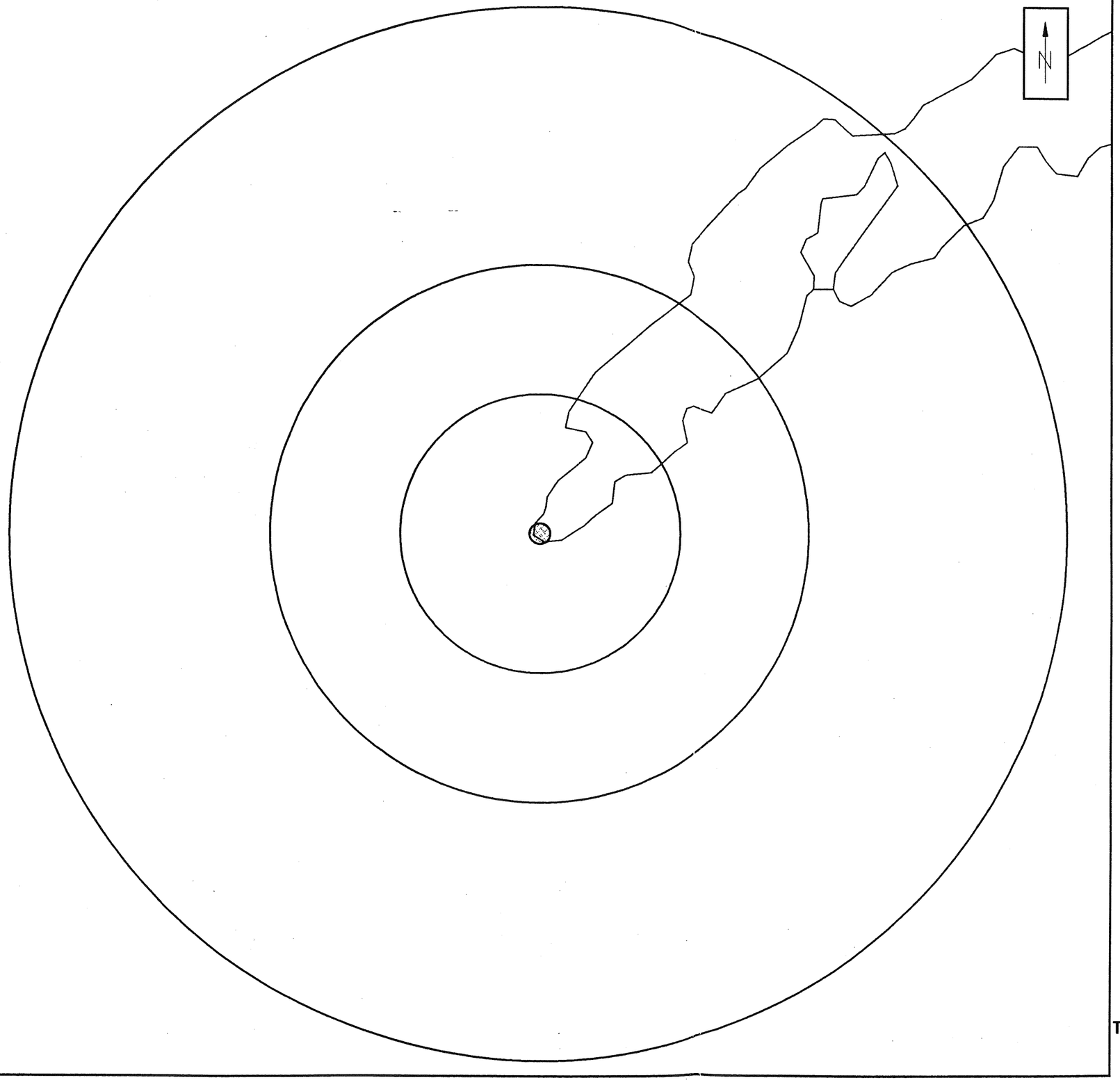
DATE OF COVERAGE	SENSOR CLASS	PROJECT CODE	SCALE	FOCAL LENGTH	FILM TYPE	CLOUD COVER	QUADRANGLE COVERAGE	REMARKS
1978 NOV 06	VERTICAL CARTO (IMPLIES STEREO)	VERA	80000	OTHER	B&W	0%	100%	
1983 MAY 01	VERTICAL CARTO (IMPLIES STEREO)	N4888	80000	OTHER	B&W	0%	100%	
1984 JUN 01	VERTICAL CARTO (IMPLIES STEREO)	N4888	58000	OTHER	COLOR	0%	100%	
1955 MAY 04	UNKNOWN	TAB	46000	OTHER	B&W	0%	100%	
1986 AUG 01	VERTICAL CARTO (IMPLIES STEREO)	N4888	58000	OTHER	COLOR	0%	100%	
1986 AUG 01	VERTICAL CARTO (IMPLIES STEREO)	N4888	80000	OTHER	B&W	0%	100%	

VENDOR NAME	STREET	STATE	ZIP	PHONE
MICHIGAN DEPT OF NATURAL RESOURCES DIV OF LAND RESOURCES PROGRAM	STEVEN T MADISON BLDG BOX 300208	MA	48909	(517) 373-9123

DATE OF COVERAGE	SENSOR CLASS	PROJECT CODE	SCALE	FOCAL LENGTH	FILM TYPE	CLOUD COVER	QUADRANGLE COVERAGE	REMARKS
1938	UNKNOWN		20000	6.00in OR 152mm	B&W	UNK	100%	
1943	UNKNOWN		25000	6.00in OR 152mm	B&W	UNK	100%	
1978 AUG 15	VERTICAL CARTO (IMPLIES STEREO)		24000	6.00in OR 152mm	COLOR	UNK	100%	
1986 JUL	VERTICAL CARTO (IMPLIES STEREO)		15840	6.00in OR 152mm	B&W IR	0%	100%	KEWEENAW COUNTY

VENDOR NAME	STREET	STATE	ZIP	PHONE
MICHIGAN DEPT OF STATE HWYS AND TRANSPORTATION	ENVIRONMENTAL LIAISON SECTION STATE HWY BLDG	MI	48904	( ) -

DATE OF COVERAGE	SENSOR CLASS	PROJECT CODE	SCALE	FOCAL LENGTH	FILM TYPE	CLOUD COVER	QUADRANGLE COVERAGE	REMARKS
1965	UNKNOWN		9600	6.00in OR 152mm	B&W	UNK	100%	
1969	UNKNOWN		9600	6.00in OR 152mm	B&W	UNK	100%	
1976	UNKNOWN		6000	6.00in OR 152mm	B&W	UNK	100%	



ERIIS
505 Huntmar Park Dr, Suite 200
Herndon, VA 20170
(703)834-0600 (800)989-0402
FAX: (703)834-0606

SITE INFORMATION

Passage Island
MI
Keweenaw County
Job Number: 186983A
Map Plotted: Aug 22, 1997

MAP LEGEND

- Target Area
- Radii .25, .5, 1 Mi
- Hydrography
- NPL 0 Sites
- RCRIS_TS 0 Sites
- RCRIS_CA 0 Sites
- CERCLIS 0 Sites
- NFRAP 0 Sites
- RCRIS_LG 0 Sites
- RCRIS_SG 0 Sites
- ERNS 0 Sites
- HWS 0 Sites
- LRST 0 Sites
- SWF 0 Sites
- RST 0 Sites

Miles

0 0.25 0.5

The Information on this map is subject to the ERIIS Disclaimer
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Appendix D

Telephone Conversation Record

Woodward-Clyde

TELEPHONE CONVERSATION RECORD

Recorded By:

Name: Glynis Hill Date 11/20/97

Site Name: Isle Royale Light and Passage Island Light

Number of Pages (including this sheet) : 1

Conversant Name(s), To / From:

Name: Glynis Hill

Company/Agency: Jim Callahan - Safety Officer and Jack Oelfke - Resource Management Specialist of the National Park Service

Fax No.: Office PH: (906) 482-0986/487-9080

Subject: Environmental Concerns Key Words:

Remarks:

According to Jim Callahan of the National Park Service does not have any records of petroleum product storage on Passage Island or Menagerie Island. According to Mr. Oelfke of the National Park Service there was a ship wreck off the coast of Passage Island in 1996. The wreck spilled approximately 300-gallons of diesel fuel in Lake Superior that reached the shore line of Passage Island. He said most of the diesel fuel has evaporated, however, debris from the wreck is still visible and it will be cleaned up by the Park Service.

Mr. Oelfke also said that there are no ASTs or USTs on either island.

Woodward-Clyde

TELEPHONE CONVERSATION RECORD

Recorded By:

Name: Glynis Hill Date 11/20/97

Site Name: Isle Royale Light and Passage Island Light

Number of Pages (including this sheet) : 1

Conversant Name(s), To / From:

Name	Ms. Ki Alexander		
Company/Agency	Michigan Department of Environmental Quality - Underground Storage Tank (UST) and Environmental Response Division		
Fax No.		Office PH:	(906) 228-6561
Subject	Environmental Status	Key Words	

Remarks:

According to Ms. Alexander, the agency does not have any records of any USTs on either island.

Appendix E

Site Reconnaissance Checklist

ASE I ESA - SITE RECONNAISSANCE CHECKLIST

..thod(s) Used to Observe Property Walk

..cess/Observation Limitations USCG Boat

Date 9/8/97
Project No. R96819
Project Name Environmental Site Assessments
Address/Location Passage Island Light
Keweenaw County, Michigan
WC Staff Heidi Fredericks
Key Site Mgr. Don McMillin
Phone No. (906) 482-1520
Other Interviewees Jim Shogren

	Observations	Photo	Interviews (Initials)
GENERAL SITE SETTING 1. Current and Past Use(s): • Property • Adjoining properties Surrounding area	Aid to Navigation		
2. Site Topography	Slight rolling hills		
Site Hydrology • Streams • Ponds • Springs, seeps • Surface water flow direction	Lake Superior		
Site Geology, Hydrogeology Sinkholes • Outcrops • Mining activity? Groundwater occurrence, depth	Exposed bedrock		
Structures - General Description • No. buildings • No. stories • Date - orig. construction, renovations General condition	• Keepers Dwelling with attached Light tower • Privy • Oil Storage shed • Paint locker • Winch, Pump and Sump Houses • Steel Tramway • Helicopter Pad • Antenna Tower • Former Antenna Tower		
6. Site Surface Cover • Vegetation - type • Manmade - type	vegetation - grass and overgrown brush		
Roads • Adjoining thoroughfares • Streets, roads, paths - use/ outlet/public access Parking facilities	Foot path from shoreline to dwelling area		
8. Potable Water Supply • Source	Water pumped from Lake Superior to keeper's dwelling		
. Sewage Disposal System • Type • Age	Septic System		
II. INTERIOR/EXTERIOR OBSERVATIONS . Aboveground Tanks (ASTs) *Check for tank pads, piping-evidence of former tanks	None observed		
How Many? for Each: • Location • Condition (check for fixture leakage, ruptures, corrosion, dents, etc.) Contents Age • Volume (cap.) • Spills/leaks? (check for stained soil, dead vegetation, etc.) Piping/ condition	According to a 1966 plot plan four (4) ASTs existed, these tanks were removed in 1996 according to the National Park Service		

2. Underground Tanks (USTs) *Check for vent and fill pipes, pump pads, cover plates, other aboveground access ways How Many? for Each: • Location • Condition/inspections? • Contents • Spills/leaks? • Volume (cap.) • Piping/condition? • Age • If closed - closure date, procedure used	None observed		
3 Odors • Describe • Source(s)?	Diesel fuel odors in the storage room of the back portion of the lighthouse		
4 Pools of Liquids • Type? • Sumps w/liquids?	Six (6) inches of water in the basement of the lighthouse		
5 Drums • Location • Type • Contents • Size/capacity • Labels • Leakage? • Condition (check for seals, bulges, rusting, proper closure) • Spill control features?	None observed		
6. Other Containers • Location • Type • Contents • Approx. size/quantity • Labels • Leakage? • Storage conditions • Spill control features?	None observed		
PCB Items Check electrical, hydraulic equipment, esp. transformers; do not include fluorescent light ballasts • Location • Type Age • Labels/ID No.s? • Condition • Leakage?	Fluorescent light ballasts Two (2) non-lead acid batteries labeled Absolyte II GB Type 6-75A15 GNB Incorporated, Langhorne, PA		
III. INTERIOR OBSERVATIONS Heating/Cooling System • Type • Fuel source • Boiler room • Exhaust(s)	Heated with coal until 1958 according to the National Register of Historic Places		
Stains/Corrosion Floors • Walls • Ceilings • Sources?	Stains observed on the concrete floor of the winch house		
Drains/Sumps Where go?	None observed		
4. Flooring Material			
Insulation Type (If asbestos - see optional asbestos section at end of checklist)	None observed		
Process Equipment Check For: • Paint booths? • Cleaning units/degreasers? • Dip tanks? • Plating? Sanding?	Multiarray Controller - Light/horn serial # 886017 manufactured by Specialty Concepts		

. XTERIOR OBSERVATIONS			
Pits, Ponds, Lagoons ocation • What used for/contents ge • Size Type of const. • General condition Discharge? To what? • Pollution control? onitoring? (If wells - note number, location, depth, ondition) Any leaks, seeps, spill evidence?	No pits or ponds observed		
ained Soil, Pavement escribe • Sources?	None observed		
tressed Vegetation escribe se of herbicides? Pesticides? - Location Amount/frequency of application Who applied	None observed		
Solid Waste Disposal - Landfills, Waste Piles ncinerators) k for fills, mounds, depressions, ash/burnt areas, nstruction debris. ff site disposal - dumpsters? Contractor name?	No onsite waste disposal areas observed		
For Each On-Site Waste Disposal Area/Facility: - Location - Age Size - Type of construction General condition - Discharge? To what? Pollution control? Monitoring? (If wells - note location, number, depth, condition) - Any leaks, seeps, spills evidence?	Waste oil pit once located onsite. Location unknown		
astewaters/Stormwaters ischarge to drains? Ditches? Streams? Manholes? • Oil/water separators? astewater treatment? What kind? If sludge enerated, where disposed?	None observed		
Wells - Dry Wells, Water Wells, Irrigation, Injection, il and Gas, Monitoring, Abandoned ype • Location Condition	None observed		
n Site Septic System - Tanks, Cesspools ype • Condition	Septic system and privy observed onsite		
Pipelines eneral location • Type (substances carried) ge • Construction Depth • Size eakage? Tests?	Steel pipeline leading to radio tower		
ir Emissions Exhausts • Stacks Vents • Incinerators ir pollution control equipment (baghouses, cyclones, tc.) Sources, emissions?	None		

V. QUESTIONS - HELPFUL DOCUMENTS, LEGAL PROCEEDINGS			
1. Site Plans 2. Aerials 3. ESA Reports 4. Environmental Audit Reports 5. Environmental Permits (e.g., solid waste, haz. waste, NPDES, air, wastewater, pretreatment, UIC) • Type • Status 6. UST/AST Registrations 7. UST/AST Inspections 8. UST/AST Inventory Reports 9. MSDS Sheets	None		
10. Community Right-to-Know Plan 11. Safety, SPCC Plans 12. Spill Reports 13. Fire Dept. Hazardous Use Permits/ Inspections 14. Pipeline Inspection Reports 15. Hazardous Waste Generator, Notification or Reports 16. Hazardous Waste Manifests/Solid Waste Disposal Documentation 17. Hydrogeologic Reports 18. Geotechnical Studies 19. Correspondence RE: Violations or Env. Liens 20. Knowledge of Any Pending, Threatened, or Past Litigation, Administrative Proceedings, or Notices of Possible Env. Liability?			
VI. SKETCH MAP			
OPTION - ASBESTOS - Preliminary Survey • Asbestos in construction materials? • Age of construction/renovation(s)? • Any asbestos survey conducted? Results? • Visual Indications of ACM: - Insulation - pipes, etc. - Floor tiles (esp. 9"x9") - Spray-on material - ceilings - Others	Suspected ACM in plaster components, floor tiles, dry wall, and roofing materials		

ATTACHMENT A

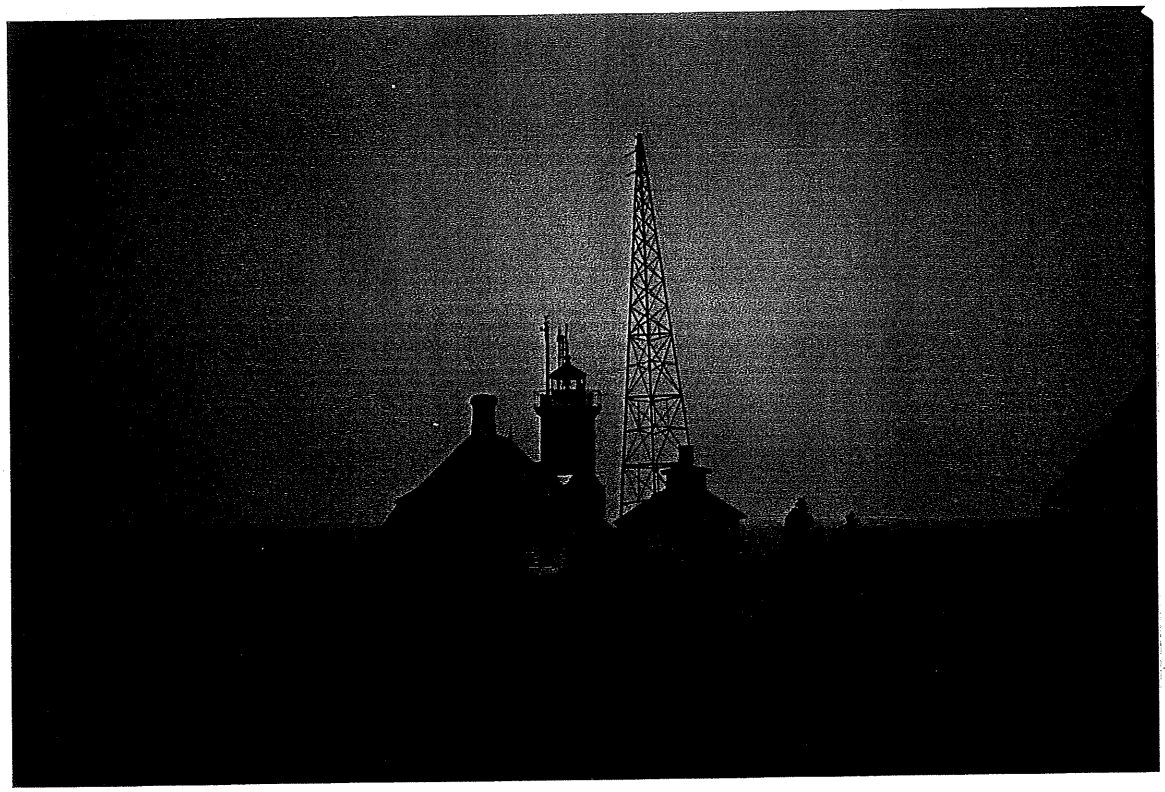
CURRENT AND PAST PROPERTY USES

Address	Current Use(s)*	Tenant(s)**	Past Use(s)	Source of Information
Subject	Lighthouse and keeper's dwelling			Jim Shogren Don McMillin
East	Lake Superior			Visual
South	Lake Superior			Visual
West	Lake Superior			Visual
North	Lake Superior			Visual
Surrounding Area	Lake Superior			Visual

*Note all unoccupied occupant spaces. For industrial uses-briefly describe processes, product.
**For occupants - identify name, length of occupancy.

Appendix F
Site Photographs

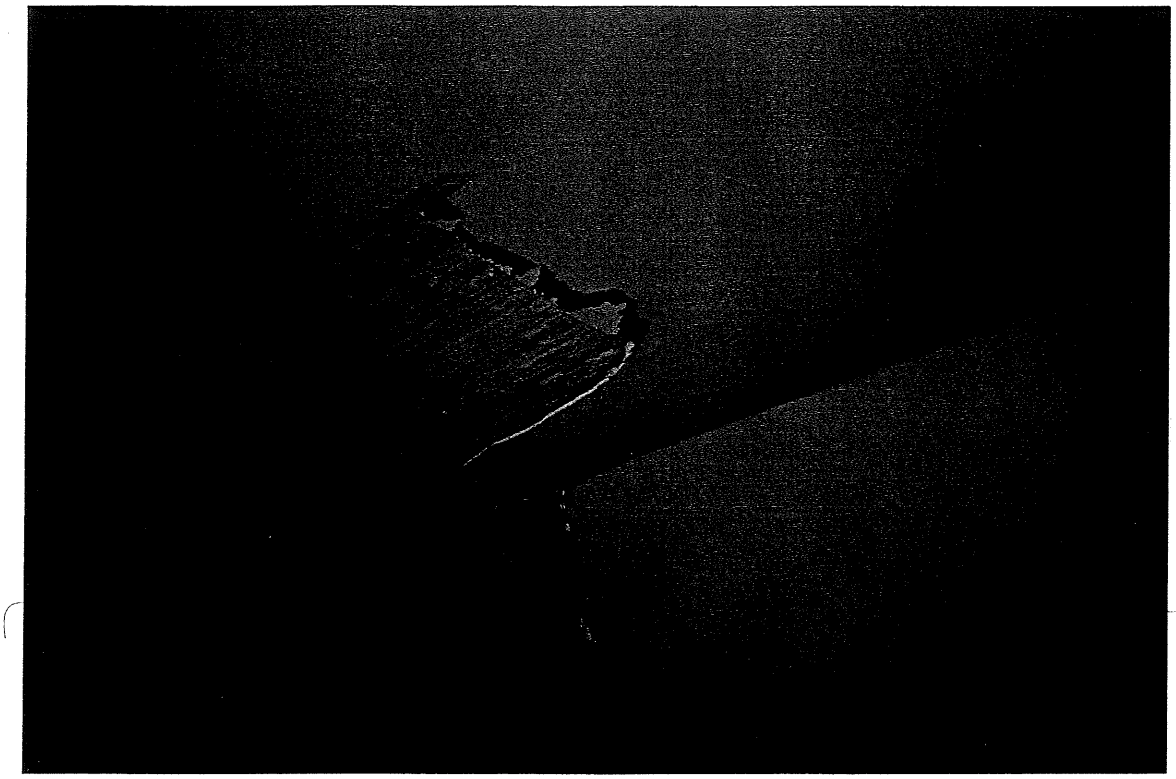
Site Photographs
September 8, 1997
Passage Island Light
Keweenaw County, Michigan



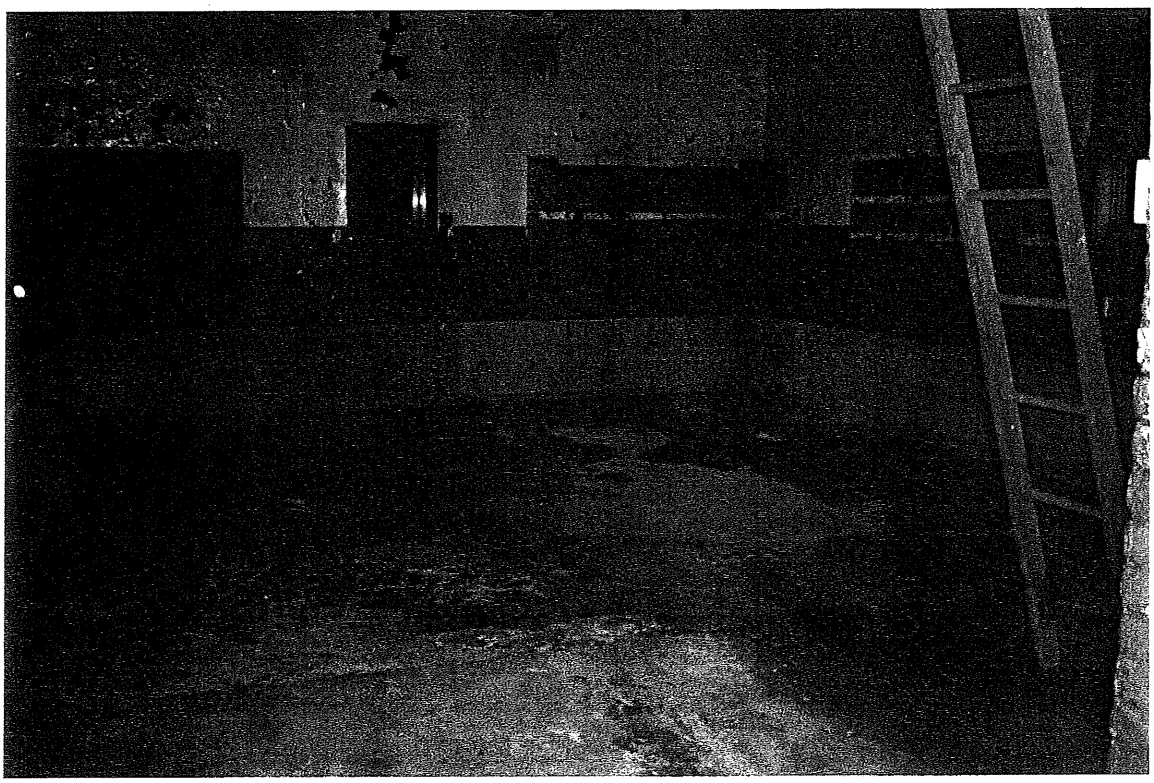
1. View of Passage Island Light

2. View of solar panels and front of keeper's dwelling

Site Photographs
September 8, 1997
Passage Island Light
Keweenaw County, Michigan



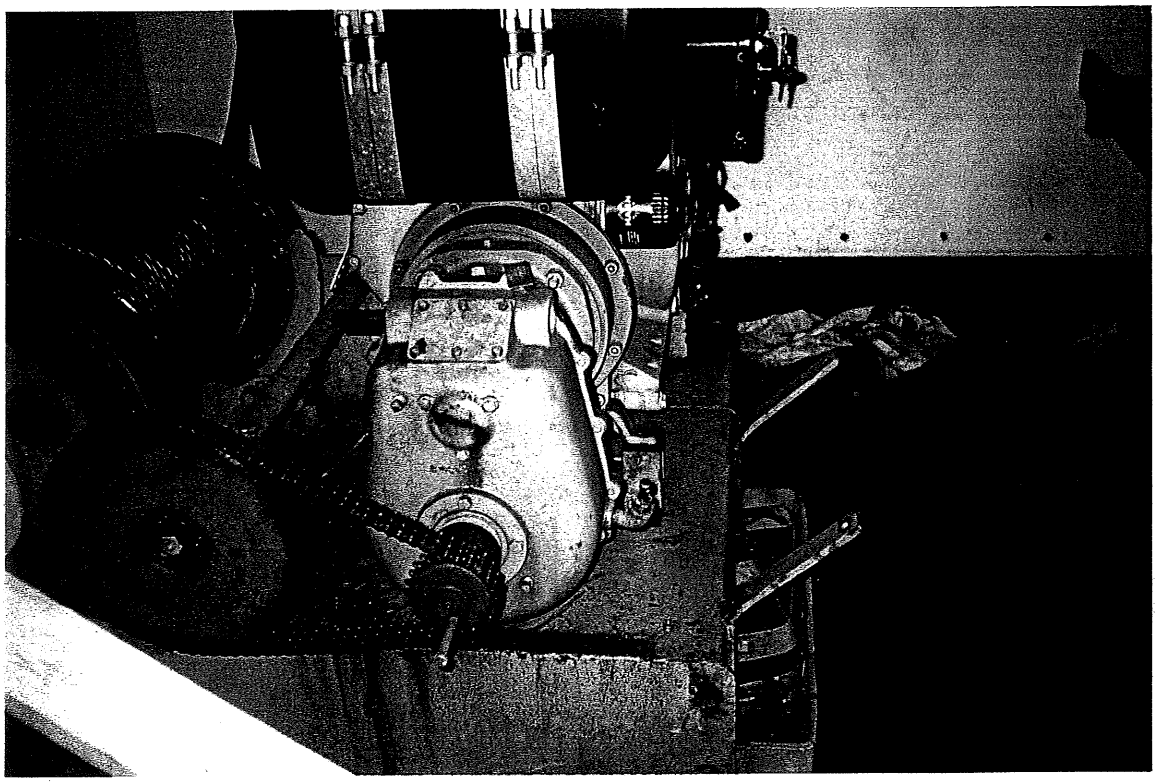
3. View of damaged dry wall in keeper's dwelling



4. View of chipped paint and stained concrete floor inside fog signal building

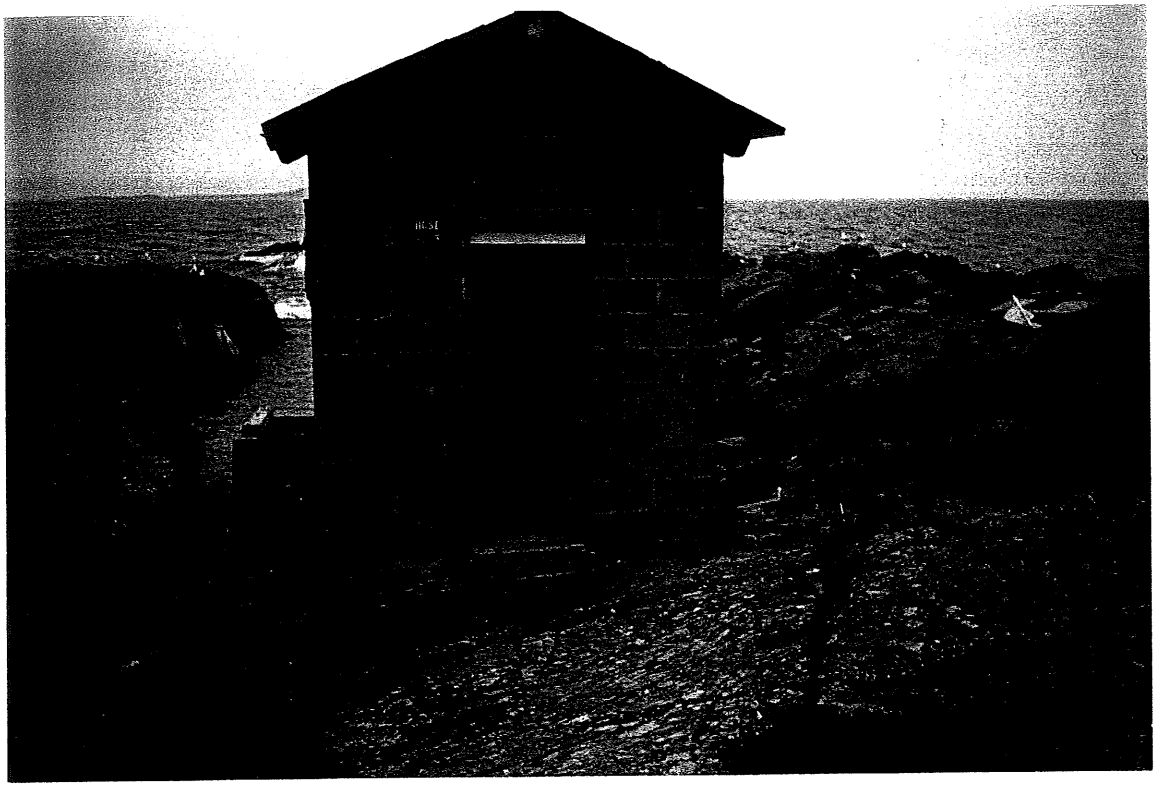
Site Photographs
September 8, 1997
Passage Island Light
Keweenaw County, Michigan

5. View of steel tramway that links fog signal building to boat house



6. View of oil stained wooden floor and motor in fog signal building

Site Photographs
September 8, 1997
Passage Island Light
Keweenaw County, Michigan



7. View of concrete block pump house with partial view of sump house in the background

8. Electric cable leading to lighthouse

Site Photographs
September 8, 1997
Passage Island Light
Keweenaw County, Michigan

9. View of suspected septic tank area

10. View of suspected septic tank ports

Appendix G
Interviews

United States Coast Guard
Interview / Pre-Site Visit Facility Questionnaire for an
Environmental Site Assessment (ESA)

Site Name: **Passage Island Light**
Site Address: **Keweenaw County, MI** **Point of Contact:** **Don McMillin**

Introduction:

The Environmental Site Assessment (ESA) is the first step in the Coast Guard Headquarters (G-SEC) program to develop a list of Coast Guard properties which may require remedial activities in the future. Once the ESA program identifies action areas, long term funding requirements can be established to address the necessary clean ups.

The ESA is essentially a ASTM Phase I Site Assessment tailored to the Coast Guard's specific site by site requirements. The ESA will review historical waste generation and disposal practices and type of hazardous substances associated with the site. It will also investigate potential off site migration pathways and affected media as well as comprehensive survey of target receptors.

The Coast Guard Facilities Design and Construction Center Atlantic (FDCC LANT) serves as the program coordinating command. Woodward Clyde Federal Services (W-C) has been contracted to perform this survey. The basic outline of the work required consists of:

1. Obtain comprehensive information on the site and surrounding area.
2. Conduct a site survey to review for any past, present or future areas of hazardous substance release.
3. Develop a report detailing all findings and recommendation.

This questionnaire is being forwarded to the chain of command for the particular site so that as much information as possible can be obtained prior to the actual site visit by W-C.

Your input is vital to the successful completion of this survey and the ESA program. Thank you for your valuable time and effort in completing this process. Any suggestions on the further development of the program are welcomed and would be appreciated. Please forward all comments to FDCCLANT, POC Jim Lewis at e-mail, J.Lewis/FDCCLANT01.

Questions	Yes	No	Unk
1. Is the *property* or any *adjacent property* used for an industrial use?			X
2. Has the *property* or any *adjacent property* been used for an industrial use in the past?			X
3. Is the *property* or any *adjacent property* used as a gasoline station, motor repair facility, commercial printing facility, dry cleaners, photo developing laboratory, junkyard or landfill, or as a waste treatment, storage, disposal, processing, or recycling facility?			X
4. Has the *property* or any *adjacent property* been used as a gasoline station, motor repair facility, commercial printing facility, dry cleaners, photo developing laboratory, junkyard or landfill, or as a waste treatment, storage, disposal, processing, or recycling facility?			X
5. Are there currently, or have there been previously, any damaged or discarded automotive or industrial batteries, or pesticides, paints or other chemicals in individual containers of greater than 5 gal (19 L) in volume or 50 gal (190 L) in the aggregate, stored on or used at the *property* or at the facility? Contents: Size:			X
6. Are there currently, or have there been previously, any industrial *drums* [typically 55 gal (208 L)] or sacks of chemicals located on the *property* or at the facility? Contents: Size range: 6a. RCRA ID# Any Hazardous waste generated on-site (*if yes see attached sheet*)			X
7. Has *fill dirt* been brought on to the *property* that originated from a contaminated site or that is of an unknown origin?			X
8. Are there currently, or have there been previously, any *pits*, *ponds*, or *lagoons* located on the *property* in connection with waste treatment or waste disposal?			X
9. Is there currently, or has there been previously, any stained soil on the *property*?			X
10. Are there currently, or have there been previously, any registered or unregistered storage tanks (above or underground) located on the *property*? # of UST: # of AST: Capacity: Capacity: Contents: Contents:			X
11. Are there currently, or have there been previously, any vent pipes, or access ways indicating a fill pipe protruding from the ground on the *property* or adjacent to any structure located on the *property*?			X
12. Are there currently, or have there been previously, any flooring, drains, or walls located within the facility that are stained by substances other than water or are emitting foul odors?			X
13. If the *property* is served by a private well or non-public water system, have contaminants been identified in the well or system that exceed guidelines applicable to the water system or has the well been designated as contaminated by any government environmental/health agency?			X

Questions (cont'd)	Yes	No	Unk
14. Does the *occupant* of the *property* have any knowledge of *environmental liens* or governmental notification relating to past or recurrent violations of environmental violations with respect to the *property* or any *facility* located on the *property*?			X
15. Has the *occupant* of the *property* been informed of the past or current existence of *hazardous substances* or ***petroleum products*** or environmental violations with respect to the *property* or any facility located on the *property*?			X
16. Does the occupant of the *property* have any knowledge of any *environmental site assessments* of the *property* or facility that indicated the presence of *hazardous substances* or *petroleum producers* involving on , or contamination of, the *property* or recommended further assessment of the *property*?			X
17. Does the *occupant* of the *property* know of any past, threatened, or pending lawsuits or administrative proceedings concerning a release of threatened release of any *hazardous substance* or *petroleum products* involving the *property* by any *owner* or *occupant* of the *property*?			X
18. Does the *property* discharge *wastewater* on or adjacent to the *property* other than storm water in a sanitary sewer system?			X
19. Have any hazardous substances or petroleum products, unidentified waste materials, tires, automotive or industrial batteries or any other waste materials been dumped above grade, buried and/or burned on the property?			X
20. Is there a transformer, capacitor, or any hydraulic equipment for which there are any records indicating the presence of PCBs?			X

Please make copies of the following information or make available for review during the site visit.				
1.	Any spills or leaks of petroleum or other chemicals on the property			X
2.	Any investigation performed at the site			
	A. Geotechnical study			X
	B. UST closure report			X
	C. Phase I Environmental Site Assessment			X
	D. Phase II or a Groundwater Environmental Assessment			X
	E. RCRA or OSHA Compliance Audit			X
	F. Other Reports (re. asbestos, LBP, radon, PCBs)			X
3.	Any permits issued for the site (NPDES, RCRA, Air Permits, etc.)			X

Please provide any other information that may be pertinent or helpful:

The questionnaire was completed by:

Name: Don McMillin

Title:

Command: Portage

Phone Number: (906) 482 - 1520

Date: September 8, 1997

W-C Project# R96819 - PASS

FDCCLANT Point of Contact is Jim Lewis, Environmental Engineer, at (757) 858-6230 x 255 Fax # (757) 858-6229, E-Mail (J.Lewis/FDCCLANT01)

Appendix H

In-Briefing And Out-Briefing Forms

In-Briefing

Woodward-Clyde

WCFS Job Number: R96817
USGC Contract Number:
DTCG47-96-D-3EFKO9/TOKO9-0017

Environmental Site Assessment Site Name(s): Passage Island / Isle Royale
Date: 9/8/97
Time:
Meeting Location: Lake Superior

Meeting called by: FDCC-LANT/WCFS

Type of meeting: ESA In-Briefing

Attendees:	Organization:	Title:	Phone Number:	Fax Number:
1. Hugh Frederick	WCC			
2. Jim Shogren	USCG	BOSN4/ATONOFFICER	906-635-3270	
3. Don McMillen	USCG			
4.				

----- Agenda Topics -----

1. Introduction	WCFS/USCG
2. Background	WCFS
3. Site Survey Description (ESA)	WCFS
4. Site Survey Schedule	WCFS
5. Project Schedule	WCFS
6. Support Required from USCG	WCFS
7. USCG Responsibilities if a Release is Encountered	WCFS
8. Site Limitations/Hazards	USCG
9. Closing Comments	All

Other information

Points of Contact:	Jim Lewis, P.E. USCG, FDCC-LANT	Edward P. Hagarty, P.E., Program Manager , WCFS	Larry P. Poole. Task Manager, WCFS
Phone Number:	(757) 858-6230 X 255	(301) 670-3322	(301) 670-3318

A:\IN_BRIEF.DOC

----- Agenda Topics -----

Introduction WCFS

Discussion: Purpose of out-briefing.

To inform parties of findings

Conclusions: location of a boathouse on Passage Island
Boathouse was not accessible due to Bad tides (No boat ACCESS)

Action items:	Person responsible:	Deadline:
roof shingles, 9X9 inch floor tile - ACM Possible Lead Paint Passage Island Attera Study	D. Frederick	9/8/97

Findings WCFS

Discussion: Present any findings. 1 set of concrete Ast cradles at base of rocks edge at Passage Island. Concrete pad w/ 2 yellow handles and a fill port near by - possible UST or septic Tank. Staining below pump generator for cable wheel in cable house at Passage Island

Conclusions:

Action items:	Person responsible:	Deadline:
Moonglow endangered Plant - D. McMillen has a copy of the letter.	D. Fredericks	9/8/97

Reporting Requirement For Releases Found WCFS

Discussion: After discussion with the W-C Program and Task Manager, present suggestions on reporting requirements.

Conclusions:

Action items:	Person responsible:	Deadline:

Closing Comments	All	
Discussion: A copy of the completed form should be given to the escort for transmittal to the Commander and a copy should be Faxed to Jim Lewis at 757.858.6229.		
Conclusions:		
Action items:	Person responsible:	Deadline:

Signed: (WCFS) Steve Frederick **Date** 9/8/97

Signed: (USCG) James Abrogan **Date** 9/8/97

Other Information

Additional Notes:

Out-Briefing

Woodward-Clyde

WCFS Job Number: R96817
USGC Contract Number:
DTCG47-96-D-3EFKO9/TOKO9-0017

Environmental Site Assessment Site Name(s): Passage Island / Isle Royal

Date: 9/8/97

Time:

Meeting Location: Lake Superior

Meeting called by: FDCC-LANT/WCFS

Type of meeting: ESA Out-Briefing

Attendees:	Organization:	Title:	Phone Number:	Fax Number:
1. Heck Frederick	WCC			
2. Don McMullin	USCG			
3. Jim Shogren	USCG	BOSN4/ATON OFFICER	906-635-3270	
4.				

----- Agenda Topics -----

1. Introduction	WCFS
2. Findings	WCFS
3. Reporting Requirement For Releases Found	WCFS
4. Closing Comments	All

Other information

Points of Contact:	Jim Lewis, P.E. USCG, FDCC-LANT	Edward P. Hagarty, P.E., Program Manager , WCFS	Larry P. Poole. Task Manager, WCFS
Phone Number:	(757) 858-6230 X 255	(301) 670-3322	(301) 670-3318

A:\OUT_BREF.DOC

----- Agenda Topics -----

Introduction — WCFS/USCG

Discussion: W-C/USCG escort introductions, roles and responsibilities

Conclusions: WCC/USCG to inspect site

Action items:	Person responsible:	Deadline:
	Heidi Fredenburg	9/8/97

Background — WCFS

Discussion: Purpose of survey, This is not a compliance audit it is a ASTM Phase I Site Assessment. The purpose is to survey the property to in order to obtain an "environmental snap shot" of the property. We are not involved beyond preparation of a report of findings. POCs, etc.

Conclusions:

Action items:	Person responsible:	Deadline:
	Heidi Fredenburg	9/8/97

Site Survey Description (ESA) — WCFS

Discussion: Description of what we will be doing.

Boating to Lighthouses. Walking in a gridlike pattern to view the site.

Conclusions:

Action items:	Person responsible:	Deadline:
	Heidi Fredenburg	9/8/97

Site Survey Schedule	WCFS	
Discussion: Time requirements for survey.		
2hrs for both lighthouses		
Conclusions:		
Moonglow - Passage Island - endangered plant.		
Action items:	Person responsible:	Deadline:
Look for ACM, lead paint look for Tanks at Passage Island & possible locations of ASTs at both sites	Sheldi Fredenes	9/8/97

Project Schedule	WCFS	
Discussion: Report due dates, etc.		
Isle Royal - 10/29/97		
Passage Island - 11/3/97		
Conclusions:		
Action items:	Person responsible:	Deadline:

Support Required from USCG	WCFS	
Discussion: Possible transportation, understand emergency calls, site limitations, escort, keys, access to structures, copies of any environmental reports.		
Transportation will be by boat		
Conclusions:		
Action items:	Person responsible:	Deadline:

USCG Responsibilities if a Release is Encountered	WCFS	
Discussion: If W-C observes a reportable release the USCG will be informed and suggestions on reporting will be presented in the out-briefing		
Any forms of release will be document & reported		
Conclusions:		
Action items:	Person responsible: Heidi Frederick	Deadline: 9/8/97

Site Limitations/Hazards	USCG	
Discussion: USCG to inform W-C of any known hazards.		
Isle Royale - A black Containment that once held acetylene tanks for lanterns. 2 rusted 55 gallon		
Conclusions: drums No tops No contents. Possible brick shallow well onsite.		
Action items: Chipping paint both sites.	Person responsible:	Deadline:

Closing Comments	All	
Discussion: A copy of the completed form should be given to the escort for transmittal to the Commander and a copy should be Faxed to Jim Lewis at 757.858.6229.		
Conclusions:		
Action items:	Person responsible:	Deadline:

Signed: (WCFS) Heidi Frederick **Date** 9/8/97

Signed: (USCG) James L Bogren **Date** 9/8/97

Other information

Additional Notes:

Appendix **B**

Phase II Environmental Site Assessment (included on CD)

U.S. Coast Guard Passage Island Light Station
Keweenaw County, Michigan

Final Site Assessment Report
Former Storage Tank Areas and
Soil Assessment for Lead

December 2003

MWH

FINAL

SITE ASSESSMENT REPORT
FORMER STORAGE TANK AREAS AND
SOIL ASSESSMENT FOR LEAD
U.S. COAST GUARD
PASSAGE ISLAND LIGHT STATION
KEWEENAW COUNTY, MICHIGAN

Contract No. DTCG83-99-D-3CL038
Task Order No. DTCG83-01-F-3CL116
CEU Cleveland Project No. 09-C01052

Prepared for:

United States Coast Guard
Civil Engineering Unit Cleveland
Cleveland, Ohio

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ACRONYM LIST

ACM	asbestos-containing material
AST	aboveground storage tank
AtoN	aid to navigation
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
CEU	Civil Engineering Unit
CFR	Code of Federal Regulation
COC	chain-of-custody
CV	coefficient of variance
EDB	dibromoethane
ESA	Environmental Site Assessment
ETC	Environmental Testing and Consulting, Inc.
eV	electron volt
DCA	dichloroethane
GSI	Groundwater Surface Water Interface
IDW	investigation-derived waste
LBP	lead-based paint
MDEQ	Michigan Department of Environmental Quality
MDNR	Michigan Department of Natural Resources
MWH	MWH Americas, Inc.
mg/cm^2	milligrams per square centimeter
mg/kg	milligrams per kilogram
MS/MSD	matrix spike/matrix spike duplicate
n	degrees of freedom
Part 201	Part 201 of the Natural Resources Environmental Protection Act, 1994 Public Act 451, as amended
PCBs	polychlorinated biphenyls
PID	photoionization detector
PNAs	polynuclear aromatic hydrocarbons
PPE	Personal Protective Equipment
RCRA	Resource Conservation and Recovery Act
SA	Site Assessment
S_b	background standard deviation
S_b^2	background variance
Site	USCG Passage Island Light Station
TPH-DRO	total petroleum hydrocarbons in the diesel range organics
TMB	trimethylbenzene
µg/kg	micrograms per kilogram
USCG	United States Coast Guard
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
$\overline{X_b}$	background mean
XRF	x-ray fluorescence

EXECUTIVE SUMMARY

MWH Americas, Inc. (MWH) (formerly Montgomery Watson) was contracted by the United States Coast Guard (USCG) to perform a Site Assessment (SA) at the USCG Passage Island Light Station, located on Passage Island, in Keweenaw County, Michigan. The SA was performed on approximately 6.3 acres of Passage Island. SA activities were performed under Task Order DTCG83-01-F-3CL116 of Contract Number DTCG83-99-D-3CL038 and Civil Engineering Unit (CEU) Cleveland Project Number 09-C01052. SA activities were conducted in accordance with the *Final Site Assessment Work Plan*, herein referred to as the *Final Work Plan*, submitted to and approved by the USCG in May 2001.

The objectives of the SA were to determine the nature and extent of soil impacts at four former fuel oil aboveground storage tank (AST) areas, a former aboveground piping area, a septic system tank area, and areas surrounding the site structures, and to perform a lead-based paint (LBP) and asbestos-containing materials (ACM) assessment on the exterior of the site structures.

On-site activities included an extensive soil assessment that included advancing 63 soil borings, at the site. Soil samples collected in the former AST areas and former aboveground piping area were analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX), 1,2,4-Trimethylbenzene, (TMB), 1,3,5-TMB, polynuclear aromatic hydrocarbons (PNAs), and total petroleum hydrocarbons diesel range organics (TPH-DRO). Soil samples collected in the septic system tank area were analyzed for BTEX, 1,2,4-TMB, 1,3,5-TMB, 1,2-ethylene dibromide (EDB), 1,2-dichloroethane (DCA), volatile halocarbons, PNAs, TPH-DRO, polychlorinated biphenyls (PCBs), cadmium, chromium, and lead. Soil samples collected surrounding the site structures were analyzed for lead. Soil samples collected from background soil borings were analyzed for cadmium, chromium, and lead.

Based on the available data, cleanup criteria established under the Part 201 Generic Residential Cleanup Criteria and Screening Levels were determined to be the applicable soil criteria for the site. The SA analytical results were compared against these criteria.

Soil analytical results for samples collected in the former AST areas and former aboveground piping area indicated that BTEX, 1,2,4-TMB, 1,3,5-TMB, PNAs, and TPH-DRO were not detected at concentrations exceeding the applicable Part 201 Cleanup Criteria.

Soil analytical results for samples collected in the septic system tank area indicated that BTEX, 1,2,4-TMB, 1,3,5-TMB, PNAs, TPH-DRO, PCBs, cadmium, and chromium were not detected at concentrations exceeding the applicable Part 201 Cleanup Criteria. Lead was detected in the soil at concentrations ranging from 417 to 786 milligrams per kilogram (mg/kg) at the five soil borings advanced at the septic tank area. These concentrations all exceed the Part 201 Residential Direct Contact Criteria of 400 mg/kg. In addition, lead was detected at concentrations ranging from 100 to 41,040 mg/kg in the soil samples collected around the lighthouse and attached keeper's dwelling, the fog signal building, the paint storage shed, the privy, the antenna tower, the former shed, the winch house, and the former pump house. Lead concentrations in 36 of the 40 soil samples collected from around the site structures exceeded the Part 201 Residential Direct Contact Criteria. Due to the close proximity of the septic tank area to the site buildings determined to have been painted with LBP, the lead impacts in soil in the septic tank area are likely attributable to impacts from the use of LBP on the site buildings.

Based on the SA analytical results, lead is the only contaminant present at the site at concentrations exceeding the Part 201 criteria determined to be applicable (residential direct contact criteria). Per Part 201 requirements, soil remediation is required for the site due to exceedances of criteria.

Based on the available data, approximately 75 cubic feet (3 cubic yards or 5 tons) of surface soils (0 to 6 inches bgs) around the septic tank and approximately 3,575 (133 cubic yards or 213 tons) cubic feet of surface soil (0 to 6 inches bgs) around the site structures exceed Residential Direct Contact criteria for lead.

Excavation and disposal would be the most viable option to remediate the site soils to meet the Part 201 residential criteria. Remediating the site soils to meet Part 201 residential criteria would be employed to achieve an unrestricted closure.

Under the 2002 revisions to the Part 201 regulations, the Michigan Department of Environmental Quality (MDEQ) has established a recreational land use category for site closure. No criteria has been established for recreational land use, so site-specific criteria would need to be developed and approved by the MDEQ. The SA results would then need to be compared against the calculated criteria to determine if exceedances exist and if remediation would be necessary. However, a deed restriction would be necessary for a site closed under the recreational scenario.

Based on the available data, and the abundance of outcropping basalt bedrock, groundwater is not expected at the site and groundwater as an exposure pathway was determined to be incomplete.

1.0 INTRODUCTION

This document presents the *Report* for the Site Assessment (SA) activities conducted at the United States Coast Guard (USCG) Passage Island Light Station, located on Passage Island in Keweenaw County, Michigan. SA activities were conducted as authorized in Task Order DTCG83-01-F-3CL116 of Contract Number DTCG83-99-D-3CL038 and Civil Engineering Unit (CEU) Cleveland Project Number 09-C01052.

1.1 PROJECT OBJECTIVES

The objectives of the SA were as follows:

- Determine the nature and extent of contamination in the soil around four former fuel oil aboveground storage tanks (ASTs), one septic tank, and aboveground piping at the keeper's dwelling.
- Assessment of lead in the soil surrounding the site structures.
- Evaluation/survey of exterior painted surfaces to determine if they contain lead. This includes recommendations on abatement work methods and a cost estimate.
- Conduct an exterior asbestos survey, which shall include recommendations on abatement work methods and a cost estimate.
- Provide conclusions based on field investigation and sampling activities and recommendations for future remedial actions or rationale for no further action required, as appropriate.

SA activities were conducted in accordance with United States Environmental Protection Agency (USEPA) and Michigan Department of Environmental Quality (MDEQ) protocols and the *Final Site Assessment Work Plan*, herein referred to as the *Final Work Plan*, submitted to and approved by the USCG in May 2001 (Montgomery Watson, 2001).

1.2 REPORT ORGANIZATION

This SA Report includes the following sections:

- Section 1.0 presents the introduction, project objectives, and the organization of this SA Report.
- Section 2.0 presents information on the site, including a description, site characteristics, and a summary of the previous investigation activities conducted at the site.
- Section 3.0 presents a summary of the SA activities conducted at the site.
- Section 4.0 presents the necessary field deviations from the *Final Work Plan*.
- Section 5.0 presents a summary of the results of the SA, including site geologic characteristics, the identification of applicable cleanup criteria, the comparison of soil analytical results with the applicable cleanup criteria, and the evaluation of the site structures for exterior asbestos containing material (ACM) and lead-based paint (LBP).
- Section 6.0 presents the conclusions and recommendations based on the results of the SA.
- References are provided following Section 6.0.
- Appendix A presents site photographs taken during the SA.
- Appendix B presents the soil boring logs.
- Appendix C presents the analytical data provided by the off-site laboratory.
- Appendix D presents the validation report for the analytical data.
- Appendix E presents the Asbestos and Lead Based Paint Assessment Report by Environmental Testing and Consulting Inc. (ETC).
- Appendix F presents back-up calculations for the determination of site-specific background metals concentrations.

2.0 SITE INFORMATION

This section presents background information on the property, including a description, site characteristics, and a summary of previous investigations conducted at the site. Photographs of the site are referenced below and included in Appendix A.

2.1 SITE DESCRIPTION

Passage Island is located three and one quarter miles off the northeastern tip of Isle Royale in Keweenaw County, Michigan. The USCG Passage Island Light Station (site) is located on the southernmost portion of Passage Island and is adjacent to Lake Superior. The site is in a remote area that is uninhabited by people. The lighthouse serves as a guide to ships travelling through to the Thunder Bay District in Ontario, Canada. See Figure 1 for the Site Location Map.

The site includes approximately 6.3 acres of land on which lie 12 structures: a lighthouse with attached keeper's dwelling (Photographs 1, 2, and 3), a fog signal building (Photograph 4), a privy, a winch house (Photograph 5), a former pump house (Photograph 6), a paint storage shed (Photograph 7), a steel rail tramway (Photograph 8), a solar panel, a helicopter landing pad (Photograph 9), an antenna tower, a former antenna tower (Photograph 10), and a boat landing/dock (Photograph 11). The location of the site structures is depicted in Drawing 6606-D, Sheet 1 of 7.

The Passage Island Light Station was constructed in 1882, in response to increased shipping from lakehead communities, such as Fort Williams/Port Arthur, Ontario, and Duluth, to the lower Great Lakes. The Passage Island Light was fully automated in December 1978. Its fourth order Fresenel Lens was powered by batteries. Currently the light uses a solar panel to produce electricity to run the automated light still functioning as an aid to navigation (AtoN). The USCG still owns and maintains the site.

2.2 SITE CHARACTERISTICS

According to the United States Geological Survey (USGS), the subject property is located approximately north 48° 14' 01.4" and west 88° 21' 09.3", and at and elevation of 601 feet above

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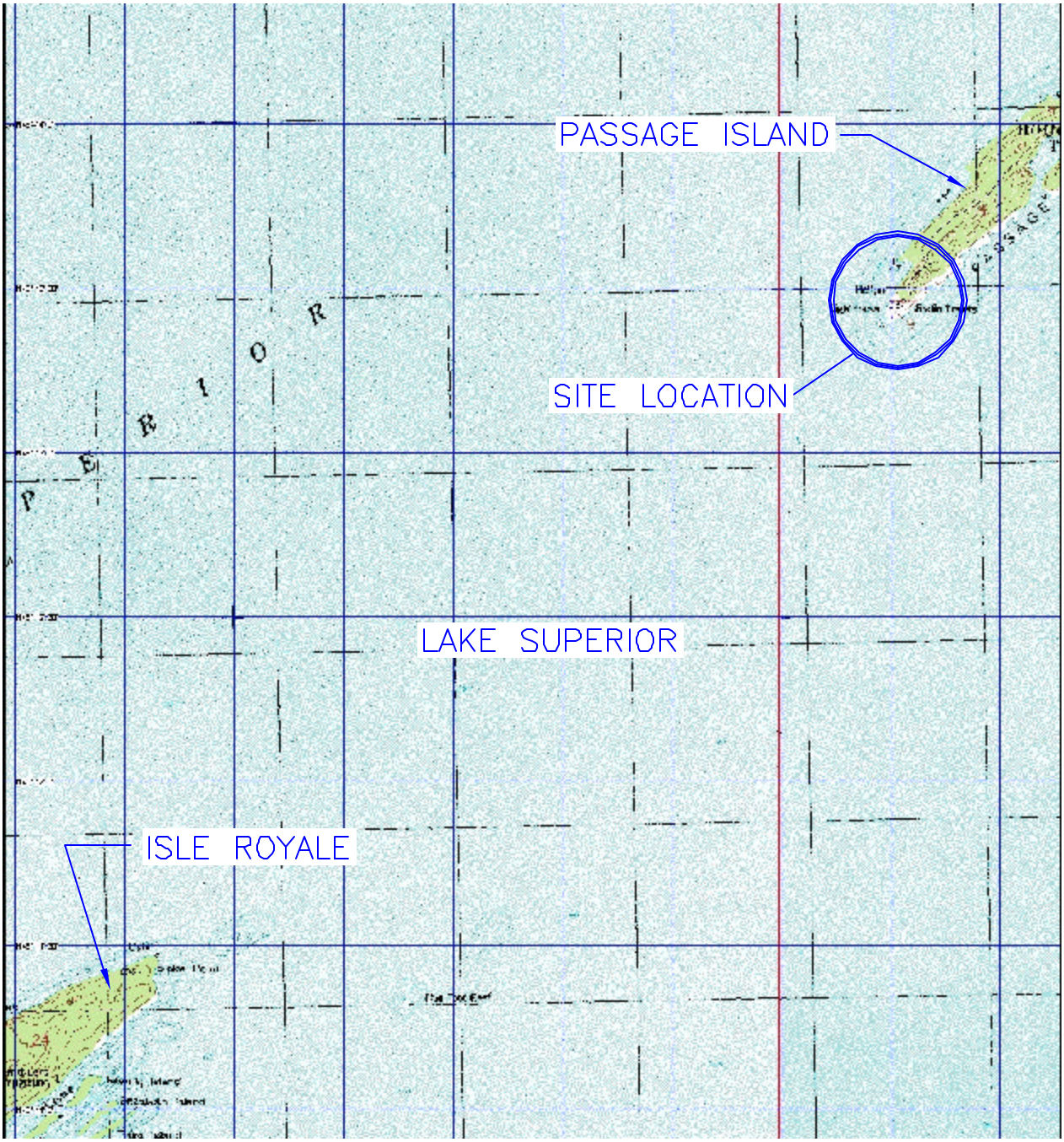

north

0 3000 6000

1"= 3000'

NOTES:

SITE LOCATION MAP DEVELOPED FROM THE PASSAGE ISLAND, MICHIGAN 7.5 MINUTE U.S.G.S. TOPOGRAPHIC QUADRANGLE MAP DATED 1985, ROCK HARBOR LODGE, MICHIGAN 7.5 MINUTE U.S.G.S. TOPOGRAPHIC QUADRANGLE MAP DATED 1985, DELORME 3-D TOPOQUADS, 1999.

SITE ASSESSMENT
PASSAGE ISLAND LIGHT STATION
KEWEENAW COUNTY, MICHIGAN

SITE LOCATION MAP

FIGURE 1

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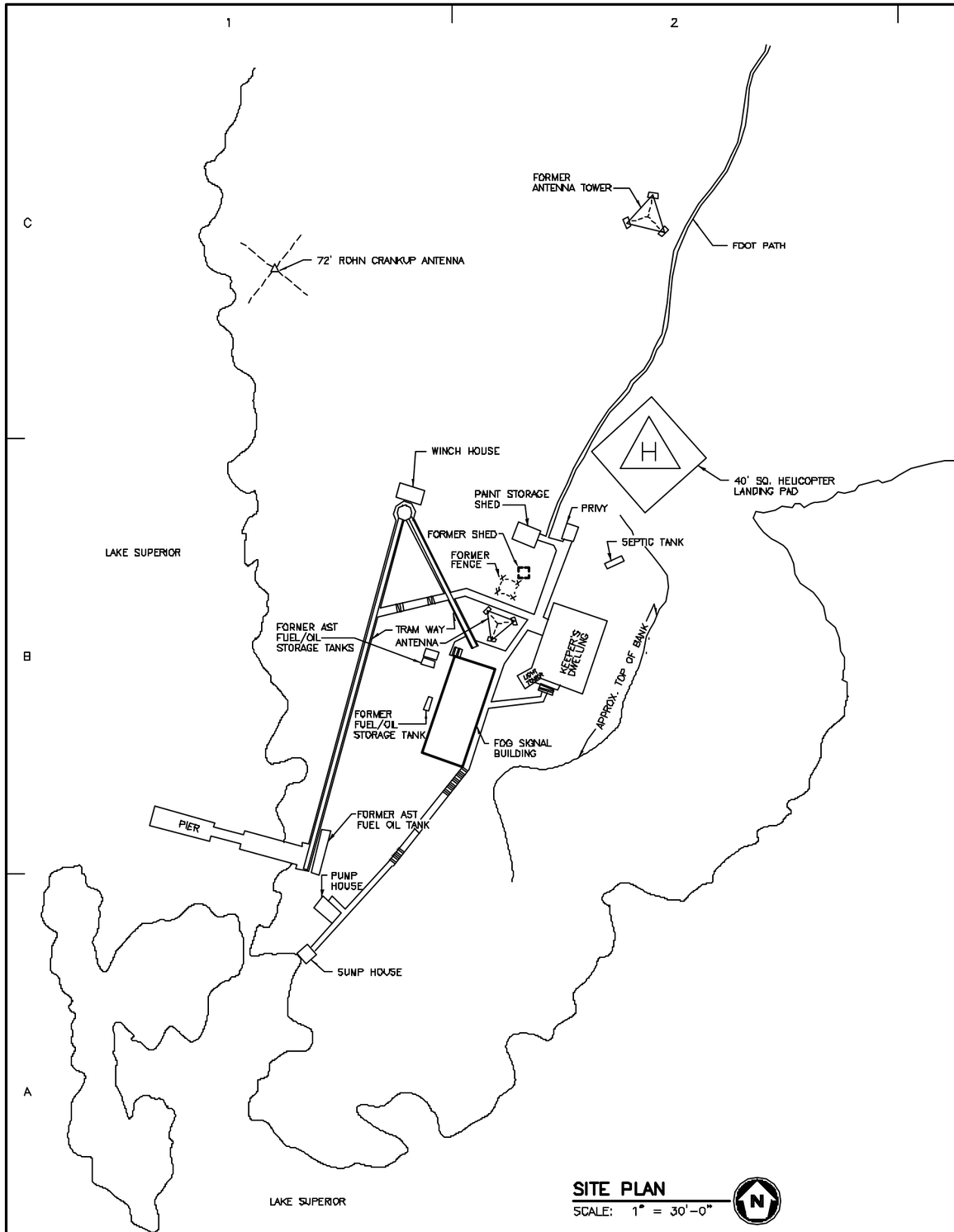

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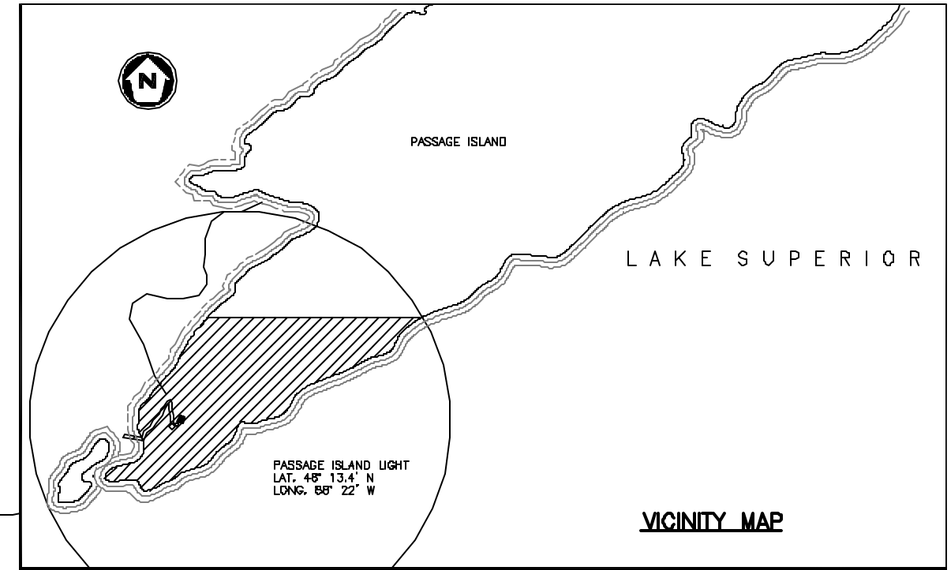
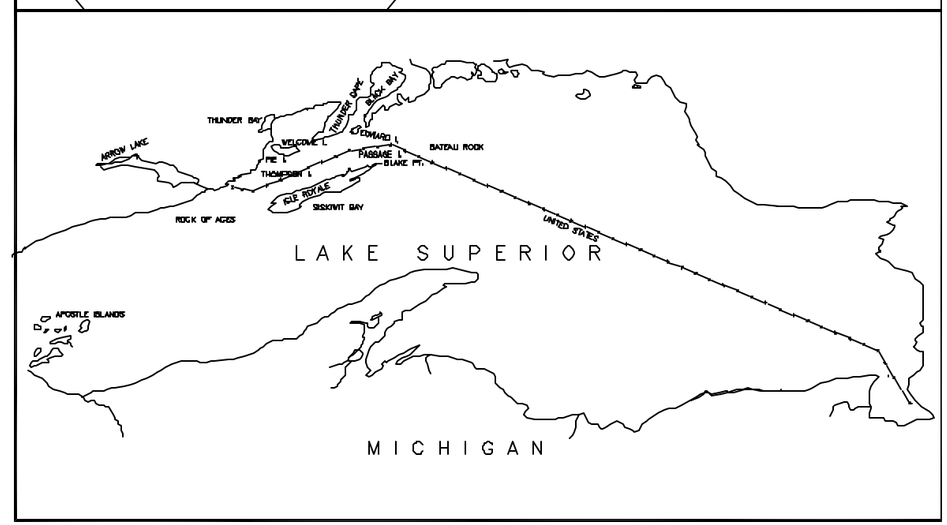


VICINITY MAP



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SHEET TITLE

SITE ASSESSMENT
PASSAGE ISLAND LIGHT STATION
KEWEENAW COUNTY MICHIGAN
SITE FEATURES MAP

SITE PLAN

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mean sea level. The property is located on exposed pre-Pleistocene bedrock that is devoid of glacial or post-glacial cover. The bedrock outcrops at several locations throughout the Island. Groundwater was not encountered during the site assessment activities.

2.3 PREVIOUS INVESTIGATIONS

A Phase I Environmental Site Assessment (ESA) was conducted by Woodward-Clyde in November 1997 (Woodward-Clyde, 1997). The Phase I ESA included a site reconnaissance, records review, interviews with USCG representatives, and review of historical aerial photographs and historical topographic maps. The Phase I ESA concluded the following:

- Possible spills or releases to surficial soils may have occurred from four on-site heating oil ASTs.
- USCG personnel reported that an oil sheen was observed in the septic tank.
- Miscellaneous aboveground pipes at the keeper's dwelling were observed during the Phase I ESA. The purpose and extent of the piping was not determined during the Phase I ESA. The piping was suspected to be former fuel supply/return lines.
- Based on visual observations and the age of the structures, ACM may be present on the exterior of the structures. Possible ACM included asphalt roofing shingles.
- Based on the age of the structures, there is a high probability that LBP was used on the exterior of the structures. There is also a possibility that soils immediately surrounding the structures may contain elevated concentrations of lead from former use of LBP.

The Phase I ESA recommended further investigation of the areas listed above.

3.0 SUMMARY OF SITE ASSESSMENT ACTIVITIES

To complete the objectives of the SA, MWH developed and implemented an environmental sampling and analysis program to determine the nature and extent of soil impacts in the former AST areas, septic system tank area, aboveground piping area, area surrounding the site structures, and to determine the site-specific background lead concentrations. Additional activities, including the assessment of exterior ACM and exterior LBP on the site structures, and analytical data validation, were also performed. SA activities were conducted in accordance with USEPA and MDEQ protocols and the *Final Work Plan* submitted to and approved by the USCG in May 2001 (Montgomery Watson, 2001).

3.1 SOIL ASSESSMENT

Soil assessment activities conducted at the site included advancing 58 soil borings for soil sample collection. Soil assessment activities were conducted in the following four areas, identified as having known or suspected impacts:

- Four former AST areas
- Aboveground piping area
- Septic system tank area
- Soil surrounding the site structures

The soil investigation was conducted at the site June 10 through June 13, 2001. Transportation of MWH personnel and equipment to and from Passage Island was provided by USCG Station Portage and the Rock Harbor Lodge on Isle Royale.

3.1.1 Former AST Soil Investigation

A total of seven soil borings (SB-42 through SB-48) were advanced at the site during the investigation of the former AST areas to determine the nature and extent of soil impacts in these areas. The seven borings (SB-42 through SB-48) were advanced in and around the former fuel oil AST locations located east of the fog signal building. Due to rock outcropping and lack of

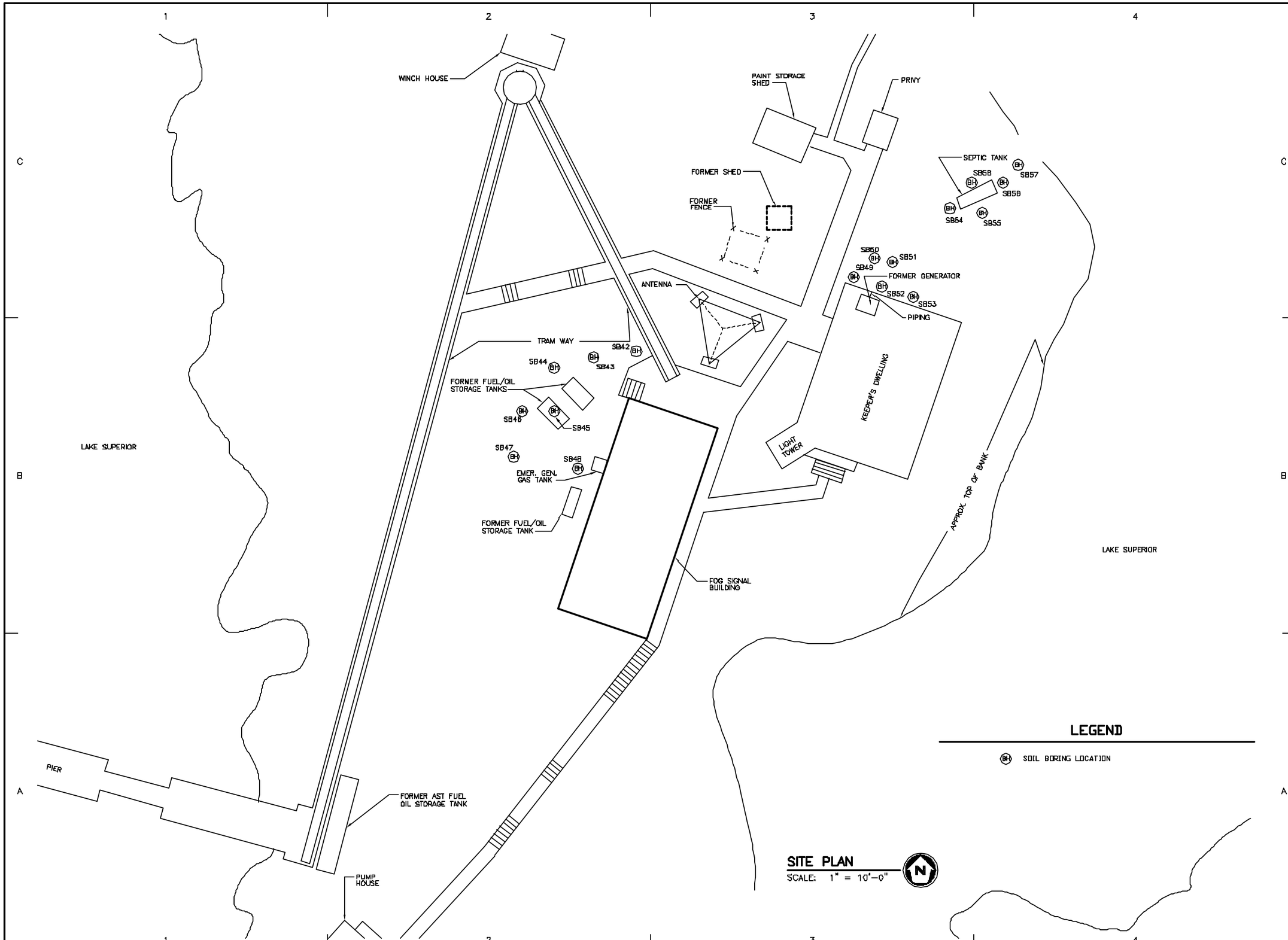
soil, samples could not be collected around the former fuel oil AST area located near the boat landing (Photograph 12). The soil borings advanced in the former AST areas are depicted in Drawing 6606-D, Sheet 2 of 7.

The island is composed mainly of exposed basalt bedrock with little or no soil cover. Due to the limited soil cover, soil borings were advanced to a maximum depth of 6 inches below ground surface (bgs) using either a hand auger or hand shovel. In addition, enough soil was not present to collect more than one sample per boring. Photographs showing the site soil conditions are provided in Appendix A. Each boring was logged for lithology in accordance with the Unified Soil Classification System (USCS). Soil boring logs are included in Appendix B. Each soil boring was screened for the presence of organic vapors using a photoionization detector (PID) equipped with an 11.7 electron volt (eV) lamp. No elevated PID readings were observed. PID readings are included in the boring logs provided in Appendix B.

A total of seven soil samples, one sample per boring, were collected in the former AST areas and submitted to an off-site laboratory (Test America, Inc. of Nashville, Tennessee) for benzene, toluene, ethylbenzene, and xylene (BTEX), 1,2,4-trimethylbenzene (TMB), 1,3,5-TMB, polynuclear aromatic hydrocarbon (PNA), and total petroleum hydrocarbon-diesel range organic (TPH-DRO) analyses.

Soil samples collected for BTEX, 1,2,4-TMB, and 1,3,5-TMB, analyses were analyzed by USEPA Method SW-846 5035/8260B. Soil samples for PNAs analyses were analyzed by USEPA Method SW-846 8310. Soil samples for TPH-DRO analyses were analyzed by USEPA Method SW-846 8015B.

Chain-of-custody (COC) procedures were utilized to ensure sample integrity. Copies of the COCs are provided in Appendix C. Quality control data included the collection of duplicate and matrix spike/matrix spike duplicate (MS/MSD) samples. Following the collection of soil samples, each boring was abandoned from the terminus of the boring (approximately 6 inches) to the surface with native topsoil.



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SHEET TITLE

SITE ASSESSMENT
PASSAGE ISLAND LIGHT STATION
KEWEENAW COUNTY MICHIGAN
SOIL BORING LOCATIONS-FORMER ASTS, PIPING & SEPTIC TANK
SITE PLAN

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3.1.2 Former Aboveground Piping Area Soil Investigation

As discussed in Section 2.3, aboveground piping was identified during the Phase I ESA. The location of the piping was not documented in the Phase I ESA. According to information provided by USCG CEU Cleveland, the piping was associated with a former generator that was located in the basement of the keeper's dwelling. During the field investigation, the piping was not present, but the location was determined to be on the north side of the keeper's dwelling, based on access holes in the wall of the building and the description in the Phase I ESA. A total of five soil borings (SB-49 through SB-53) were advanced at the site during the investigation of the former aboveground piping area to determine the nature and extent of soil impacts in this area. The five borings (SB-49 through SB-53) were advanced around the former aboveground piping located along the north wall of the keeper's dwelling. The soil borings advanced in the former aboveground piping area are depicted in Drawing 6606-D, Sheet 2 of 7. A photograph of the former aboveground piping area is included in Appendix A (Photograph 13).

The island is composed mainly of exposed basalt bedrock with little or no soil cover. Due to the limited soil cover, soil borings were advanced to a maximum depth of 4 inches bgs using either a hand auger or hand shovel. In addition, enough soil was not present to collect more than one sample per boring. Each boring was logged for lithology in accordance with the USCS. Soil boring logs are included in Appendix B. Each soil boring was screened for the presence of organic vapors using a PID equipped with an 11.7 eV lamp. No elevated PID readings were observed. PID readings are included in the boring logs provided in Appendix B.

A total of five soil samples, one sample per boring, were collected in the former aboveground piping area and submitted to Test America and analyzed for BTEX, 1,2,4-TMB, 1,3,5-TMB, PNAs, and TPH-DRO.

Soil samples collected for BTEX, 1,2,4-TMB, and 1,3,5-TMB, analyses were analyzed by USEPA Method SW-846 5035/8260B. Soil samples for PNAs analyses were analyzed by USEPA Method SW-846 8310. Soil samples for TPH-DRO analyses were analyzed by USEPA Method SW-846 8015B.

COC procedures were utilized to ensure sample integrity. Copies of the COCs are provided in Appendix C. Quality control data included the collection of duplicate and MS/MSD samples. Following the collection of soil samples, each boring was abandoned from the terminus of the boring (approximately 4 inches) to surface with native topsoil.

3.1.3 Septic System Tank Soil Investigation

As summarized in Section 2.3, the Phase I ESA documented that an oil sheen was observed in the septic tank at the site. According to information provided by USCG CEU Cleveland, waste oil was temporarily stored in the septic tank prior to removal during regularly scheduled trips to the mainland. To determine if the storage of waste oil in the septic tank has impacted the site soils, a total of five soil borings (SB-54 through SB-58) were advanced at the site during the investigation of the septic system tank area to determine the nature and extent of soil impacts in this area. The five borings (SB-54 through SB-58) were advanced around the septic system tank located north of the keeper's dwelling and east of the privy. The soil borings were advanced on the four sides of the area and in the presumed downgradient direction. The soil borings advanced in the septic system tank area are depicted in Drawing 6606-D, Sheet 2 of 7. Photograph 14 in Appendix A illustrates the septic tank area. During the field investigation, the aboveground portion of the septic tank, including a concrete pad and concrete lid, were observed to be in good condition.

The island is composed mainly of exposed basalt bedrock with little or no soil cover. Due to the limited soil cover, soil borings were advanced to a maximum depth of 6 inches bgs using either a hand auger or hand shovel. In addition, enough soil was not present to collect more than one sample per boring. Each boring was logged for lithology in accordance with the USCS. Soil boring logs are included in Appendix B. Each soil boring was screened for the presence of organic vapors using a PID equipped with an 11.7 eV lamp. No elevated PID readings were observed. PID readings are included in the boring logs provided in Appendix B.

A total of five soil samples were collected in the septic system tank area. One sample per boring was collected. Soil samples collected from the septic system tank area were submitted to Test America and analyzed for BTEX, 1,2,4-TMB, 1,3,5-TMB, 1,2-dibromoethane (EDB),

1,2-dichloroethane (DCA), volatile halocarbons, PNAs, TPH-DRO, polychlorinated biphenyls (PCBs), lead, cadmium, and chromium.

Soil samples collected for BTEX, 1,2,4-TMB, 1,3,5-TMB, 1,2-EDB, 1,2-DCA, and volatile halocarbons analyses were analyzed by USEPA Method SW-846 5035/8260B. Soil samples for PNAs analyses were analyzed by USEPA Method SW-846 8310. Soil samples for TPH-DRO analyses were analyzed by USEPA Method SW-846 8015B. Soil samples for PCB analyses were analyzed by USEPA Method SW-846 8082. Soil samples for lead, cadmium, and chromium analyses were analyzed by USEPA Method SW-846 6010B.

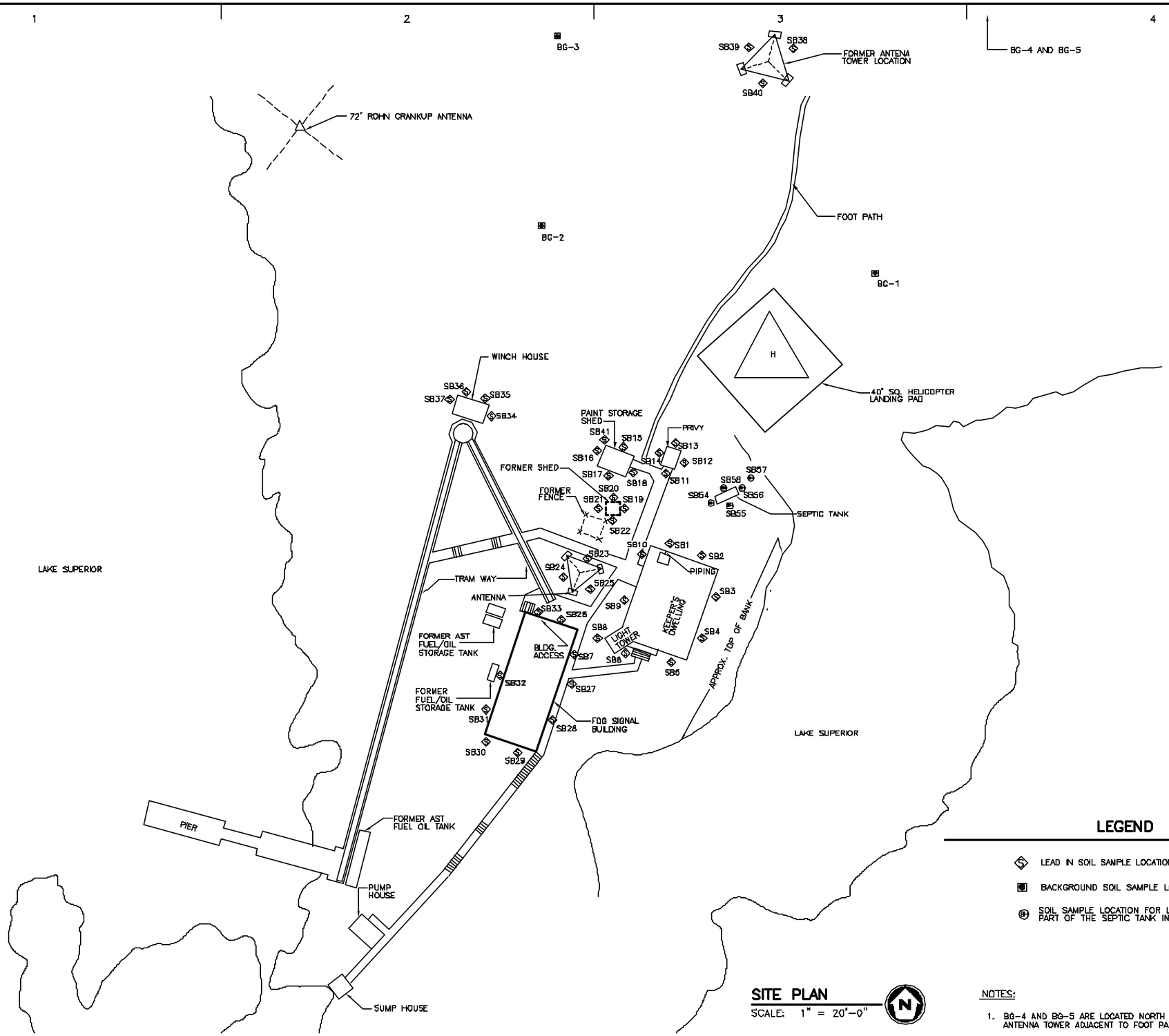
COC procedures were utilized to ensure sample integrity. Copies of the COCs are provided in Appendix C. Quality control data included the collection of duplicate and MS/MSD samples. Following the collection of soil samples, each boring was abandoned from the terminus of the boring (approximately six inches) to the surface with native topsoil.

3.1.4 Soil Investigation for Lead

A total of 41 soil borings (SB-1 through SB-41) were advanced during the soil investigation for lead to determine the nature and extent of lead impacts due to historic painting of the site structures with LBP. Drawing 6606-D, Sheet 3 of 7 presents the lead in soil boring locations.

The island is composed mainly of exposed basalt bedrock with little or no soil cover. Due to the limited soil cover, soil borings were advanced to a maximum depth of 8 inches bgs using either a hand auger or hand shovel. In addition, enough soil was not present to collect more than one sample per boring. Each boring was logged for lithology in accordance with USCS. Soil boring logs are included in Appendix B.

A total of 41 soil samples were collected, one sample per boring, during the soil investigation for lead. Soil samples collected were submitted to Test America for lead analysis by USEPA Method SW-846 6010B.



LEGEND

- LEAD IN SOIL SAMPLE LOCATION
- BACKGROUND SOIL SAMPLE LOCATION
- SOIL SAMPLE LOCATION FOR LEAD COLLECTED AS PART OF THE SEPTIC TANK INVESTIGATION

SITE PLAN

SCALE: 1" = 20'-0"

NOTES:

1. BG-4 AND BG-5 ARE LOCATED NORTH OF FORMER ANTENNA TOWER ADJACENT TO FOOT PATH

MWH
NOVI, MICHIGAN
(248) 344-0205

CONSULTANTS

U. S. COAST GUARD
CIVIL ENGINEERING UNIT
CLEVELAND

USCG, CEU CLEVELAND
1240 EAST 9TH STREET
CLEVELAND, OH 44199-2060

ISSUE		
MARK	DATE	DESCRIPTION

A/E PROJECT NO:	I:\\uscg\1999\517\c
CAD FILE NAME:	C6606C03
DESIGNED BY:	KMD
DRAWN BY:	STR
EDITED BY:	STR
CHECKED BY:	EAG
SCALE: AS SHOWN	PLOT SCALE: 1" = 30'

SHEET TITLE

SITE ASSESSMENT
PASSAGE ISLAND LIGHT STATION
KEWEENAW COUNTY MICHIGAN
LEAD IN SOIL SAMPLE LOCATIONS
SITE PLAN

REVIEWED BY:	REVIEWED BY:	REVIEWED BY:
PROJECT ENG.	BRANCH CHIEF	CONTRACTING KO
APPROVING OFFICER		DATE

PROJECT NUMBER	DRAWING NUMBER
09-C01052	6606-D
DISCIPLINE/SHT NO	SHEET 3 OF 7
C/03	

COC procedures were utilized to ensure sample integrity. Copies of the COCs are included in Appendix C. Quality control data included the collection of duplicate and MS/MSD samples. Following the collection of soil samples, each boring was abandoned from the terminus of the boring (approximately six inches bgs) with native topsoil.

3.2 BACKGROUND SOIL ASSESSMENT

A total of five soil borings (BG-01 through BG-05) were advanced in areas that were not presumed to have been impacted by historic operations at the site to determine the site-specific background lead, cadmium, and chromium concentrations. Drawing 6606-D, Sheet 3 of 7 illustrates the locations of the background borings.

The island is composed mainly of exposed basalt bedrock with little or no soil cover. Due to the limited soil cover, soil borings were advanced to a maximum depth of 6 inches bgs using either a hand auger or hand shovel. In addition, enough soil was not present to collect more than one sample per boring. Each boring was logged for lithology in accordance with USCS. Soil boring logs are included in Appendix B.

A total of five soil samples were collected from the background soil borings, one soil sample per soil boring. Soil samples were submitted to Test America for lead, cadmium, and chromium analyses by USEPA Method SW-846 6010B.

COC procedures were utilized to ensure sample integrity. Copies of the COCs are included in Appendix C. Quality control data included the collection of duplicate and MS/MSD samples. Following the collection of soil samples, each boring was abandoned from the terminus of the boring (approximately six inches bgs) with native topsoil.

3.3 EXTERIOR LEAD-BASED PAINT AND EXTERIOR ASBESTOS-CONTAINING MATERIALS ASSESSMENT

MWH contracted ETC to evaluate the exterior surfaces for LBP and ACM. ETC evaluated the site structures on June 12, 2001. The LBP assessment followed guidelines established under

USEPA Part 40 of the Code of Federal Regulations (CFR), Chapter 745, and Section 227 (40 CFR § 745.227). LBP samples were transported by ETC to an MDEQ-certified laboratory, for analysis of lead content. The ACM assessment followed guidelines established under USEPA 40 CFR § 763.86 (Sampling) and USEPA 40 CFR § 763.87 (Analysis). ACM samples were transported by ETC to an MDEQ-certified laboratory for Bulk Asbestos Fiber Analysis. The results of the evaluation are provided in Section 5.0 of this SA Report. The ETC Asbestos and Lead Based Paint Assessment Report is included in Appendix E.

3.4 DATA REDUCTION AND VALIDATION

The analytical data provided by the off-site laboratory was reduced, tabulated, and evaluated and is presented in Section 5.0 of this SA Report. The analytical data provided by Test America is provided in Appendix C. The analytical data was validated by qualified MWH personnel in accordance with the procedures defined in USEPA's *Laboratory Data Validation Functional Guidelines for Evaluation of Organic/Inorganic Data Analyses* (USEPA, 1994). Based on the results of the data validation, the analytical data generated during the SA was considered complete and valid as qualified. The validation report for the analytical data is provided in Appendix D.

3.5 INVESTIGATION-DERIVED WASTE MANAGEMENT

Investigation-derived waste (IDW) generated during the SA included disposable personal protective equipment (PPE) (i.e., sampling gloves, etc.). Excess soil cuttings were not generated due to the lack of soil on the island. Disposable PPE was placed in polyethylene trash bags, transported offsite, and disposed of at a sanitary landfill.

4.0 DEVIATIONS FROM THE WORK PLAN

Field activities were conducted in accordance with the procedures outlined in the *Final Work Plan* (Montgomery Watson, 2001). Due to conditions observed during site activities, the following modifications were necessary:

- Soil borings were advanced using a hand auger or hand shovel only. Due to shallow bedrock conditions (encountered from two inches to six inches bgs), the use of a powered auger or other direct-push techniques (i.e., Geoprobe®) was not feasible.

- Soil borings could not be advanced at the former AST area located near the boat landing due to lack of soil. The former AST area near the boat landing is composed entirely of bedrock outcrop.

- Only one soil sample per boring was collected from soil borings across the site due to lack of soil and shallow bedrock.

- During the field investigation, it was observed that the former pump house is located on exposed bedrock, which is devoid of soil cover, and the former sump house no longer exists. Therefore, soil samples were not collected surrounding the structures, as proposed in the Work Plan.

- The Phase I ESA did not depict the location of the aboveground piping at the keeper's dwelling; therefore, the location was assumed in the Work Plan to be near the northwest corner of the building. However, based on observations made during the field investigation, the piping is assumed to have been located on the north side of the keeper's dwelling. Soil borings were placed around the presumed location of the former piping.

- The Work Plan proposed five soil borings in the septic tank area. One on each side of the septic tank and one in the presumed downgradient direction. The downgradient boring was placed to the southwest of the septic tank in the Work Plan. Based on observations made during the field investigation, the presumed downgradient direction is to the northeast, and the downgradient boring was placed northeast of the septic tank.

- The background samples were not all advanced in the locations proposed in the Work Plan, due to the lack of soil and exposed bedrock in some of the locations proposed.

- USEPA Method 8310 was used to analyze the samples submitted for PNA analysis, instead of USEPA Method 8270, which was proposed in the Work Plan, as Method 8310 has lower detection limits than Method 8270.

The above deviations were discussed with the USCG during the field event and are deemed not to have negatively impacted the SA.

5.0 SUMMARY OF SITE ASSESSMENT RESULTS

This section presents the results of the SA, including site characteristics and observations, determination of the applicable cleanup criteria, the soil analytical results, and the assessment of the exterior ACM and exterior LBP on the site structures.

5.1 SITE CHARACTERISTICS AND OBSERVATIONS

Based on conditions observed at the site, the general soil profile at the site consists of brown topsoil with some vegetation, sand, and fine gravel, underlain by basalt bedrock (Photograph 15, Appendix A). Refusal was encountered at a depth of zero to eight inches bgs.

Topography in the soil investigation areas is relatively flat. The terrain is extremely rocky with little or no soil cover. The site is located on a rocky bluff that is surrounded by water to the south and east, and forested land to the north and west. Photographs in Appendix A illustrate the site topography and terrain.

5.2 APPLICABLE CRITERIA

The criteria applicable to the site includes the cleanup criteria established under Part 201. To select the appropriate cleanup criteria under Part 201, the county zoning classification for the site, intended current and future uses of the property, and the potential relevant exposure pathways at the site for soil and groundwater need to be addressed.

5.2.1 Zoning Classification

Passage Island is located within Keweenaw County, Michigan. According to the Keweenaw County Planning/Zoning Commission, Passage Island is classified as a Conservation District. The Conservation District classification includes lands designated for recreational and resource conservation purposes. Lands under the Conservation District include State-owned forest and park lands, privately held recreational property, and environmentally sensitive areas such as wetlands, offshore islands, sinkhole areas, and other features which preclude intensive development. Within a Conservation District, some of the permitted principal uses include the following:

- Cabins, summer homes, vacation cottages, or one-family detached residences.
- Farms and agricultural operations.
- Public and private camping areas for recreational or educational purposes.
- Public and private parks, playgrounds, recreational areas, camping grounds, hunting grounds, and fishing sites and wildlife preserves.

Special approval permits can be obtained from the County to allow the following uses:

- Marinas and boat launching areas.
- Utility, public service, and institutional or educational facilities and uses.
- Non-commercial garages and storage buildings not associated with agricultural use.
- Home occupations.

5.2.2 Current and Future Land Uses

Currently, the USCG owns and operates the lighthouse and surrounding site structures. The lighthouse is currently an active aid to navigation. Passage Island is maintained by the National Park Service. The USCG plans to excess the lighthouse and surrounding site structures following the resolution of environmental issues. The National Park Service is currently the planned recipient of the property. At the time of the SA, the lighthouse and surrounding structures are the focal point of a National Park Service guided tour.

Based on available information, the expected future land use of the site is to remain an active aid to navigation. The expected future land use of the surrounding property is for the purposes of a national park.

5.2.3 Potential Relevant Exposure Pathways

Based on the zoning classification and the current and expected future land uses of Passage Island, the appropriate potential relevant exposure pathways can be determined for soil and groundwater at the island.

5.2.3.1 Soil. Potential receptors for on-site soil include USCG personnel and national park employees and patrons in the vicinity of the site, and surface water. Based on the potential receptors, potential relevant exposure pathways include the following:

- Direct contact with the soil.
- Inhalation of airborne particulates.
- Inhalation of volatile organic constituents to ambient air.
- Ingestion of groundwater through which constituents in the soil have leached.
- Sediment and associated aquatic flora/fauna in a receiving water body through stormwater runoff.

Direct contact with the soil and inhalation of airborne particulates are relevant exposure pathways for on-site soil due to USCG personnel, and national park employees and patrons in the vicinity of the site.

Inhalation of volatile organic constituents to ambient air is not considered a complete pathway, as volatile organic constituents were not detected above Part 201 criteria at the site.

No drinking water wells are located on-site and groundwater was not encountered during the SA activities. While the facility was operational, potable water was pumped from Lake Superior. In addition, according to USCG CEU Cleveland personnel, level foundations for the buildings were constructed by blasting away portions of the bedrock using explosives. The foundation of the lighthouse and Keeper's Dwelling is recessed approximately 8 feet into the bedrock. Groundwater was not encountered during the construction of the building foundations. Based on the available data and due to bedrock outcrops throughout the island and at the shoreline, groundwater is not expected to be present on the island; therefore, direct contact and ingestion of groundwater through which constituents in the soil have leached are not considered complete exposure pathways.

Surface water is a relevant exposure pathway due to stormwater runoff and the close proximity of the site buildings to Lake Superior.

5.2.4 Selected Applicable Criteria

Although the permitted uses under the zoning classification of the site (Conservation District) fall under different land use categories (i.e., Residential or Commercial), under Part 201, the most stringent cleanup criteria is applicable (i.e., Residential). Based on the previously identified relevant exposure pathways, Direct Contact and Particulate Soil Inhalation Criteria established under Part 201 Generic Residential Cleanup Criteria and Screening Levels are the applicable soil criteria for the site.

Other considered criteria include site-specific background data. Under Part 201, site-specific background inorganic data can be used as default criteria if the background data is higher than the applicable criteria and statewide soil background levels provided in Part 201. Site-specific background data is discussed in Section 5.3.6 of this SA Report.

Under the 2002 revisions to the Part 201 regulations, the MDEQ has established a recreational land use category for site closure. No criteria has been established for recreational land use, so site-specific criteria would need to be developed and approved by the MDEQ. In addition, a deed restriction would be necessary for a site closed under the recreational scenario. However, closure under the recreational land use scenario would be an option.

5.3 SOIL ANALYTICAL RESULTS

A total of seven soil samples, including duplicates, were collected in the former AST areas and analyzed during SA activities. A total of six soil samples, including duplicates, were collected in the former aboveground piping area and analyzed during SA activities. A total of six soil samples, including duplicates, were collected and analyzed during the background metals investigation. A total of 43 soil samples, including duplicates, were collected and analyzed during the soil investigation for lead. A total of six soil samples were collected and analyzed during the septic system tank soil investigation. The analytical results provided by the off-site laboratory are provided in Appendix C.

5.3.1 Former ASTs Area

A total of seven soil samples, including duplicates, were collected in the former ASTs area during SA activities. The soil samples were collected from seven soil borings (SB-42 through SB-48). SB-42 through SB-48 were advanced around the three former fuel oil ASTs located along the west wall of the fog signal building. Soil samples were analyzed for BTEX, 1,2,4-TMB, 1,3,5-TMB, PNAs, and TPH-DRO. The soil analytical results are presented in Table 1. Soil boring locations are depicted in Drawing 6606-D Sheet 2 of 7.

Soil analytical results for BTEX, 1,2,4-TMB, 1,3,5-TMB, PNAs, and TPH-DRO in the former AST areas indicated several analytes were detected above the laboratory detection limits (Table 1); however, none of the constituents were detected above the Part 201, Residential Generic Cleanup Criteria. TPH-DRO was detected above the target method detection limit; however, the target method detection limit is used for screening only and no Part 201 criteria has been established for TPH-DRO.

5.3.2 Former Aboveground Piping Area

A total of six soil samples, including duplicates, were collected in the former aboveground piping area during SA activities. The soil samples were collected from five soil borings (SB-49 through SB-53). SB-49 through SB-53 were advanced along the north wall of the keeper's dwelling. Soil samples were analyzed for BTEX, 1,2,4-TMB, 1,3,5-TMB, PNAs, and TPH-DRO. The soil analytical results are presented in Table 2. Soil boring locations are depicted in Drawing 6606-D, Sheet 2 of 7.

Soil analytical results for BTEX, 1,2,4-TMB, 1,3,5-TMB, PNAs, and TPH-DRO in the former aboveground piping area indicated several analytes were detected above the laboratory detection limits (Table 2); however, none of the constituents were detected above the Part 201, Residential Generic Cleanup Criteria.

5.3.3 Septic System Tank Area

A total of six soil samples, including duplicates, were collected in the septic system tank area during SA activities. The soil samples were collected from five soil borings (SB-54 through

TABLE 1

Soil Analytical Results, AST Areas
USCG Passage Island Light Station
Keweenaw County, Michigan
Page 1 of 1

Sample ID Sample Depth	Criteria Direct Contact	Indoor Air	Inhalation	Target MDL	SB-42 (0-3")	SB-43 (0-3")	SB-44 (0-2")	SB-45 (0-3")	SB-46 (0-3")	SB-47 (0-3")	SB-48 (0-3")
BTEX and TMB Isomers											
Benzene	180	1.60	380,000	---	0.0926 J	0.0824 J	0.2151	0.2045	0.137 J	<0.1205	<0.1136
Toluene	250	250	27,000,000	---	0.6605	0.5588	1.157	1.136	0.7877	0.1807	0.233
Ethylbenzene	140	140	67,000,000	---	0.1173 J	0.1706	0.2616	0.303	0.2945	0.0542 J	.1023 J
Xylenes	150	150	290,000,000	---	0.5802	0.7706	1.581	1.477	1.404	0.2952	0.3182
1,2,4-TMB	110	110	82,000,000	---	0.1914	0.2706	0.593	0.5227	0.5205	0.1325	0.125
1,3,5-TMB	94	94	82,000,000	---	<0.1235	0.0647 J	0.1453	0.1364 J	0.1575	<0.1205	<0.1136
PNAs											
Acenapthene	41,000	190,000	14,000,000	---	<0.205 J	<0.195 J	<0.193 J	<0.252 J	<0.200 J	<0.200 J	<0.189 J
Acenapthylene	1,600	1,600	2,300,000	---	<0.411	<0.392	<0.387	<0.505	<0.456	<0.401	<0.378
Anthracene	230,000	1,000,000	67,000,000	---	<0.136	<0.129	<0.128	<0.167	<0.151	<0.133	<0.125
Benzo (a) anthracene	20	NLV	ID	---	0.1172	0.0588	<0.0251	0.0455	0.1529	0.032	0.0227
Benzo (a) pyrene	2	NLV	1,500	---	0.089	0.112	<0.020	0.056	0.178	0.052	0.023
Benzo (b) fluoranthene	20	NLV	ID	---	0.095	0.129	<0.035	0.08	0.26	0.066	0.032 J
Benzo (g,h,i) perylene	2,500	NLV	800,000	---	<0.157	0.055 J	<0.148	0.182 J	0.447	0.139 J	0.106 J
Benzo (k) fluoranthene	200	NLV	ID	---	0.047	0.071	<0.033	0.035 J	0.116	0.084	0.023 J
Chrysene	2,000	ID	ID	---	0.12	0.051	<0.029	0.058	0.195	0.052	0.026 J
Dibenzo (a,h) anthracene	2	NLV	ID	---	0.146	<0.059	<0.058	<0.076	<0.059 J	<0.060	<0.057
Fluoranthene	46,000	1,000,000	9,300,000	---	0.423 J	0.035	<0.041	0.035 J	0.388 J	0.141 J	<0.040
Fluorene	27,000	580,000	9,300,000	---	<0.102	<0.098	<0.097	<0.126	<0.114	<0.100	<0.094
Indeno (1,2,3-cd) pyrene	20	NLV	ID	---	<0.089	0.185	<0.084	0.252	0.59	0.165	0.076 J
Napthalene	16,000	250	200,000	---	<0.205	<0.195	<0.193	<0.252	<0.227	<0.200	<0.189
Phenanthrene	1,600	1,800	6,700	---	0.179	<0.126	<0.124	0.2	0.473	0.087 J	<0.122
Pyrene	29,000	1,000,000	6,700,000	---	0.257 J	0.074 J	<0.052	0.083 J	0.268	0.066 J	0.032
TPH-DRO	---	---	---	400	83.8	29.4	1170	107	579	236	210

NOTES:
1. All data in milligrams per kilogram (mg/kg)
2. ": indicates inches below ground surface
3. TMB: trimethylbenzene
4. PNAs: polynuclear aromatic hydrocarbons
5. TPH-DRO: Total Petroleum Hydrocarbons in the Diesel Range Organics
6. J: Concentration listed is an estimated value
7. Boxed data indicates criteria exceedance
8. MDL: Method Detection Limit

CRITERIA:
Criteria is Michigan Department of Environmental Quality (MDEQ), Part 201 of the Natural Resources and Environmental Protection Act, 1994 Public Act 451, as amended, Residential Generic Cleanup Criteria and Screening Levels
1. GSI: Groundwater Surface Water Interface Protection Criteria
2. Indoor Air: Soil Volatilization to Indoor Air Inhalation Criteria
3. Inhalation: Particulate Soil Inhalation Criteria
4. NLL: Criteria not available under MDEQ Part 201, hazardous substance is not likely to leach under most soil conditions
5. NLV: Criteria not available under MDEQ Part 201, hazardous substance is not lilkely to volatize under most conditions
6. ID: Criteria not available under MDEQ Part 201, inadequate data to develop criterion
7. --- : Not Applicable

TABLE 2

Soil Analytical Results, Aboveground Piping by Keeper's Dwelling Area
USCG Passage Island Light Station
Keweenaw County, Michigan

Sample ID	Criteria: Direct Contact	Criteria: Indoor Air	Criteria: Inhalation	Criteria: Target MDL	SB-49 (0-2")	SB-50 (0-4")	SB-51 (0-3")	SB-52 (0-2")	SB-53 (0-1)'
Benzene	180	1.60	380,000	---	<0.1351	<0.1562	<0.1471	<0.1333	<0.1449
Toluene	250	250	27,000,000	---	<0.1351	<0.1562	<0.1471	<0.1333	<0.1449
Ethylbenzene	140	140	67,000,000	---	<0.1351	<0.1562	<0.1471	<0.1333	<0.1449
Xylenes	150	150	290,000,000	---	<0.1351	<0.1562	<0.1471	<0.1333	<0.1449
1,2,4-TMB	110	110	82,000,000	---	<0.1351	<0.1562	<0.1471	<0.1333	<0.1449
1,3,5-TMB	94	94	82,000,000	---	<0.1351	<0.1562	<0.1471	<0.1333	0.0775 J
PNAs									
Acenapthene	41,000	190,000	14,000,000	---	<0.224	<0.259	<0.244	<0.221	<0.241
Acenapthylene	1,600	1,600	2,300,000	---	<0.450	<0.520	<0.490	<0.444	<0.483
Anthracene	230,000	1,000,000	67,000,000	---	<0.149	<0.172	<0.162	<0.147	<0.159
Benzo (a) anthracene	20	NLV	ID	---	<0.0292	0.0728	0.1101	0.2043	0.0748
Benzo (a) pyrene	2	NLV	1,500	---	<0.023	0.073	0.151	0.257	0.072
Benzo (b) fluoranthene	20	NLV	ID	---	<0.041	0.067	0.143	0.261	0.099
Benzo (g,h,i) perylene	2,500	NLV	800,000	---	<0.172	0.152 J	0.216 J	0.264 J	0.113 J
Benzo (k) fluoranthene	200	NLV	ID	---	<0.038	0.031 J	0.069	0.123	0.046
Chrysene	2,000	ID	ID	---	<0.034	0.083	0.135	0.235	0.075
Dibenzo (a,h) anthracene	2	NLV	ID	---	<0.068 J	<0.078 J	0.287 J	0.047 J	<0.072 J
Fluoranthene	46,000	1,000,000	9,300,000	---	<0.047	0.286 J	0.346 J	0.441 J	0.222 J
Fluorene	27,000	580,000	9,300,000	---	<0.112	<0.130	<0.122	<0.111	<0.120
Indeno (1,2,3-cd) pyrene	20	NLV	ID	---	<0.097	0.152	0.343	0.313	0.097 J
Napthalene	16,000	250	200,000	---	<0.224	<0.259	<0.244	<0.221	<0.241
Phenanthrene	1,600	1,800	6,700	---	<0.145	<0.167	0.331	0.16	<0.155
Pyrene	29,000	1,000,000	6,700,000	---	<0.061	0.144 J	0.276 J	0.604 J	0.145 J
TPH-DRO	---	---	---	400	201	53.1	43.4	58.4	44.6

NOTES:
1. All data in milligrams per kilogram (mg/kg)
2. *: Indicates an exceedance of GSI criteria
3. TMB: trimethylbenzene
4. PNAs: polynuclear aromatic hydrocarbons
5. ND: Analyte not detected above the detection limit
6. NA: Sample not collected for analyte analysis
7. J: Concentration listed is an estimated value

CRITERIA:
Criteria is Michigan Department of Environmental Quality (MDEQ), Part 201 of the Natural Resources and Environmental Protection Act, 1994 Public Act 451, as amended, Residential Generic Cleanup Criteria and Screening Levels
1. Indoor Air: Soil Volatilization to Indoor Air Inhalation Criteria
2. Inhalation: Particulate Soil Inhalation Criteria
3. NLL: Criteria not available under MDEQ Part 201, hazardous substance is not likely to leach under most soil conditions
4. NLV: Criteria not available under MDEQ Part 201, hazardous substance is not likely to volatize under most conditions
5. ID: Criteria not available under MDEQ Part 201, inadequate data to develop criterion
6. ---: Criteria not available
7. MDL: Target Method Detection Limit used as a screening level for TPH-DRO

SB-58). SB-54 through SB-58 were advanced around the septic system tank located north of the keeper's dwelling and east of the privy. Soil samples were analyzed for BTEX, 1,2,4-TMB, 1,3,5-TMB, volatile halocarbons, 1,2-DCA, 1,2-EDB, PNAs, TPH-DRO, PCBs, cadmium, chromium, and lead. The soil analytical results for BTEX, 1,2,4-TMB, 1,3,5-TMB, volatile halocarbons, 1,2-DCA, 1,2-EDB, PNAs, and TPH-DRO are presented in Table 3. The soil analytical results for PCBs, cadmium, chromium, and lead are presented in Table 4. Soil boring locations are depicted in Drawing 6606-D Sheet 2 of 7.

Soil analytical results for BTEX, 1,2,4-TMB, 1,3,5-TMB, volatile halocarbons, 1,2-DCA, 1,2-EDB, PNAs, TPH-DRO, PCBs, cadmium, and chromium in the septic system tank area indicated several analytes were detected above the laboratory detection limits. Soil analytical results for BTEX, 1,2,4-TMB, 1,3,5-TMB, volatile halocarbons, 1,2-DCA, 1,2-EDB, PNAs, TPH-DRO, PCBs, cadmium, and chromium were not detected above criteria.

Soil analytical results for lead indicated exceedances of the direct contact criteria of 400 milligrams per kilogram (mg/kg) in all five soil borings (SB-54 through SB-58). Lead in soil analytical results range from 417 mg/kg to 786 mg/kg. Due to the proximity of the lead detections in the septic tank area to the keeper's dwelling, the lead detections in this area are likely attributable to impacts from LBP from the exterior of the keeper's dwelling. Lead analytical results are presented in Table 4. The locations of the soil borings with concentrations of lead exceeding criteria are depicted in Drawing 6606-D, Sheet 4 of 7.

5.3.4 Lead in Soil

A total of 43 soil samples, including duplicates, were collected during the soil investigation for lead. The lead in soil analytical results are presented in Table 5. Soil boring locations are depicted in Drawing 6606-D Sheet 3 of 7.

Lead was detected at concentrations exceeding Part 201 Direct Contact Criteria (400 mg/kg) in 36 soil borings (SB-1 through SB-19, and SB-21 through SB-37). The soil borings exceeding criteria surround the following site structures: the lighthouse and attached keeper's dwelling, fog

TABLE 3

Soil Analytical Results, Septic System Tank Area
USCG Passage Island Light Station
Keweenaw County, Michigan

Sample ID	Criteria: Direct Contact	Criteria: Indoor Air	Criteria: Inhalation	Criteria: Target MDL	SB-54 (0-6")	SB-55 (0-4")	SB-56 (0-4")	SB-57 (0-4")	SB-58 (0-4")
BTEX & TMB Isomers									
Benzene	180	1.60	380,000	---	<0.1316	<0.1111	<0.1515	<0.1515	<0.1493
Toluene	250	250	27,000,000	---	<0.1316	<0.1111	<0.1515	<0.1515	<0.1493
Ethylbenzene	140	140	67,000,000	---	<0.1316	<0.1111	<0.1515	<0.1515	<0.1493
Xylenes	150	150	290,000,000	---	<0.1316	<0.1111	<0.1515	<0.1515	<0.1493
1,2,4-TMB	110	110	82,000,000	---	<0.1316	<0.1111	<0.1515	<0.1515	<0.1493
1,3,5-TMB	94	94	82,000,000	---	<0.1316	<0.1111	<0.1515	<0.1515	<0.1493
Volatile Halocarbons									
Acetone	23,000	110,000	3.9 x 10^8	---	0.4145 J	<2.778	<3.778	<3.788	<3.731
Trichlorofluoromethane	560	560	3.8 x 10^9	---	0.1118 J	<0.1111	<0.1515	<0.1515	<0.1493
PNAs									
Acenapthene	41,000	190,000	14,000,000	---	<0.088	<0.037	<0.100	<0.100	<0.100
Acenapthylene	1,600	1,600	2,300,000	---	<0.175	<0.074	<0.202	<0.200	<0.199
Anthracene	230,000	1,000,000	67,000,000	---	<0.058	<0.024	<0.067	<0.067	<0.066
Benzo (a) anthracene	20	NLV	ID	---	0.0096 J	0.0041 J	<0.0130	0.0211 J	0.0109 J
Benzo (a) pyrene	2	NLV	1,500	---	0.017	0.008	0.014	0.038	0.022
Benzo (b) fluoranthene	20	NLV	ID	---	0.02	0.008	0.014 J	0.036	0.019
Benzo (g,h,i) perylene	2,500	NLV	800,000	---	0.036 J	0.006 J	0.026 J	0.042 J	0.022 J
Benzo (k) fluoranthene	200	NLV	ID	---	<0.014	0.004 J	<0.017	0.017 J	0.012 J
Chrysene	2,000	ID	ID	---	0.017 J	0.007 J	<0.015	0.033 J	0.016 J
Dibenzo (a,h) anthracene	2	NLV	ID	---	<0.026	<0.011	<0.030	<0.030	<0.030
Fluoranthene	46,000	1,000,000	9,300,000	---	0.038	0.013	<0.021	0.062	0.033
Fluorene	27,000	580,000	9,300,000	---	<0.043	<0.019	<0.050	<0.050	<0.049
Indeno (1,2,3-cd) pyrene	20	NLV	ID	---	0.026 J	0.009 J	0.027 J	0.042 J	0.022 J
Napthalene	16,000	250	200,000	---	<0.088	<0.037	<0.100	<0.100	<0.100
Phenanthrene	1,600	1,800	6,700	---	0.058	0.016 J	<0.065	0.035 J	<0.064
Pyrene	29,000	1,000,000	6,700,000	---	0.024 J	0.009 J	<0.027	0.045 J	0.027 J
TPH-DRO	---	---	---	400	28	61.2	39.8	56.8	29.1
1,2 DCA	91	2	120,000	---	<0.1316	<0.1111	<0.1515	<0.1515	<0.1493
1,2 EDB	0.092	0.670	14,700	---	<0.1316	<0.1111	<0.1515	<0.1515	<0.1493

NOTES:
1. All data in milligrams per kilogram (mg/kg)
2.. TMB: trimethylbenzene
3. PNAs: polynuclear aromatic hydrocarbons
4. TPH-DRO: Total Petroleum Hydrocarbons in the Diesel Range Organics
5. DCA: dichloroethane
6. EDB: dibromoethane
7. J: Concentration listed is an estimated value
8. Only volatile halocarbons detected above the laboratory detection limits are listed above
9. MDL: Method Detection Limit

CRITERIA:
Criteria is Michigan Department of Environmental Quality (MDEQ), Part 201 of the Natural Resources and Environmental Protection Act, 1994 Public Act 451, as amended, Residential Generic Cleanup Criteria and Screening Levels
1. Indoor Air: Soil Volatilization to Indoor Air Inhalation Criteria
2. Inhalation: Particulate Soil Inhalation Criteria
3. NLV: Criteria not available under MDEQ Part 201, hazardous substance is not likely to volatize under most conditions
4. ID: Criteria not available under MDEQ Part 201, inadequate data to develop criterion

TABLE 4

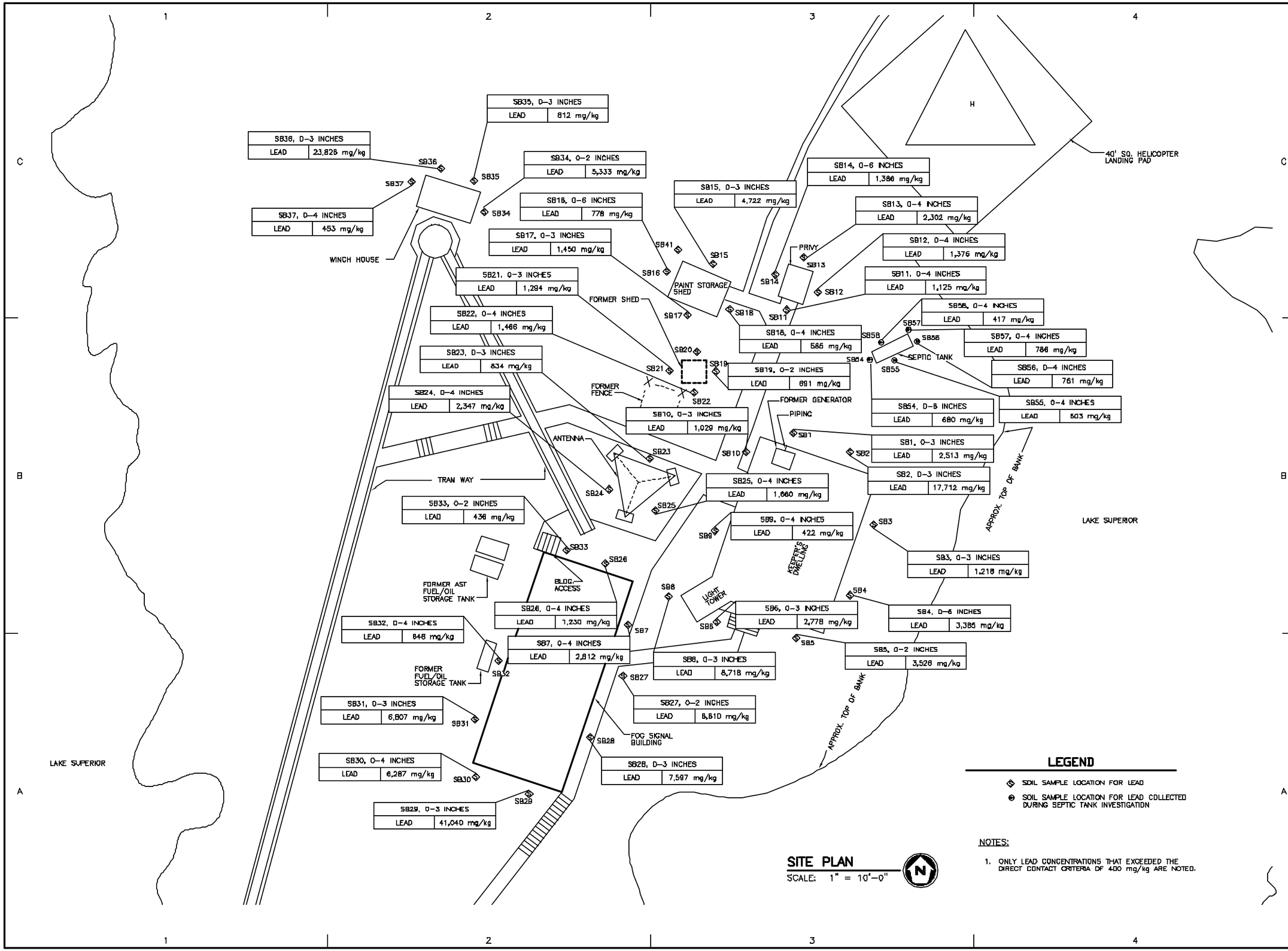
Soil Analytical Results - Septic System Tank Area
USCG Passage Island Light Station
Keweenaw County, Michigan
Page 1 of 1

Sample ID	Depth (inches bgs)	PCBs	Cadmium	Chromium	Lead
SB-54	**(0-6")**	<0.0263	1.78	15.5	680
SB-55	**(0-4")**	<0.0222	1.95	13.5	603
SB-56	**(0-4")**	<0.3027	2.41	17.1	761
SB-57	**(0-4")**	<0.0303	9.30	27.3	786
SB-58	**(0-4")**	<0.0299	<1.478	20.1	417
CRITERIA					
Direct Contact		4	550	790,000	400
Indoor Air		3,000	NLV	NLV	NLV
Inhalation		5,200	1,700	330,000	100,000
Statewide Default Bkgd		NA	1.2	18	21
Calc Bkgd		NA	5.4	46	459.4

NOTES:
1. All data in milligrams per kilogram (mg/kg)
2. Boxed cells indicate an exceedance of Direct Contact criteria
3. PCBs: polychlorinated biphenyls
4. inches bgs: inches below ground surface

CRITERIA:

Criteria is Michigan Department of Environmental Quality (MDEQ), Part 201 of the Natural Resources and Environmental Protection Act, 1994 Public Act 451, as amended, Residential Generic Cleanup Criteria and Screening Levels
1. Indoor Air: Soil Volatilization to Indoor Air Inhalation Criteria
2. Inhalation: Particulate Soil Inhalation Criteria
3. NLV: Criteria not available under MDEQ Part 201, hazardous substance is not lilkely to volatize under most conditions
4. NA: Not applicable
5. Calc Bkgd: Calculated site-specific background concentrations, represent upper limit



LEGEND

- SOIL SAMPLE LOCATION FOR LEAD
- SOIL SAMPLE LOCATION FOR LEAD COLLECTED DURING SEPTIC TANK INVESTIGATION

NOTES:

1. ONLY LEAD CONCENTRATIONS THAT EXCEEDED THE DIRECT CONTACT CRITERIA OF 400 mg/kg ARE NOTED.

SITE PLAN

SCALE: 1" = 10'-0"

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1240 EAST 9TH STREET
CLEVELAND, OH 44199-2060

ISSUE

MARK	DATE	DESCRIPTION

A/E PROJECT NO: I:\uscg\1999\517\c
CAD FILE NAME: C6606C04
DESIGNED BY: KMD
DRAWN BY: STR
EDITED BY: STR
CHECKED BY: EAG

SCALE: AS SHOWN PLOT SCALE: 1" = 30'

SHEET TITLE

SITE ASSESSMENT
PASSAGE ISLAND LIGHT STATION
KEWEENAW COUNTY MICHIGAN
DETECTED LEAD CONCENTRATIONS EXCEEDING CRITERIA
SITE PLAN

REVIEWED BY:	REVIEWED BY:	REVIEWED BY:
PROJECT ENG.	BRANCH CHIEF	CONTRACTING KO

APPROVING OFFICER DATE

PROJECT NUMBER	DRAWING NUMBER
09-C01052	6606-D

DISCIPLINE/SHT NO C/04 SHEET 4 OF 7

TABLE 5

Soil Analytical Results - Lead in Soil
USCG Passage Island Light Station
Keweenaw County, Michigan
Page 1 of 1

Sample ID	Depth (inches bgs)	Lead
SB-01	**(0-3")**	2,513
SB-02	**(0-3")**	17,712
SB-03	**(0-3")**	1,218
SB-04	**(0-6")**	3,385
SB-05	**(0-2")**	3,526
SB-06	**(0-3")**	2,778
SB-07	**(0-4")**	2,812
SB-08	**(0-3")**	8,718
SB-09	**(0-4")**	422
SB-10	**(0-3")**	1,029
SB-11	**(0-4")**	1,125
SB-12	**(0-4")**	1,376
SB-13	**(0-4")**	2,302
SB-14	**(0-6")**	1,386
SB-15	**(0-3")**	4,722
SB-16	**(0-6")**	778
SB-17	**(0-3")**	1,450
SB-18	**(0-4")**	585
SB-19	**(0-2")**	691
SB-20	**(0-3")**	382
SB-21	**(0-3")**	1,294
SB-22	**(0-4")**	1,466
SB-23	**(0-3")**	834
SB-24	**(0-4")**	2,347
SB-25	**(0-4")**	1,660
SB-26	**(0-4")**	1,230
SB-27	**(0-2")**	6,610
SB-28	**(0-3")**	7,597
SB-29	**(0-3")**	41,040
SB-30	**(0-4")**	6,287
SB-31	**(0-3")**	6,807
SB-32	**(0-4")**	648
SB-33	**(0-2")**	436
SB-34	**(0-2")**	5,333
SB-35	**(0-3")**	812
SB-36	**(0-3")**	23,826
SB-37	**(0-4")**	453
SB-38	**(0-3")**	103
SB-39	**(0-3")**	338
SB-40	**(0-3")**	100

CRITERIA[a]	
Direct Contact	400
Indoor Air	NLV
Inhalation	100,000
Statewide Default Bkgd	21
Calc Bkgd	538

NOTES:
1. All data in milligrams per kilogram (mg/kg)
2. Boxed cells indicate an exceedance of Direct Contact criteria
3. *: Indicates an exceedance of GSI criteria
4. inches bgs: inches below ground surface

CRITERIA:
Criteria is Michigan Department of Environmental Quality (MDEQ), Part 201 of the Natural Resources and Environmental Protection Act, 1994 Public Act 451, as amended, Residential Generic Cleanup Criteria and Screening Levels

1. Indoor Air: Soil Volatilization to Indoor Air Inhalation Criteria
2. Inhalation: Particulate Soil Inhalation Criteria
3. NLV: Criteria not available under MDEQ Part 201, hazardous substance is not likely to volatize under most conditions
4. Calc Bkgd: Calculated site-specific background concentrations, represent upper limit

signal building, winch house, antenna tower, paint locker, and privy. Soil borings were advanced to a maximum depth of 6 inches bgs, where refusal was encountered. One sample was collected per boring. Lead in soil concentrations ranged from 100 mg/kg to 41,040 mg/kg. The locations of the soil borings with concentrations of lead exceeding criteria are depicted in Drawing 6606-D, Sheet 4 of 7.

5.3.5 Site-Specific Background Metals

A total of six samples, including duplicates, were collected to determine the site-specific background lead, cadmium, and chromium concentrations at the site. One sample was collected per boring from BG-1 through BG-5. The background metals analytical results are presented in Table 6. The location of the background soil borings is depicted in Drawing 6606-D, Sheet 3 of 7.

Soil analytical results for the background samples indicated that cadmium, chromium, and lead were not detected above criteria. Cadmium was not detected above laboratory detection limits. Chromium was detected above laboratory detection limits at concentrations ranging from 18.9 mg/kg to 33.9 mg/kg. Lead was also detected above laboratory detection limits at concentrations ranging from 19.8 mg/kg to 288 mg/kg.

To determine site-specific background metals concentrations, a statistical analysis of the data was performed in accordance with Part 201 guidelines. Under Part 201, which defaults to the guidelines established in Michigan Department of Natural Resources (MDNR) *Guidance Document, Verification of Soil Remediation* (MDNR, 1994), the recommended statistical method for determining background concentrations is to establish the upper limit of the constituent using the mean plus three standard deviation approach. Under this approach, at least four concentrations must be available per constituent and the background mean ($\overline{X_b}$), background variance (S_b^2), background standard deviation (S_b), and coefficient of variance (CV) must be determined.

The background mean is calculated using the following equation:

$$\overline{X_b} = \frac{X_1 + X_2 + \ldots X_n}{n_b}$$

TABLE 6

Soil Analytical Results - Background Soil Borings
USCG Passage Island Light Station
Keweenaw County, Michigan
Page 1 of 1

Sample ID	Depth (inches bgs)	Cadmium	Chromium	Lead
BG-1	**(0-3")**	<2.17	11.3	180
BG-2	**(0-3")**	<2.86	18	288
BG-3	**(0-2")**	<2.61	21.9	46.4
BG-4	**(0-6")**	<4.1	18.9	30.3
BG-4 DUP	**(0-6")**	<3.82	28.2	19.8
BG-5	**(0-3")**	<3.46	33.9	199
CRITERIA				
Direct Contact		550	790,000	400
Indoor Air		NLV	NLV	NLV
Inhalation		1,700	330,000	100,000
Statewide Default Bkgd		1.2	18	21
Calc Bkgd		5.4	46	459.4

NOTES:
1. All data in milligrams per kilogram (mg/kg)
2. inches bgs: feet below ground surface

CRITERIA:
Criteria is Michigan Department of Environmental Quality (MDEQ), Part 201 of the Natural Resources and Environmental Protection Act, 1994 Public Act 451, as amended, Residential Generic Cleanup Criteria and Screening Levels
1. Indoor Air: Soil Volatilization to Indoor Air Inhalation Criteria
2. Inhalation: Particulate Soil Inhalation Criteria
3. NLV: Criteria not available under MDEQ Part 201, hazardous substance is not lilkely to volatize under most conditions
4. Calc Bkgd: Calculated site-specific background concentrations, represent upper limit

The background variance is calculated by summing the squares of the mean subtracted from each concentration and dividing by the degrees of freedom (n) (total number of background concentrations minus one). The background variance is calculated as follows:

$$S_b^2 = \frac{(X_1 - \overline{X_b})^2 + (X_2 - \overline{X_b})^2 + \ldots (X_n - \overline{X_b})^2}{n - 1}$$

The background standard deviation is calculated by taking the square root of the background variance. The coefficient of variance is calculated to evaluate the distribution of the data. According to Part 201, background data should generally have a coefficient of variance less than 0.5 for granular soils. According to USEPA guidance provided in the *Interim Final Guidance, Statistical Analysis of Ground-Water Monitoring Data at RCRA (Resource Conservation and Recovery Act) Facilities*, (USEPA, 1989) a coefficient of variance greater than 1.00 is an indication that the collected data does not fit a normal distribution. The coefficient of variance is calculated by dividing the background standard deviation by the background mean, shown below:

$$CV = \frac{S_b}{\overline{X_b}}$$

To determine the maximum allowable limit (upper background concentration limit), the background mean is added to three times the background standard deviation, shown below:

$$\text{Background upper limit} = \overline{X_b} + (3 * S_b)$$

The site-specific background upper limits and associated statistical analysis values for lead cadmium and chromium are presented in Table 6. In accordance with Part 201, for metals with less than half of the background data available below the detection limit, one half of the detection limit was used as the analytical result. For metals with more than half of the background data available below the detection limit, half of the data was substituted with the

detection limit and the other half with the value of zero. An example calculation for determining the site-specific background metal upper limit is provided in Appendix F.

5.4 EXTERIOR LEAD-BASED PAINT AND EXTERIOR ASBESTOS-CONTAINING MATERIALS ASSESSMENT

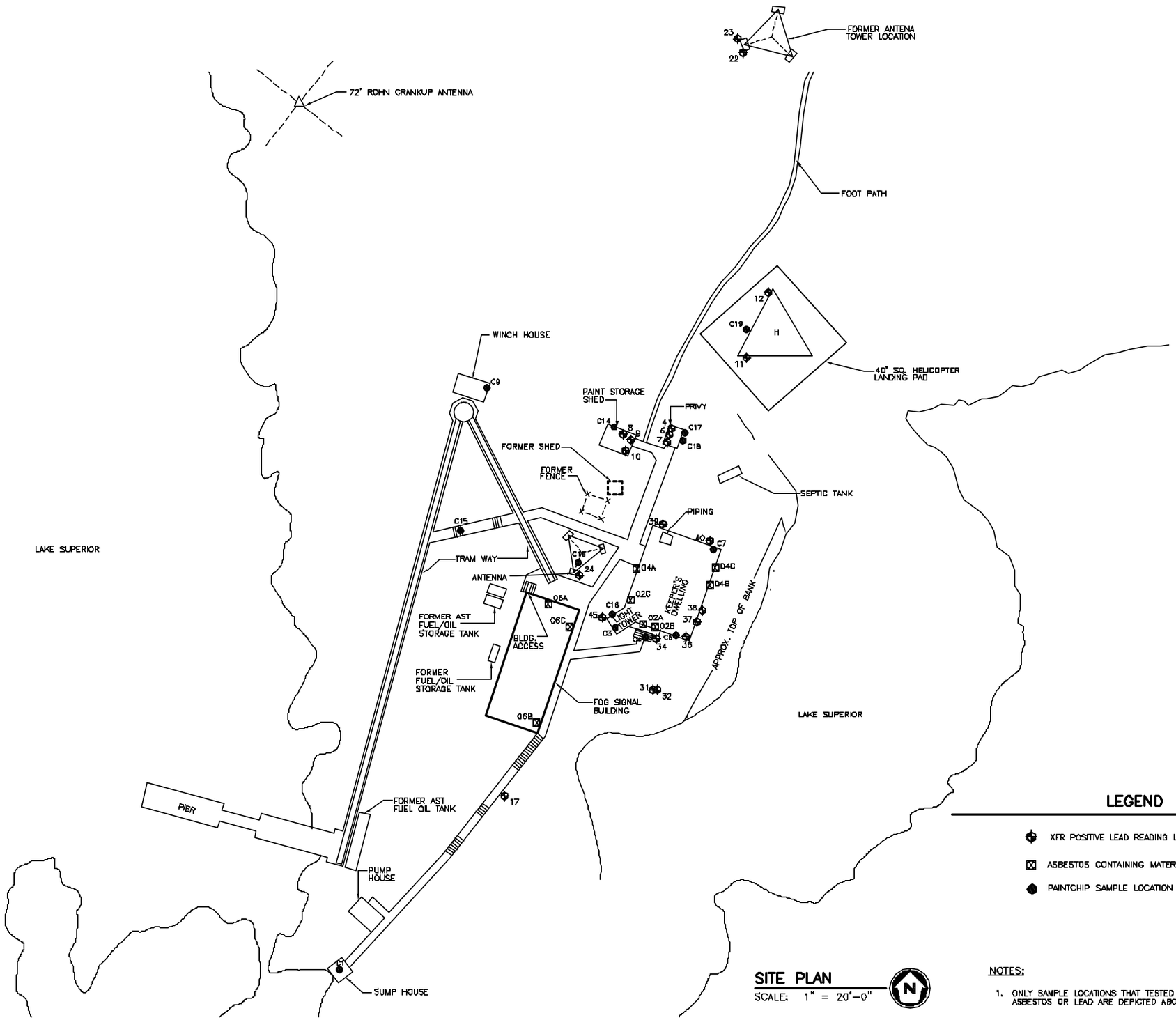
ETC conducted an exterior ACM and LBP assessment at the Passage Island Light Station on June 12, 2001. ETC evaluated 10 structures at the Light Station. The evaluated structures included: the lighthouse and attached keeper's dwelling, fog signal building, winch house, paint locker, former pump house, privy, solar panels, antenna tower, helicopter pad, and former antenna tower. The ETC LPB and ACM Assessment Report is included in Appendix E.

5.4.1 Exterior ACM Assessment

During the exterior ACM assessment, ETC collected 30 individual samples for the presence of asbestos fibers. The lighthouse and attached keeper's dwelling, fog signal building, winch house and former pump house were identified as having potential asbestos containing materials. The location of the samples containing asbestos are depicted on Drawing 6606-D, Sheet 5 of 7. The results are summarized in Table 7.

Four different types of materials were sampled at the lighthouse and attached keeper's dwelling for the presence of asbestos fibers. The types of material sampled included roof flashing sealer (found on roof surface where roof meets a higher level of the building), asphalt shingles, window glazing, and tar sealant (found on pipes exiting the stone walls on north and south side of structure). The sample results indicated that the roof flashing sealer and tar sealant were the only materials containing asbestos. The roof flashing and tar sealant appeared to be in good condition during the Site Assessment. These materials are considered non-friable due to the sticky nature of the material.

Two different types of materials were sampled at the fog signal building for the presence of asbestos fibers. The types of material sampled included tar paper and asphalt shingles. The



LEGEND

- XFR POSITIVE LEAD READING LOCATION
- ASBESTOS CONTAINING MATERIAL SAMPLE LOCATION
- PAINTCHIP SAMPLE LOCATION

SITE PLAN

SCALE: 1" = 20'-0"

NOTES:

1. ONLY SAMPLE LOCATIONS THAT TESTED POSITIVE FOR ASBESTOS OR LEAD ARE DEPICTED ABOVE

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ISSUE		
MARK	DATE	DESCRIPTION

A/E PROJECT NO:	I:\\uscg\1999\517\c
CAD FILE NAME:	C6606C05
DESIGNED BY:	KMD
DRAWN BY:	STR
EDITED BY:	STR
CHECKED BY:	EAG

SCALE: AS SHOWN PLOT SCALE: 1" = 30'

SHEET TITLE

SITE ASSESSMENT
PASSAGE ISLAND LIGHT STATION
KEWEENAW COUNTY MICHIGAN
ACM AND LBP SAMPLE LOCATIONS
SITE PLAN

REVIEWED BY:	REVIEWED BY:	REVIEWED BY:
PROJECT ENG.	BRANCH CHIEF	CONTRACTING KO

APPROVING OFFICER DATE

PROJECT NUMBER	DRAWING NUMBER
09-C01052	6606-D
DISCIPLINE/SHT NO	
C/05	SHEET 5 OF 7

TABLE 7

Asbestos Results
USCG Passage Island Light Staton
Keweenaw County, Michigan
Page 1 of 1

Bulk Asbestos Sample # and Description	Asbestos-Containing Materials Abatement or Hazard Reduction Action Levels	Asbestos Present	Types of Asbestos	Percent of Asbestos Present
02A Lighthouse-flashing tar on main entrance	1% Asbestos by Weight	YES	Chrysotile	5% Asbestos by Weight
02B Lighthouse-flashing tar on main entrance	1% Asbestos by Weight	YES	Chrysotile	5% Asbestos by Weight
02C Lighthouse-flashing tar on roof	1% Asbestos by Weight	YES	Chrysotile	15% Asbestos by Weight
04A Lighthouse-tar sealer on pipes	1% Asbestos by Weight	YES	Chrysotile	5% Asbestos by Weight
04B Lighthouse-tar sealer on pipes	1% Asbestos by Weight	YES	Chrysotile	30% Asbestos by Weight
04C Lighthouse-tar sealer on window	1% Asbestos by Weight	YES	Chrysotile	10% Asbestos by Weight
06A Fog Signal Building-roofing	1% Asbestos by Weight	YES	Chrysotile	15% Asbestos by Weight
06B Fog Signal Building-roofing	1% Asbestos by Weight	YES	Chrysotile	20% Asbestos by Weight
06C Fog Signal Building-roofing	1% Asbestos by Weight	YES	Chrysotile	20% Asbestos by Weight

sample results indicated that the asphalt shingles were the only material to contain asbestos fibers. The shingles are considered non-friable and appeared to be in good condition.

Tar paper and asphalt shingles were also sampled at the winch house for the presence of asbestos fibers. The sample results indicated that neither material contains asbestos fibers. The roofing material (rolled asphalt sheeting) was sampled at the former pump house for the presence of asbestos fibers. The sample results indicated that the roofing material does not contain asbestos.

5.4.2 Exterior LBP Assessment

During the exterior LBP assessment, ETC used an X-Ray Fluorescence (XRF) device and collected paint chip samples to determine the presence of LBP. The painted surfaces on the exterior of 10 site structures including; the lighthouse and attached keeper's dwelling, fog signal building, winch house, paint locker, former pump house, privy, solar panels, antenna tower, helicopter pad, and former antenna tower were identified as potential lead-based painted surfaces. In addition to the 10 site structures, some additional exterior features including the steel tramway, steps leading to the winch house, entrance steps into the lighthouse, and the flagpole were tested for the presence of LBP.

The XRF and paint chip sample results indicate that nine of the 10 site structures contain LBP. The nine structures include: the lighthouse and attached keeper's dwelling, fog signal building, winch house, paint locker, former pump house, privy, antenna tower, helicopter pad, and former antenna tower. The XRF and paint chip sample results are summarized in Table 8, and the locations of samples tested positive for LBP are included on Drawing 6606-D, Sheet 5 of 7. A positive reading refers to a sample that registered an average lead concentration of equal to or greater than 0.3 milligrams per square centimeter (mg/cm^2).

Painted surfaces on the exterior of the lighthouse and attached keeper's dwelling included decorative wood pieces, soffits, and window sashes and frames. All painted surfaces on the lighthouse and attached keeper's dwelling, including the decorative wood pieces, soffits, and exterior window sashes, tested positive for LBP, and the metal roof flashings are composed entirely of lead. All painted surfaces on the fog signal building including the soffits, window

Table 8

Lead Based Paint Analytical Results
USCG Passage Island Light Station
Keweenaw County, Michigan
Page 1 of 1

Sample ID	Sample Location	XRF Result for LBP
4	Privy-exterior wall siding (white)	POSITIVE FOR LEAD
6	Privy-exterior wall siding (white)	POSITIVE FOR LEAD
7	Privy-exterior wall siding (white)	POSITIVE FOR LEAD
8	Paint Locker-exterior wall siding (white)	POSITIVE FOR LEAD
9	Paint Locker-exterior wall siding (white)	POSITIVE FOR LEAD
10	Paint Locker-exterior wall siding (white)	POSITIVE FOR LEAD
11	Helicopter Landing Pad-red paint markings	POSITIVE FOR LEAD
12	Helicopter Landing Pad-paint markings (red)	POSITIVE FOR LEAD
17	Catwalk-railing (yellow)	POSITIVE FOR LEAD
22	Former Antenna Tower Base (white)	POSITIVE FOR LEAD
23	Former Antenna Tower Base (white)	POSITIVE FOR LEAD
24	Antenna Tower (red)	POSITIVE FOR LEAD
31	Flag Pole (white)	POSITIVE FOR LEAD
32	Flag Pole (white)	POSITIVE FOR LEAD
34	Lighthouse Main Entrance (gray)	POSITIVE FOR LEAD
36	Lighthouse Window Sash (green)	POSITIVE FOR LEAD
37	Lighthouse Window Trim (white)	POSITIVE FOR LEAD
38	Lighthouse-soffit (white)	POSITIVE FOR LEAD
39	Lighthouse-soffit (white)	POSITIVE FOR LEAD
40	Lighthouse-corner cap (white)	POSITIVE FOR LEAD
45	Lighthouse-tower (green)	POSITIVE FOR LEAD

Sample ID	Sample Locaton	Paint Chip Samples Results for Lead % by weight
C1	Pump House (gray)	>1.28
C3	Lighthouse (green)	>0.78
C4	Lighthouse-main entrance stairway (green)	>0.94
C6	Lighthouse-window boards (white)	>0.85
C7	Lighthouse-window boards (blue)	1.38
C9	Winch House-soffits (green)	0.53
C14	Paint Storage Shed	>1.28
C15	Concrete Walk (yellow)	>1.14
C16	Antenna-tower (red)	>7.14
C17	Privy (white)	>0.5
C18	Lighthouse-corner (white)	>0.62
C19	Helicopter Landing Pad (red)	>16.67
C20	Privy (white)	>0.77

Notes:
1. XRF: x-ray fluoresence
2. A positive result for lead refers to a sample that registered a reading of an average lead concentration of equal to or greater than 0.3 mg/cm^2
3. Color specifies color of paint sampled

casings, and door frames tested positive for LBP. All painted surfaces on the former pump house including the door frame and roof tested positive for LBP. All painted surfaces on the winch house including the door, door frame, windows, and soffits tested positive for LBP. All painted surfaces on the privy and paint locker tested positive for LBP. All painted surfaces on the antenna tower tested positive for LBP. All painted surfaces on the helicopter pad tested positive
for LBP. A small 2 foot by 2 foot square painted surface on the former antenna tower foundation tested positive for LBP.

Additional exterior site features at the site were also tested for LBP. The painted surfaces on the tramway and associated railing leading to the boat landing tested negative for LBP. The yellow painted surface on a step leading from the lighthouse to the winch house tested positive for LBP. The flagpole on the west side of the lighthouse tested positive for LBP. The painted surfaces on entrance steps to the lighthouse on the west side of the building tested positive for LBP.

The painted surfaces that tested positive for LBP were all partially peeling and flaking.

6.0 CONCLUSIONS AND RECOMMENDATIONS

SA activities performed at the USCG Passage Island Light Station included a soil assessment to determine the nature and extent of soil impacts at the former ASTs area, former aboveground piping area, septic system tank area, and areas surrounding the site structures; determine the site-specific background metals concentrations; and evaluate ACM and LBP on the exterior of the site structures. The following discussions provide conclusions made based on the results of the assessments conducted at the site and the resulting recommendations for future action.

6.1 HORIZONTAL AND VERTICAL EXTENT OF CONTAMINATION

6.1.1 Former AST Areas

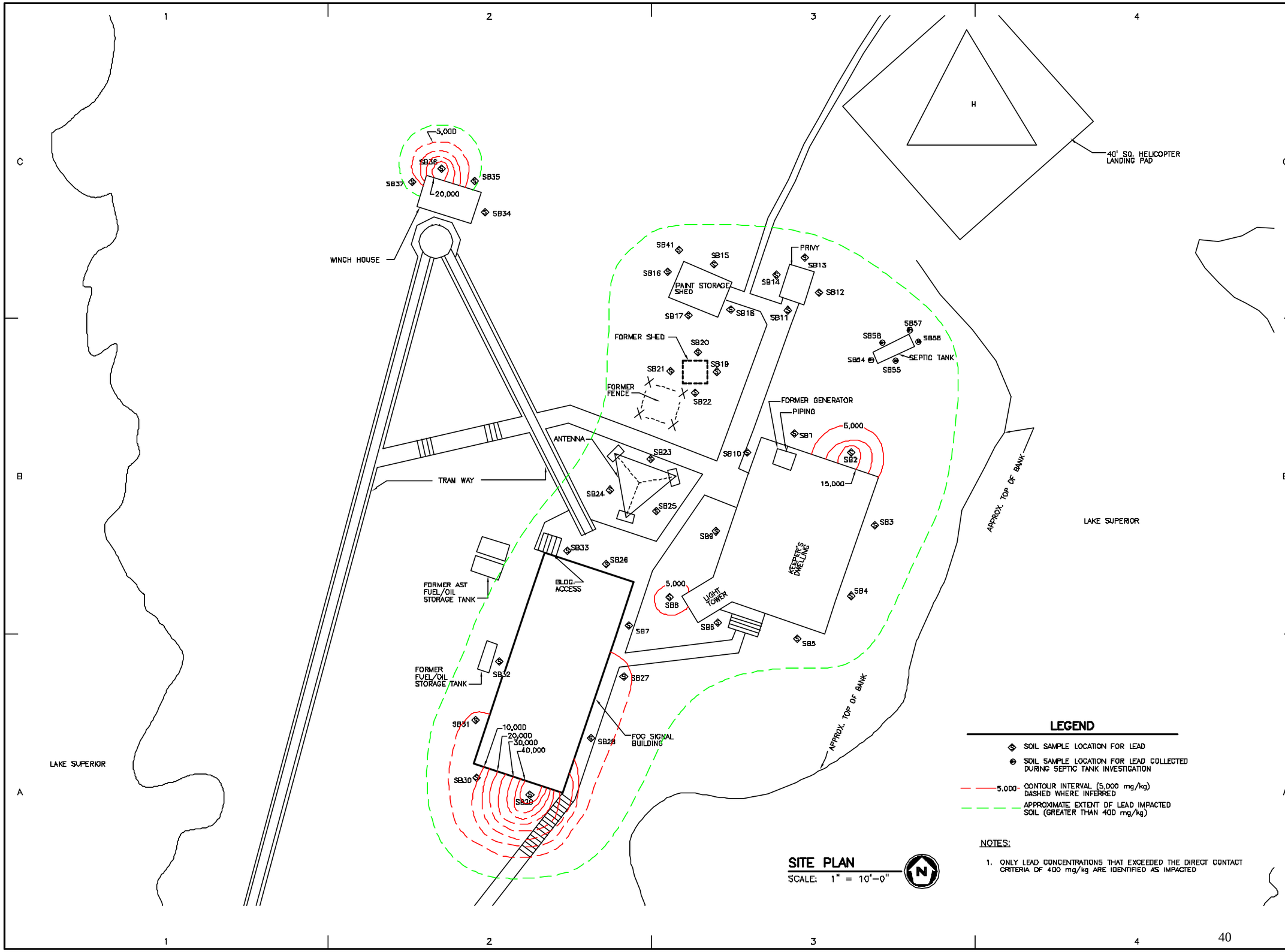
Soil analytical results for BTEX, 1,2,4-TMB, 1,3,5-TMB, PNAs, and TPH-DRO indicate no exceedances of Part 201 cleanup criteria.

6.1.2 Former Aboveground Piping Area

Soil analytical results for BTEX, 1,2,4-TMB, 1,3,5-TMB, PNAs, and TPH-DRO indicate no exceedances of Part 201 cleanup criteria.

6.1.3 Septic System Tank Area

Soil analytical results for BTEX, 1,2,4-TMB, 1,3,5-TMB, volatile halocarbons, PNAs, TPH-DRO, 1,2-DCA, 1,2-EDB, cadmium, and chromium indicate no exceedances of Part 201 cleanup criteria. Soil analytical results for lead indicate exceedances of the direct contact criteria in all five soil borings (SB-54 through SB-58). Lead was detected at levels ranging from 417 mg/kg to 786 mg/kg. Lead impacted soil extends approximately 0 inches to 6 inches bgs. Based on the close proximity of the septic tank to the keeper's dwelling, the lead impacts in the soil around the septic tank are likely attributable to LBP from the exterior of the keeper's dwelling. Based on analytical results, approximately 75 cubic feet (3 cubic yards, or 5 tons) of soil exceed Part 201 cleanup criteria and the site specific background concentration. The horizontal extent of lead impacted soil is depicted in Drawing 6606-D Sheet 6 of 7. The vertical extent of lead impacted soil is depicted in Drawing 6606-D Sheet 7 of 7.



MWH
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(248) 344-0205

CONSULTANTS

U. S. COAST GUARD
CIVIL ENGINEERING UNIT CLEVELAND

UNITED STATES COAST GUARD 1790

USCG, CEU CLEVELAND
1240 EAST 9TH STREET
CLEVELAND, OH 44199-2060

ISSUE		
MARK	DATE	DESCRIPTION

A/E PROJECT NO:	I:\uscg\1999\517\c
CAD FILE NAME:	C6606C06
DESIGNED BY:	KMD
DRAWN BY:	STR
EDITED BY:	STR
CHECKED BY:	EAG

SCALE: AS SHOWN PLOT SCALE: 1" = 30'

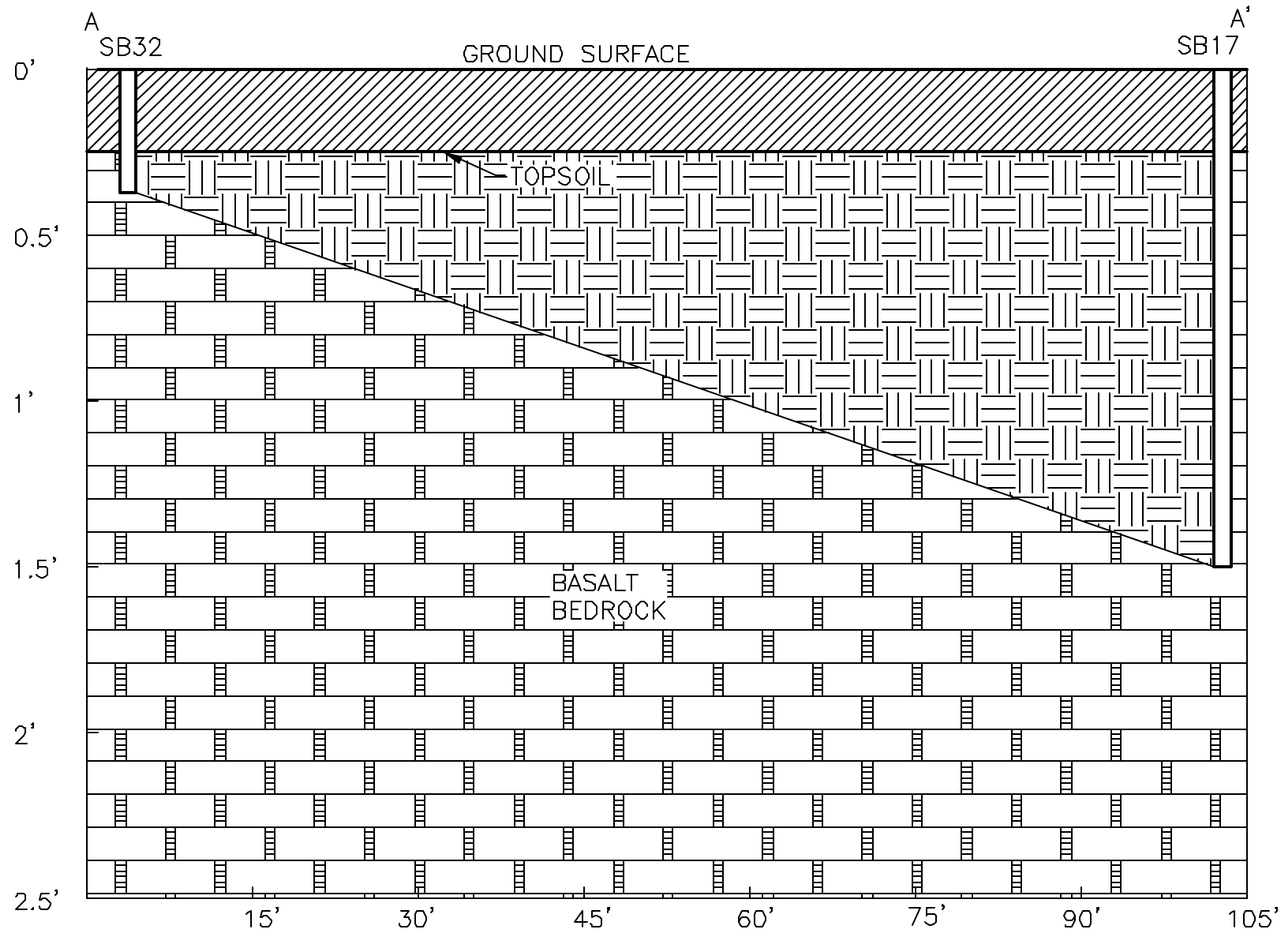
SHEET TITLE

SITE ASSESSMENT
PASSAGE ISLAND LIGHT STATION
KEWEENAW COUNTY MICHIGAN
HORIZONTAL EXTENT OF LEAD IMPACTED SOIL
SITE PLAN

REVIEWED BY:	REVIEWED BY:	REVIEWED BY:
PROJECT ENG.	BRANCH CHIEF	CONTRACTING KO

APPROVING OFFICER DATE

PROJECT NUMBER	DRAWING NUMBER
09-C01052	6606-D
DISCIPLINE/SHT NO	
C/06	SHEET 6 OF 7



LEGEND:

TOPSOIL

BASALT BEDROCK

SHADED REGION REPRESENTS APPROXIMATE LEAD IMPACTED INTERVAL (0–3")

HORIZONTAL SCALE: 1 INCH = 15 FEET

VERTICAL SCALE: 1 INCH = 0.5 FEET

U. S. COAST GUARD

CIVIL ENGINEERING UNIT CLEVELAND

USCG, CEU CLEVELAND
1240 EAST 9TH STREET
CLEVELAND, OH 44199–2060

A/E PROJECT NO:	j:\j\uscg\1999\517\c
CAD FILE NAME:	C6606C07
DESIGNED BY:	KBK
DRAWN BY:	STR
EDITED BY:	STR
CHECKED BY:	EAG
SCALE: AS SHOWN	PLOT SCALE: 1" = 5'

SHEET TITLE

SITE ASSESSMENT
PASSAGE ISLAND STATION

KEWEENAW COUNTY MICHIGAN

VERTICAL EXTENT OF LEAD IMPACTED SOIL
SITE PLAN

REVIEWED BY:	REVIEWED BY:	REVIEWED BY:
PROJECT ENG	BRANCH CHIEF	TECH. DIRECTOR

APPROVING OFFICER | DATE

PROJECT NUMBER	DRAWING NUMBER
09–C01052	6606–B
DISCIPLINE/SHT NO	
C/07	SHEET 7 OF 7

6.1.4 Lead in Soil

Soil analytical results for lead indicate the exceedance of Part 201 Direct Contact Criteria of 400 mg/kg in 41 of the 49 soil borings advanced surrounding the site structures, and septic system tank area (SB-1 through SB-19, SB-21 through SB-37, and SB-54 through SB-58). The site specific background lead concentration was calculated as an upper limit of 459.4 mg/kg. A total of 37 soil borings (SB-1 through SB-8, SB-10 through SB-19, SB-21 through SB-32, SB-34, through SB-36, and SB-54 through SB-57) exceed Part 201 Direct Contact Criteria and the site specific background lead concentration.

The soil samples were collected from the ground surface to a maximum depth of 6 inches bgs. One sample was collected per boring. Lead was detected at levels exceeding criteria and the site specific background level at concentrations ranging from 417 mg/kg to 41,040 mg/kg. The horizontal extent of contamination extends approximately 15 feet in all directions surrounding the site structures. Based on the analytical results, approximately 3,575 cubic feet (133 cubic yards or 213 tons) of surface soils (0 to 6 inches bgs) exceed the Direct Contact criteria for lead (Drawing 6606-D, Sheet 6 of 7).

6.2 EXTERIOR ASBESTOS-CONTAINING MATERIALS AND LEAD-BASED PAINT ASSESSMENT

The ACM and LBP assessment conducted by ETC concluded that four of the 10 site structures contain exterior asbestos material. The structures that tested positive for ACM include the lighthouse and attached keeper's dwelling, fog signal building, winch house, and former pump house. The assessment also concluded that nine of the 10 site structures and three exterior site features (flag pole, painted walkway steps, and painted lighthouse steps) contain exterior LBP surfaces. The nine structures that tested positive for LBP include the lighthouse and attached keeper's dwelling, fog signal building, winch house, paint locker, former pump house, privy, antenna tower, helicopter pad, and former antenna tower.

Based on observations at the site by ETC, ETC recommends exterior LBP abatement. Exterior LBP abatement includes wet scrape of flaking LBP, and encapsulation of the LBP. Following

removal and encapsulation, clearance sampling should be conducted in accordance with USEPA guidelines for LBP post remediation clearance testing.

According to ETC the exterior ACM appears to be in good condition and can be left in place as long as it is not disturbed by renovation or demolition activities. If the ACM cannot be left in place, abatement activities would include removal and disposal.

6.3 RECOMMENDATIONS

6.3.1 Impacted Soil

Based on the SA analytical results, lead is the only contaminant present at the site at concentrations exceeding the Part 201 criteria determined to be applicable (residential direct contact criteria). Per Part 201 requirements, soil remediation is required for the site due to exceedances of criteria.

Based on the available data, approximately 75 cubic feet (3 cubic yards or 5 tons) of surface soils (0 to 6 inches bgs) around the septic tank and approximately 3,575 (133 cubic yards or 213 tons) cubic feet of surface soil (0 to 6 inches bgs) around the site structures exceed Residential Direct Contact criteria for lead.

Excavation and disposal would be the most viable option to remediate the site soils to meet the Part 201 residential criteria. Remediating the site soils to meet Part 201 residential criteria would be employed to achieve an unrestricted closure.

Under the 2002 revisions to the Part 201 regulations, the MDEQ has established a recreational land use category for site closure. No criteria has been established for recreational land use, so site-specific criteria would need to be developed and approved by the MDEQ. The SA results would then need to be compared against the calculated criteria to determine if exceedances exist and if remediation would be necessary. However, a deed restriction would be necessary for a site closed under the recreational scenario.

Based on the available data, and the abundance of outcropping basalt bedrock, groundwater is not expected at the site and groundwater as an exposure pathway was determined to be incomplete.

KMD/EAG/TWK/DJB/EAG
J:\jobs\U.S.C.G\USCG-new contract\17-Passage Island SA\Reports\SA Report\Draft SA Report\Draft SA Report.doc

REFERENCES

Michigan Department of Environmental Quality, 1994. Part 201 of the Natural Resources Environmental Protection Act, Public Act 451 as amended.

Michigan Department of Natural Resources, April 1994, revision 1. *Guidance Document, Verification of Soil Remediation*.

Montgomery Watson, May 2001. *Final Site Assessment Work Plan.*

United States Environmental Protection Agency, February 1989. *Interim Final Guidance, Statistical Analysis of Ground-Water Monitoring Data at RCRA (Resource Conservation and Recovery Act) Facilities.*

United States Environmental Protection Agency, 1994. "Laboratory Data Validation Functional Guidelines for Evaluation of Organic/Inorganic Analyses".

Woodward-Clyde, November 26, 1997. *Phase I Environmental Site Assessment, Passage Island Light, Keweenaw County, Michigan.*

APPENDIX A

SITE PHOTOGRAPHS

SITE PHOTOGRAPHS
USCG PASSAGE ISLAND LIGHT STATION
KEWEENAW COUNTY, MICHIGAN

Photograph 1 – View of Passage Island Light Station from Lake Superior

Photograph 2 – View of the Lighthouse and Attached Keeper's Dwelling from the Coastline

Photograph 3 – Lighthouse and Attached Keeper's Dwelling

Photograph 4 – Fog Signal Building

Photograph 5 – View of the Winch House from the Fog Signal Building

Photograph 6 – View of the Pump House from the Fog Signal Building

Photograph 7 – Paint Storage Shed and Privy

Photograph 8 – View of the Tramway from the Dock

Photograph 9 – Helicopter Landing Pad

Photograph 10 – Former Antenna Tower

Photograph 11 – Boat landing/dock

Photograph 12 – Former AST Cradles by the Dock

Photograph 13 – Presumed Location of the Piping at the Keeper's Dwelling

Photograph 14 – Septic Tank

Photograph 15 – View of the Passage Island Coastline

APPENDIX B

SOIL BORING LOGS

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB-1
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft N S ft E W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger: EAG Editor: MLV
Start Date: 6/10/01 End Date: 6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					3" Topsoil		0		Hit refusal at 3" bgs
						End of Boring 3"				Collected sample at 0-3 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB- 2
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft N S ft E W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger: EAG Editor: MLV
Start Date: 6/10/01 End Date: 6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					3" Topsoil		0		Hit refusal at 3" bgs
						End of Boring 3"				Collected sample at 0-3 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB- 3
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft N S ft E W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample / Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger: EAG Editor: MLV
Start Date: 6/10/01 End Date: 6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					3" Topsoil		0		Hit refusal at 3" bgs
						End of Boring 3"				Collected sample at 0-3 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB- 4
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft N S ft E W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger: EAG Editor: MLV
Start Date: 6/10/01 End Date: 6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					6" Topsoil		0		Hit refusal at 6" bgs
						End of Boring 6"				Collected sample at 0-6 inches
						1				Paint chips observed
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB- 5
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft N S ft E W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger: EAG Editor: MLV
Start Date: 6/10/01 End Date: 6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					2" Dark Brown Topsoil		0		Hit refusal at 2" bgs
						End of Boring 2"				Collected sample at 0-2 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB- 6
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft N S ft E W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample / Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger: EAG Editor: MLV
Start Date: 6/10/01 End Date: 6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					3" Dark Brown Topsoil		0		Hit refusal at 3" bgs
						End of Boring 3"				Collected sample at 0-3 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB- 7
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler		N E
Drill Rig	Hand Auger	Local Grid Location	ft S ft W
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger: EAG Editor: MLV
Start Date: 6/10/01 End Date: 6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					4" Dark Brown Topsoil		0		Hit refusal at 4" bgs
						End of Boring 4"				Collected sample at 0-4 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB- 8
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler		☐ N ☐ E
Drill Rig	Hand Auger	Local Grid Location	ft ☐ S ft ☐ W
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger	EAG
Editor	MLV
Start Date	6/10/01
End Date	6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					3" Dark Brown Topsoil		0		Hit refusal at 3" bgs
						End of Boring 3"				Collected sample at 0-3 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB- 9
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft N S ft E W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger	EAG
Editor	MLV
Start Date	6/10/01
End Date	6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					4" Dark Brown Topsoil		0		Hit refusal at 4" bgs
						End of Boring 4"				Collected sample at 0-4 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB- 10
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler		☐ N ☐ E
Drill Rig	Hand Auger	Local Grid Location	ft ☐ S ☐ ft W
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger: EAG Editor: MLV
Start Date: 6/10/01 End Date: 6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					3" Gravely Topsoil		0		Hit refusal at 3" bgs
						End of Boring 3"				Collected sample at 0-3 inches, Duplicate collected
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB- 11
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft N S ft E W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger: EAG Editor: MLV
Start Date: 6/10/01 End Date: 6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					4" Dark Brown Topsoil		0		Hit refusal at 4" bgs
						End of Boring 4"				Collected sample at 0-4 inches
						1				White paint chips observed
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB- 12
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft N S ft E W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger	EAG
Editor	MLV
Start Date	6/10/01
End Date	6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					4" Dark Brown Topsoil		0		Hit refusal at 4" bgs
						End of Boring 4"				Collected sample at 0-4 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB- 13
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler		☐ N ☐ E
Drill Rig	Hand Auger	Local Grid Location	ft ☐ S ft ☐ W
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger	EAG	Editor	MLV
Start Date	6/10/01	End Date	6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					4" Dark Brown Topsoil with Organic Matter		0		Hit refusal at 4" bgs
						End of Boring 4"				Collected sample at 0-4 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB- 14
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft N S ft E W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger: EAG Editor: MLV
Start Date: 6/10/01 End Date: 6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					6" Dark Brown Topsoil		0		Hit refusal at 6" bgs
						End of Boring 6"				Collected sample at 0-6 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB- 15
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler		☐ N ☐ E
Drill Rig	Hand Auger	Local Grid Location	ft ☐ S ☐ ft W
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger	EAG
Editor	MLV
Start Date	6/10/01
End Date	6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					3" Dark Brown Topsoil		0		Hit refusal at 3" bgs
						End of Boring 3"				Collected sample at 0-3 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB- 16
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft N S ft E W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger: EAG Editor: MLV
Start Date: 6/10/01 End Date: 6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	M					6" Dark Brown Topsoil		0		Hit refusal at 6" bgs
						End of Boring 6"				Collected sample at 0-6 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB- 17
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft ☐ N ☐ S ft ☐ E ☐ W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger	EAG
Editor	MLV
Start Date	6/10/01
End Date	6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					8" Dark Brown Topsoil		0		Hit refusal at 8" bgs
						End of Boring 8"				Collected sample at 0-3 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB- 18
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft N S ft E W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger: EAG Editor: MLV
Start Date: 6/10/01 End Date: 6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					4" Dark Brown Topsoil		0		Hit refusal at 4" bgs
						End of Boring 4"				Collected sample at 0-4 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB- 19
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler		☐ N ☐ E
Drill Rig	Hand Auger	Local Grid Location	ft ☐ S ft ☐ W
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger	EAG
Editor	MLV
Start Date	6/10/01
End Date	6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					2" Dark Brown Topsoil		0		Hit refusal at 2" bgs
						End of Boring 2"				Collected sample at 0-2 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB- 20
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler		☐ N ☐ E
Drill Rig	Hand Auger	Local Grid Location	ft ☐ S ☐ ft W
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger	EAG
Editor	
Start Date	6/10/01
End Date	6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					3" Gravely Dark Brown Topsoil		0		Hit refusal at 3" bgs
						End of Boring 3"				Collected sample at 0-3 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB- 21
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft N S ft E W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger: EAG Editor: MLV
Start Date: 6/10/01 End Date: 6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					3" Gravely Brown Topsoil		0		Hit refusal at 3" bgs
						End of Boring 3"				Collected sample at 0-3 inches, Duplicate collected
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB- 22
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft N S ft E W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger	EAG
Editor	MLV
Start Date	6/10/01
End Date	6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					4" Gravely Brown Topsoil		0		Hit refusal at 4" bgs
						End of Boring 4"				Collected sample at 0-4 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB- 23
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft N S ft E W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger: EAG Editor: MLV
Start Date: 6/10/01 End Date: 6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					3" Gravely Dark Brown Topsoil		0		Hit refusal at 3" bgs
						End of Boring 3"				Collected sample at 0-3 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB- 24
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft ☐ N ☐ S ft ☐ E ☐ W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger: EAG Editor: MLV
Start Date: 6/10/01 End Date: 6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					4" Dark Brown Topsoil		0		Hit refusal at 4" bgs
						End of Boring 4"				Collected sample at 0-4 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB- 25
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft N S ft E W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger	EAG
Editor	MLV
Start Date	6/10/01
End Date	6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					4" Dark Brown Topsoil		0		Hit refusal at 4" bgs
						End of Boring 4"				Collected sample at 0-4 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB- 26
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler		☐ N ☐ E
Drill Rig	Hand Auger	Local Grid Location	ft ☐ S ft ☐ W
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger	EAG	Editor MLV
Start Date	6/10/01	End Date 6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					4" Dark Brown Topsoil		0		Hit refusal at 4" bgs
						End of Boring 4"				Collected sample at 0-4 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB- 27
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft N S ft E W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger	EAG
Editor	MLV
Start Date	6/10/01
End Date	6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					2" Dark Brown Topsoil		0		Hit refusal at 2" bgs
						End of Boring 2"				Collected sample at 0-2 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB- 28
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft ☐ N ☐ S ft ☐ E ☐ W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger	EAG	Editor	MLV
Start Date	6/10/01	End Date	6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					3" Dark Brown Topsoil		0		Hit refusal at 3" bgs
						End of Boring 3"				Collected sample at 0-3 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB- 29
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft N S ft E W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger: EAG Editor: MLV
Start Date: 6/10/01 End Date: 6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					3" Dark Brown Topsoil		0		Hit refusal at 3" bgs
						End of Boring 3"				Collected sample at 0-3 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB- 30
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft N S ft E W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger: EAG Editor:
Start Date: 6/10/01 End Date: 6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					4" Dark Brown Topsoil with Debris		0		Hit refusal at 4" bgs
						End of Boring 4"				Collected sample at 0-4 inches, Duplicate collected
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB- 31
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft ☐ N ☐ S ft ☐ E ☐ W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger: EAG Editor: KMD
Start Date: 6/10/01 End Date: 6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					3" Dark Brown Topsoil		0		Hit refusal at 3" bgs
						End of Boring 3"				Collected sample at 0-3 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB- 32
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft N S ft E W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger: EAG Editor: MLV
Start Date: 6/10/01 End Date: 6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					4" Dark Brown Topsoil		0		Hit refusal at 4" bgs
						End of Boring 4"				Collected sample at 0-4 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB- 33
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft ☐ N ☐ S ft ☐ E ☐ W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger: EAG Editor: MLV
Start Date: 6/10/01 End Date: 6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					2" Dark Brown Topsoil		0		Hit refusal at 2" bgs
						End of Boring 2"				Collected sample at 0-2 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB- 34
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler		☐ N ☐ E
Drill Rig	Hand Auger	Local Grid Location	ft ☐ S ☐ ft W
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger: EAG Editor: MLV
Start Date: 6/10/01 End Date: 6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					2" Dark Brown Topsoil		0		Hit refusal at 2" bgs
						End of Boring 2"				Collected sample at 0-2 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB- 35
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft N S ft E W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger	EAG	Editor	MLV
Start Date	6/10/01	End Date	6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					3" Dark Brown Topsoil		0		Hit refusal at 3" bgs
						End of Boring 3"				Collected sample at 0-3 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB- 36
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft N S ft E W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger: EAG Editor: MLV
Start Date: 6/10/01 End Date: 6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					3" Dark Brown Topsoil		0		Hit refusal at 3" bgs
						End of Boring 3"				Collected sample at 0-3 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB- 37
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler		☐ N ☐ E
Drill Rig	Hand Auger	Local Grid Location	ft ☐ S ☐ ft W
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger	EAG
Editor	MLV
Start Date	6/10/01
End Date	6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					4" Dark Brown Topsoil		0		Hit refusal at 4" bgs
						End of Boring 4"				Collected sample at 0-4 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB- 38
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft N S ft E W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger: EAG Editor: MLV
Start Date: 6/10/01 End Date: 6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					3" Dark Brown Topsoil		0		Hit refusal at 3" bgs
						End of Boring 3"				Collected sample at 0-3 inches, Duplicate collected
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB- 39
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler		☐ N ☐ E
Drill Rig	Hand Auger	Local Grid Location	ft ☐ S ☐ ft W
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger: EAG Editor: MLV
Start Date: 6/10/01 End Date: 6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					3" Dark Brown Topsoil		0		Hit refusal at 3" bgs
						End of Boring 3"				Collected sample at 0-3 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB- 40
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft ☐ N ☐ S ft ☐ E ☐ W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger: EAG Editor: MLV
Start Date: 6/10/01 End Date: 6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					3" Dark Brown Topsoil		0		Hit refusal at 3" bgs
						End of Boring 3"				Collected sample at 0-3 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB-41
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler		
Drill Rig	Hand Auger	Local Grid Location	ft N S ft E W
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger: EAG Editor: MLV
Start Date: 6/11/01 End Date: 6/11/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					3" Dark Brown Topsoil		0		Hit refusal at 3" bgs
						End of Boring 3"				Collected sample at 0-3 inches
						1				Paint chips observed
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB-42
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	☐ N ft ☐ S ☐ E ft ☐ W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger: EAG Editor: MLV
Start Date: 6/12/01 End Date: 6/12/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					3" Dark Brown Topsoil		0		Hit refusal at 3" bgs
						End of Boring 3"				Collected sample at 0-3 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB-43
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft N S ft E W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger: EAG Editor: MLV
Start Date: 6/12/01 End Date: 6/12/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					3" Dark Brown Topsoil		0		Hit refusal at 3" bgs
						End of Boring 3"				Collected sample at 0-3 inches
						1				No PID readings
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB-44
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler		
Drill Rig	Hand Auger	Local Grid Location	ft N S ft E W
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger: EAG Editor: MLV
Start Date: 6/12/01 End Date: 6/12/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					2" Dark Brown Topsoil		0		Hit refusal at 2" bgs
						End of Boring 2"				Collected sample at 0-2 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB-45
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft ☐ N ☐ S ft ☐ E ☐ W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger: EAG Editor: MLV
Start Date: 6/12/01 End Date: 6/12/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					3" Dark Brown Topsoil		0		Hit refusal at 3" bgs
						End of Boring 3"				Collected sample at 0-3 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB-46
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft N S ft E W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger: EAG Editor: MLV
Start Date: 6/12/01 End Date: 6/12/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					3" Gravely Dark Brown Topsoil		0		Hit refusal at 3" bgs
						End of Boring 3"				Collected sample at 0-3 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB-47
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler		☐ N ☐ E
Drill Rig	Hand Auger	Local Grid Location	ft ☐ S ft ☐ W
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger	EAG
Editor	MLV
Start Date	6/12/01
End Date	6/12/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					3" Gravely Dark Brown Topsoil		0		Hit refusal at 3" bgs
						End of Boring 3"				Collected sample at 0-3 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB-48
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft N S ft E W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger: EAG Editor: MLV
Start Date: 6/12/01 End Date: 6/12/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					3" Gravely Dark Brown Topsoil		0		Hit refusal at 3" bgs
						End of Boring 3"				Collected sample at 0-3 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB-49
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft N S ft E W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger	EAG
Editor	MLV
Start Date	6/12/01
End Date	6/12/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					2" Dark Brown Topsoil		0		Hit refusal at 2" bgs
						End of Boring 2"				Collected sample at 0-2 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB-50
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft N S ft E W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger: EAG Editor: MLV
Start Date: 6/12/01 End Date: 6/12/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					4" Dark Brown Topsoil		0		Hit refusal at 4" bgs
						End of Boring 4"				Collected sample at 0-4 inches, Duplicate collected
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB-51
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler		☐ N ☐ E
Drill Rig	Hand Auger	Local Grid Location	ft ☐ S ft ☐ W
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger	EAG
Editor	MLV
Start Date	6/12/01
End Date	6/12/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					3" Dark Brown Topsoil		0		Hit refusal at 3" bgs
						End of Boring 3"				Collected sample at 0-3 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB-52
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft N S ft E W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger	EAG
Editor	MLV
Start Date	6/12/01
End Date	6/12/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					2" Dark Brown Topsoil		0		Hit refusal at 2" bgs
						End of Boring 2"				Collected sample at 0-2 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB-53
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft N S ft E W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger: EAG Editor: MLV
Start Date: 6/12/01 End Date: 6/12/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					2" Dark Brown Topsoil		0		Hit refusal at 2" bgs
						End of Boring 2"				Collected sample at 0-2 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB-54
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft N S ft E W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger	EAG
Editor	MLV
Start Date	6/12/01
End Date	6/12/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					6" Dark Brown Topsoil		0		Hit refusal at 6" bgs
						End of Boring 6"				Collected sample at 0-6 inches, Duplicate collected
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB-55
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft N S ft E W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger	EAG	Editor	MLV
Start Date	6/12/01	End Date	6/12/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					4" Dark Brown Topsoil		0		Hit refusal at 4" bgs
						End of Boring 4"				Collected sample at 0-4 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB-56
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft N S ft E W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger	EAG	Editor	MLV
Start Date	6/12/01	End Date	6/12/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					4" Dark Brown Topsoil		0		Hit refusal at 4" bgs
						End of Boring 4"				Collected sample at 0-4 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB-57
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft N S ft E W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger: EAG Editor: MLV
Start Date: 6/12/01 End Date: 6/12/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					4" Dark Brown Topsoil		0		Hit refusal at 4" bgs
						End of Boring 4"				Collected sample at 0-4 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	SB-58
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft N S ft E W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger	EAG	Editor	MLV
Start Date	6/12/01	End Date	6/12/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					4" Dark Brown Topsoil		0		Hit refusal at 4" bgs
						End of Boring 4"				Collected sample at 0-4 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	BG- 01
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft N S ft E W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger	EAG
Editor	MLV
Start Date	6/10/01
End Date	6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					2" Dark Brown Topsoil		0		Hit refusal at 2" bgs
						End of Boring 2"				Collected sample at 0-2 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	BG- 02
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft N S ft E W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger	EAG	Editor	MLV
Start Date	6/10/01	End Date	6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					2" Dark Brown Topsoil		0		Hit refusal at 2" bgs
						End of Boring 2"				Collected sample at 0-2 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	BG- 03
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft ☐ N ☐ S ft ☐ E ☐ W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger	EAG
Editor	MLV
Start Date	6/10/01
End Date	6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	D					2" Dark Brown Topsoil		0		Hit refusal at 2" bgs
						End of Boring 2"				Collected sample at 0-2 inches
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	BG- 04
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	☐ N ft ☐ S ☐ E ft ☐ W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger	EAG
Editor	MLV
Start Date	6/10/01
End Date	6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	M					6" Dark Brown Topsoil		0		Hit refusal at 6" bgs
						End of Boring 6"				Collected sample at 0-6 inches, Duplicate collected
						1				
						2				
						3				
						4				
						5				

MONTGOMERY WATSON

SOIL BORING LOG

Facility/Project Name	USCG Passage Island Light Station	**Boring No.**	BG-05
Location	Passage Island, Keweenaw County, Michigan	**Project No.**	2101151.171601

Drilling Company	Montgomery Watson	State Plane	N, E
Driller's Name	Kris Donaldson & Erica Geasler	Local Grid Location	ft N S ft E W
Drill Rig	Hand Auger		
Drill Method	Hand Driven		
Water Level	NE	Sample Hammer Torque	
Surface Elevation		Borehole Diameter	2 in

Logger: EAG Editor: MLV
Start Date: 6/10/01 End Date: 6/10/01

Sample No.	Moisture	Blows on Sampler 0/6	Blows on Sampler 6/12	Sample Recovery	N Value	VISUAL CLASSIFICATION	Penetrometer (Tons/sq. ft.)	PID	% Gravel-Sand-Fines	Remarks
	M					3" Dark Brown Topsoil		0		Hit refusal at 3" bgs
						End of Boring 3"				Collected sample at 0-3 inches
						1				
						2				
						3				
						4				
						5				

APPENDIX C

SOIL ANALYTICAL DATA

TestAmerica INCORPORATED

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Phone: 615-726-0177
Fax: 615-726-3404

To assist us in using the proper analytical methods, is this work being conducted for regulatory purposes?
Compliance Monitoring _____

241628

Client Name: Montgomery Watson Client #: 8446

Address: 41551 Eleven Mile Road

City/State/Zip Code: Novi MI 48375

Project Manager: Erica Geasler

Telephone Number: 248 449 3419 Fax: 8.12483440217

Sampler Name: (Print Name) Kris Donaldson

Sampler Signature: Kris Donaldson

Project Name: USCG Passage Island

Project #: 2101151

Site/Location ID: Keweenaw County State: MI

Report To: Erica Geasler

Invoice To: "Same"

Quote #: _____ PO#: _____

TAT: X Standard; ___ Rush (surcharges may apply)

Date Needed: _____

Fax Results: Y (N)

QC Deliverables: ___ None; ___ Level 2 (Batch QC); X Level 3; ___ Level 4; Other: _____

SAMPLE ID	Date Sampled	Time Sampled	G = Grab, C = Composite	Field Filtered	Matrix (SL - Sludge, DW - Drinking Water, GW - Groundwater, S - Soil/Solid, WW - Wastewater, Specify Other)	HNO_3	HCl	NaOH	H_2SO_4	Methanol	None	Other (Specify)	Lead 6010										REMARKS
SB-1 (0-3")	6/10/01	1300	G	N	S						X		X										82270
SB-2 (0-3")		1305	G	N	S						X		X										71
SB-3 (0-3")		1310	G	N	S						X		X										72
SB-4 (0-6")		1315	G	N	S						X		X										73
SB-5 (0-2")		1325	G	N	S						X		X										74
SB-6 (0-3")		1330	G	N	S						X		X										75
SB-7 (0-4")		1340	G	N	S						X		X										76
SB-8 (0-3")		1345	G	N	S						X		X										77
SB-9 (0-4")		1350	G	N	S						X		X										78
SB-10 (0-3")		1400	G	N	S						X		X										82279

Special Instructions:

Relinquished By: Kirk Kitt	Date: 6/15/01	Time: 14:00	Received By: FedEx	Date: 6/15/01	Time: 14:00
Relinquished By:	Date:	Time:	Received By: [signature]	Date: 6/16/01	Time: 900
Relinquished By:	Date:	Time:	Received By:	Date:	Time:

LABORATORY COMMENTS:
Init Lab Temp:
Rec Lab Temp: 3°C
Custody Seals: (Y) N N/A
Bottles Supplied by TestAmerica: Y N
Method of Shipment:

TestAmerica INCORPORATED

Nashville Division
2960 Foster Creighton
Nashville, TN 37204

Phone: 615-726-0177
Fax: 615-726-3404

To assist us in using the proper analytical methods, is this work being conducted for regulatory purposes?
Compliance Monitoring _____

241628

Client Name: Montgomery Watson Client #: 8446

Address: 41551 Eleven Mile Road

City/State/Zip Code: Novi MI 48375

Project Manager: Erica Geasler

Telephone Number: 248 449 3419 Fax: 8,12483440217

Sampler Name: (Print Name) Kris Donaldson

Sampler Signature: Kris Donaldson

Project Name: USCG Passage Island

Project #: 2101151

Site/Location ID: Keweenaw Co. State: MI

Report To: Erica Geasler

Invoice To: Same

Quote #: _____ PO#: _____

TAT: ✓ Standard; ___ Rush (surcharges may apply)

Date Needed: _____

Fax Results: Y (N)

QC Deliverables: ___ None; ___ Level 2 (Batch QC); ✓ Level 3; ___ Level 4; Other: _____

SAMPLE ID	Date Sampled	Time Sampled	G = Grab, C = Composite	Field Filtered	Matrix (SL - Sludge DW - Drinking Water GW - Groundwater S - Soil/Solid WW - Wastewater Specify Other)	HNO_3	HCl	NaOH	H_2SO_4	Methanol	None	Other (Specify)	Lead 6010										REMARKS
SB-10 (0-3") DUP	6/10/01	1400	G	N	S						X		X										82280
SB-11 (0-4")		1405	G	N	S						X		X										81
SB-12 (0-4")		1410	G	N	S						X		X										82
SB-13 (0-4")		1420	G	N	S						X		X										83
SB-14 (0-6")		1425	G	N	S						X		X										84
SB-15 (0-3")		1430	G	N	S						X		X										85
SB-16 (0-6")		1435	G	N	S						X		X										86
SB-17 (0-3")		1440	G	N	S						X		X										87
SB-18 (0-4")		1445	G	N	S						X		X										88
SB-19 (0-2")		1450	G	N	S						X		X										82289

Special Instructions:

Relinquished By: Kris Cotch	Date: 6/15/01	Time: 14:00	Received By: FedEx	Date: 6/15/01	Time: 14:00		
Relinquished By:	Date:	Time:	Received By:	Date: 6/18/01	Time: 900		
Relinquished By:	Date:	Time:	Received By:	Date:	Time:		

LABORATORY COMMENTS:
Init Lab Temp:
Rec Lab Temp: 3°C
Custody Seals: (Y) N N/A
Bottles Supplied by TestAmerica: Y N
Method of Shipment:

TestAmerica INCORPORATED

Nashville Division
2960 Foster Creighton
Nashville, TN 37204

Phone: 615-726-0177
Fax: 615-726-3404

To assist us in using the proper analytical methods, is this work being conducted for regulatory purposes?
Compliance Monitoring _____

241628

Client Name: Montgomery Watson Client #: 8446

Address: 41551 Eleven Mile Road

City/State/Zip Code: Novi MI 48375

Project Manager: Erica Geasler

Telephone Number: 248 449 3419 Fax: 8.12483440217

Sampler Name: (Print Name) Kris Donaldson

Sampler Signature: Kris Donaldson

Project Name: USCG Passage Island

Project #: 2101158

Site/Location ID: Keweenaw County State: MI

Report To: Erica Geasler

Invoice To: same

Quote #: _____ PO#: _____

TAT
X Standard
___ Rush (surcharges may apply)

Date Needed: _____

Fax Results: Y (N)

QC Deliverables
___ None
___ Level 2
X Level 3 (Batch QC)
___ Level 4
Other: _____

SAMPLE ID	Date Sampled	Time Sampled	G = Grab, C = Composite	Field Filtered	Matrix (SL - Sludge, DW - Drinking Water, GW - Groundwater, S - Soil/Solid, WW - Wastewater, Specify Other)	HNO3	HCl	NaOH	H2SO4	Methanol	None	Other (Specify)	Lead 6010									REMARKS
SB-20 (0-3")	6/10/01	1455	G	N	S						X		X									82290
SB21 (0-3")		1500	G	N	S						X		X									91
SB21 (0-3") DUP		1500	G	N	S						X		X									92
SB22 (0-4")		1505	G	N	S						X		X									93
SB23 (0-3")		1510	G	N	S						X		X									94
SB24 (0-4")		1515	G	N	S						X		X									95
SB25 (0-4")		1520	G	N	S						X		X									96
SB26 (0-4")		1575	G	N	S						X		X									97
SB27 (0-2")		1530	G	N	S						X		X									98
SB28 (0-3")		1535	G	N	S						X		X									82299

Special Instructions:
MS/MSD included

LABORATORY COMMENTS:
Init Lab Temp:
Rec Lab Temp: 3°C
Custody Seals: (Y) N N/A
Bottles Supplied by TestAmerica: Y N
Method of Shipment:

Relinquished By:	Date:	Time:	Received By:	Date:	Time:
Kris Donaldson	6/15/01	14:00	FedEx	6/15/01	14:00
			[illegible]	6/16/01	900

TestAmerica INCORPORATED

Nashville Division
2960 Foster Creighton
Nashville, TN 37204

Phone: 615-726-0177
Fax: 615-726-3404

To assist us in using the proper analytical methods, is this work being conducted for regulatory purposes?
Compliance Monitoring _____

241628

Client Name: Montgomery Watson Client #: 6446
Address: 41551 Eleven Mile Road
City/State/Zip Code: Novi MI 48375
Project Manager: Erica Geasler
Telephone Number: 248 449 3419 Fax: 8.12483440217
Sampler Name: (Print Name) Kris Donaldson
Sampler Signature: Kris Donaldson

Project Name: USCG Passage Island
Project #: 2101151
Site/Location ID: Keweenaw County State: MI
Report To: Erica Geasler
Invoice To: same
Quote #: _____ PO#: _____

TAT: ✓ Standard; ___ Rush (surcharges may apply)
Date Needed: _____
Fax Results: Y (N)

QC Deliverables: ___ None; ___ Level 2 (Batch QC); X Level 3; ___ Level 4; Other: _____

SAMPLE ID	Date Sampled	Time Sampled	G = Grab, C = Composite	Field Filtered	Matrix (SL - Sludge, DW - Drinking Water, GW - Groundwater, S - Soil/Solid, WW - Wastewater, Specify Other)	HNO_3	HCl	NaOH	H_2SO_4	Methanol	None	Other (Specify)	Lead 6010										REMARKS
SB-29 (0-3")	6/10/01	1540	G	N	S						X		X										82300
SB-30 (0-4")		1545	G	N	S						X		X										01
SB 31 (0-3")		1550	G	N	S						X		X										02
SB32 (0-4")		1555	G	N	S						X		X										03
SB33 (0-2")		1600	G	N	S						X		X										04
SB34 (0-2")		1605	G	N	S						X		X										05
SB-35 (0-3")		1610	G	N	S						X		X										06
SB-36 (0-3")		1615	G	N	S						X		X										07
SB-37 (0-4")		1620	G	N	S						X		X										08
SB-38 (0-3")		1625	G	N	S						X		X										82309

Special Instructions:

Relinquished By:	CoTL	Date: 6/15/01	Time: 14:00	Received By: FedEx	Date: 6/15/01	Time: 14:00	
Relinquished By:		Date:	Time:	Received By:	Date: 6/16/01	Time: 900	
Relinquished By:		Date:	Time:	Received By:	Date:	Time:	

LABORATORY COMMENTS:
Init Lab Temp:
Rec Lab Temp: 3°C
Custody Seals: (Y) N N/A
Bottles Supplied by TestAmerica: Y N
Method of Shipment:

TestAmerica INCORPORATED

Nashville Division
2960 Foster Creighton
Nashville, TN 37204

Phone: 615-726-0177
Fax: 615-726-3404

To assist us in using the proper analytical methods, is this work being conducted for regulatory purposes?
Compliance Monitoring _____

241628

Client Name: Montgomery Watson Client #: 8446
Address: 41551 Eleven Mile Road
City/State/Zip Code: Novi MI 48375
Project Manager: Erica Geasler
Telephone Number: 248 449 3419 Fax: 8.12483440217
Sampler Name: (Print Name) Kris Donaldson
Sampler Signature: Kris Donaldson

Project Name: USCG Passage Island
Project #: 2101151
Site/Location ID: Keweenaw County State: MI
Report To: Erica Geasler
Invoice To: "same"
Quote #: _____ PO#: _____

TAT
___ Standard
___ Rush (surcharges may apply)
Date Needed: _____
Fax Results: Y (N)

QC Deliverables
___ None
___ Level 2 (Batch QC)
X Level 3
___ Level 4
Other: _____

SAMPLE ID	Date Sampled	Time Sampled	G = Grab, C = Composite	Field Filtered	Matrix (SL - Sludge, DW - Drinking Water, GW - Groundwater, S - Soil/Solid, WW - Wastewater, Specify Other)	HNO_3	HCl	NaOH	H_2SO_4	Methanol	None	Other (Specify)	Lead 6010	Cadmium	Chromium	TCLP - Lead, Cadmium, Chromium							REMARKS
SB39 (0-3") DUP	6/10/01	1605	G	N							X		X										82310
SB 39 (0-3")		1630	G	N							X		X										311
SB 40 (0-3")		1635	G	N							X		X										312
SB B6-01 (0-3")		1650	G	N							X		X	X	X								82264
B6-02 (0-3")		1655	G	N							X		X	X	X								65
B6-03 (0-2")		1705	G	N							X		X	X	X								66
B6-04 (0-6")		1710	G	N							X		X	X	X								67
B6-04 (0-6") DUP		1710	G	N							X		X	X	X								68
B6-05 (0-3")		1715	G	N							X		X	X	X								69
SB41 (0-3")	6/11/01	1210	G	N							X					X							82263

Special Instructions: MS/MSD included
add SB-17 (8") 82313
add SB-30 (0-4") DUP 82314

Relinquished By:	Date:	Time:	Received By:	Date:	Time:
[signature]	6/15/01	14:00	FedEx	6/15/01	14:20
			[signature]	6/18/01	900

LABORATORY COMMENTS:
Init Lab Temp:
Rec Lab Temp: 3°C
Custody Seals: (Y) N N/A
Bottles Supplied by TestAmerica: Y N
Method of Shipment:

TestAmerica
INCORPORATED

Sample Identification

BG-01(0-3")

Matrix: Soil
% Dry Weight: 46.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82264
Date Sampled: 6/11/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 11:52
Sample QC Group: 8719

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7440-43-9	Cadmium	2.17	U
7440-47-3	Chromium	11.3	
7439-92-1	Lead	180	

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TestAmerica
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Sample Identification

BG-02(0-3")

Matrix: Soil
% Dry Weight: 34.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82265
Date Sampled: 6/11/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 11:52
Sample QC Group: 8719

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7440-43-9	Cadmium	2.86	U
7440-47-3	Chromium	18	
7439-92-1	Lead	288	

TestAmerica
INCORPORATED

Sample Identification

BG-03(0-2")

Matrix: Soil
% Dry Weight: 38.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82266
Date Sampled: 6/11/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 11:52
Sample QC Group: 8719

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7440-43-9	Cadmium	2.61	U
7440-47-3	Chromium	21.9	
7439-92-1	Lead	46.4	

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TestAmerica
INCORPORATED

Sample Identification

BG-04(0-6")

Matrix: Soil
% Dry Weight: 24.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82267
Date Sampled: 6/11/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 11:52
Sample QC Group: 8719

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7440-43-9	Cadmium	4.1	U
7440-47-3	Chromium	18.9	
7439-92-1	Lead	30.3	

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TestAmerica
INCORPORATED

Sample Identification

BG-04(0-6")DUP

Matrix: Soil
% Dry Weight: 26.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82268
Date Sampled: 6/11/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 11:52
Sample QC Group: 8719

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7440-43-9	Cadmium	3.82	U
7440-47-3	Chromium	28.2	
7439-92-1	Lead	19.8	

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TestAmerica
INCORPORATED

Sample Identification

BG-05(0-3")

Matrix: Soil
% Dry Weight: 29.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82269
Date Sampled: 6/11/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 11:52
Sample QC Group: 8719

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7440-43-9	Cadmium	3.46	U
7440-47-3	Chromium	33.9	
7439-92-1	Lead	199	

TestAmerica
INCORPORATED

Sample Identification

SB-1(0-3")

Matrix: Soil
% Dry Weight: 63.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82270
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 11:52
Sample QC Group: 8719

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	2510	

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TestAmerica
INCORPORATED

Sample Identification

SB-2(0-3")

Matrix: Soil
% Dry Weight: 48.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82271
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 11:52
Sample QC Group: 8719

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	17700	

TestAmerica
INCORPORATED

Sample Identification

SB-3(0-3")

Matrix: Soil
% Dry Weight: 57.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82272
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 11:52
Sample QC Group: 8719

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	1220	

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TestAmerica
INCORPORATED

Sample Identification

SB-4(0-6")

Matrix: Soil
% Dry Weight: 65.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82273
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 11:52
Sample QC Group: 8719

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	3380	

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TestAmerica
INCORPORATED

Sample Identification

SB-5(0-2")

Matrix: Soil
% Dry Weight: 88.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82274
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 11:52
Sample QC Group: 8719

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	3530	

2960 Foster Creighton Drive / Nashville,TN 37204 / 615-726-0177 / Fax: 615-726-0954 / 800-765-0980

TestAmerica
INCORPORATED

Sample Identification

SB-6(0-3")

Matrix: Soil
% Dry Weight: 73.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82275
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 11:52
Sample QC Group: 8719

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	2780	

2960 Foster Creighton Drive / Nashville,TN 37204 / 615-726-0177 / Fax: 615-726-0954 / 800-765-0980

TestAmerica
INCORPORATED

Sample Identification

SB-7(0-4")

Matrix: Soil
% Dry Weight: 85.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82276
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 11:52
Sample QC Group: 8719

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	2810	

2960 Foster Creighton Drive / Nashville,TN 37204 / 615-726-0177 / Fax: 615-726-0954 / 800-765-0980

TestAmerica
INCORPORATED

Sample Identification

SB-8(0-3")

Matrix: Soil
% Dry Weight: 78.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82277
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 11:52
Sample QC Group: 8719

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	8720	

TestAmerica
INCORPORATED

Sample Identification

SB-9(0-4")

Matrix: Soil
% Dry Weight: 90.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82278
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 11:52
Sample QC Group: 8719

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	422	

TestAmerica
INCORPORATED

Sample Identification

SB-10(0-3")

Matrix: Soil
% Dry Weight: 84.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82279
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 11:52
Sample QC Group: 8719

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	1030	

2960 Foster Creighton Drive / Nashville,TN 37204 / 615-726-0177 / Fax: 615-726-0954 / 800-765-0980

TestAmerica
INCORPORATED

Sample Identification

SB-10(0-3")DUP

Matrix: Soil
% Dry Weight: 88.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82280
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 11:52
Sample QC Group: 8719

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	947	

TestAmerica
INCORPORATED

Sample Identification

SB-11(0-4")

Matrix: Soil
% Dry Weight: 49.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82281
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 11:52
Sample QC Group: 8719

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	1130	

2960 Foster Creighton Drive / Nashville,TN 37204 / 615-726-0177 / Fax: 615-726-0954 / 800-765-0980

TestAmerica
INCORPORATED

Sample Identification

SB-12(0-4")

Matrix: Soil
% Dry Weight: 61.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82282
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 11:52
Sample QC Group: 8719

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	1380	

TestAmerica
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Sample Identification

SB-13(0-4")

Matrix: Soil
% Dry Weight: 53.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82283
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 11:52
Sample QC Group: 8719

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	2300	

2960 Foster Creighton Drive / Nashville,TN 37204 / 615-726-0177 / Fax: 615-726-0954 / 800-765-0980

TestAmerica
INCORPORATED

Sample Identification

SB-14(0-6")

Matrix: Soil
% Dry Weight: 59.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82284
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 14:18
Sample QC Group: 2753

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	1390	

2960 Foster Creighton Drive / Nashville.TN 37204 / 615-726-0177 / Fax: 615-726-0954 / 800-765-0980

TestAmerica
INCORPORATED

Sample Identification

SB-15(0-3")

Matrix: Soil
% Dry Weight: 54.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82285
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 14:18
Sample QC Group: 2753

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	4720	

TestAmerica
INCORPORATED

Sample Identification

SB-16(0-6")

Matrix: Soil
% Dry Weight: 39.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82286
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 14:18
Sample QC Group: 2753

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	778	

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TestAmerica
INCORPORATED

Sample Identification

SB-17(0-3")

Matrix: Soil
% Dry Weight: 73.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82287
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 14:18
Sample QC Group: 2753

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	1450	

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TestAmerica
INCORPORATED

Sample Identification

SB-18(0-4")

Matrix: Soil
% Dry Weight: 66.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82288
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 14:18
Sample QC Group: 2753

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	585	

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TestAmerica
INCORPORATED

Sample Identification

SB-19(0-2")

Matrix: Soil
% Dry Weight: 78.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82289
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 14:18
Sample QC Group: 2753

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	691	

TestAmerica
INCORPORATED

Sample Identification

SB-20(0-3")

Matrix: Soil
% Dry Weight: 92.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82290
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 14:18
Sample QC Group: 2753

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	383	

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TestAmerica
INCORPORATED

Sample Identification

SB-21(0-3")

Matrix: Soil
% Dry Weight: 66.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82291
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 14:18
Sample QC Group: 2753

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	1290	

TestAmerica
INCORPORATED

Sample Identification

SB-21(0-3")DUP

Matrix: Soil
% Dry Weight: 57.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82292
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 14:18
Sample QC Group: 2753

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	1130	

TestAmerica
INCORPORATED

Sample Identification

SB-22(0-4")

Matrix: Soil
% Dry Weight: 84.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82293
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 14:18
Sample QC Group: 2753

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	1470	

TestAmerica
INCORPORATED

Sample Identification

SB-23(0-3")

Matrix: Soil
% Dry Weight: 63.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82294
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 14:18
Sample QC Group: 2753

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	834	

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TestAmerica
INCORPORATED

Sample Identification

SB-24(0-4")

Matrix: Soil
% Dry Weight: 72.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82295
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 14:18
Sample QC Group: 2753

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	2350	

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TestAmerica
INCORPORATED

Sample Identification

SB-25(0-4")

Matrix: Soil
% Dry Weight: 71.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82296
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 14:18
Sample QC Group: 2753

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	1660	

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TestAmerica
INCORPORATED

Sample Identification

SB-26(0-4")

Matrix: Soil
% Dry Weight: 86.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82297
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 14:18
Sample QC Group: 2753

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	1230	

TestAmerica
INCORPORATED

Sample Identification

SB-27(0-2")

Matrix: Soil
% Dry Weight: 91.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82298
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 14:18
Sample QC Group: 2753

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	6610	

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TestAmerica
INCORPORATED

Sample Identification

SB-28(0-3")

Matrix: Soil
% Dry Weight: 66.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82299
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 14:18
Sample QC Group: 2753

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	7600	

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TestAmerica
INCORPORATED

Sample Identification

SB-29(0-3")

Matrix: Soil
% Dry Weight: 71.
Units: mg/kg dry weight
Dilution Factor: 10.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82300
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 14:18
Sample QC Group: 2753

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	41000	

TestAmerica
INCORPORATED

Sample Identification

SB-30(0-4")

Matrix: Soil
% Dry Weight: 82.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82301
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 14:18
Sample QC Group: 2753

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	6290	

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TestAmerica
INCORPORATED

Sample Identification

SB-31(0-3")

Matrix: Soil
% Dry Weight: 83.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82302
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 14:18
Sample QC Group: 2753

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	6810	

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TestAmerica
INCORPORATED

Sample Identification

SB-32(0-4")

Matrix: Soil
% Dry Weight: 85.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82303
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 14:18
Sample QC Group: 2753

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	648	

TestAmerica
INCORPORATED

Sample Identification

SB-33(0-2")

Matrix: Soil
% Dry Weight: 90.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82304
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 19:00
Sample QC Group: 2758

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	436	

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TestAmerica
INCORPORATED

Sample Identification

SB-34(0-2")

Matrix: Soil
% Dry Weight: 53.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82305
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 19:00
Sample QC Group: 2758

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	5330	

TestAmerica
INCORPORATED

Sample Identification

SB-35(0-3")

Matrix: Soil
% Dry Weight: 75.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82306
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 19:00
Sample QC Group: 2758

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	812	

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TestAmerica
INCORPORATED

Sample Identification

SB-36(0-3")

Matrix: Soil
% Dry Weight: 77.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82307
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 19:00
Sample QC Group: 2758

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	23800	

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TestAmerica
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Sample Identification

SB-37(0-4")

Matrix: Soil
% Dry Weight: 45.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82308
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 19:00
Sample QC Group: 2758

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	453	

TestAmerica
INCORPORATED

Sample Identification

SB-38(0-3")

Matrix: Soil
% Dry Weight: 54.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82309
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 19:00
Sample QC Group: 2758

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	103	J

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TestAmerica
INCORPORATED

Sample Identification

SB-38(0-3")DUP

Matrix: Soil
% Dry Weight: 50.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82310
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 19:00
Sample QC Group: 2758

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	383	

TestAmerica
INCORPORATED

Sample Identification

SB-39(0-3")

Matrix: Soil
% Dry Weight: 52.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82311
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 19:00
Sample QC Group: 2758

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	338	

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TestAmerica
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Sample Identification

SB-40(0-3")

Matrix: Soil
% Dry Weight: 51.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82312
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 19:00
Sample QC Group: 2758

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	100	

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INCORPORATED

Sample Identification

SB-17(8")

Matrix: Soil
% Dry Weight: 63.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82313
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 19:00
Sample QC Group: 2758

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	2690	

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Sample Identification

SB-30(0-4")DUP

Matrix: Soil
% Dry Weight: 72.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82314
Date Sampled: 6/10/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 19:00
Sample QC Group: 2758

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7439-92-1	Lead	6730	

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Sample Identification

SB41(0-3")

Matrix: Extract
pH:
Units: ug/l

Analysis Method: 6010B
Delivery Group: 241628
Instrument:

Lab Sample ID: 01-A82263
Date Sampled:: 6/11/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 15:37
Sample QC Group: 2761

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7440-43-9	Cadmium	100.	U
7440-47-3	Chromium	500.	U
7439-92-1	Lead	2010	

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Nashville Division
2960 Foster Creighton
Nashville, TN 37204

Phone: 615-726-0177
Fax: 615-726-3404

To assist us in using the proper analytical methods, is this work being conducted for regulatory purposes?
Compliance Monitoring _____

241660

Client Name: Montgomery Watson Client #: 8446

Address: 41551 Eleven Mile Road

City/State/Zip Code: Novi MI 48375

Project Manager: Erica Geasler

Telephone Number: 248 449 3419 Fax: 3.12483440217

Sampler Name: (Print Name) Kris Donaldson

Sampler Signature: Kris Donaldson

Project Name: USCG Passage Island

Project #: 210151.171601

Site/Location ID: Keweenaw County State: MI

Report To: Erica Geasler

Invoice To: Erica Geasler

Quote #: _____ PO#: _____

TAT: X Standard; ___ Rush (surcharges may apply)

Date Needed: _____

Fax Results: Y (N)

QC Deliverables: ___ None; ___ Level 2 (Batch QC); X Level 3; ___ Level 4; Other: _____

SAMPLE ID	Date Sampled	Time Sampled	G = Grab, C = Composite	Field Filtered	Matrix: SL - Sludge, DW - Drinking Water, GW - Groundwater, S - Soil/Solid, WW - Wastewater, Specify Other	HNO_3	HCl	NaOH	H_2SO_4	Methanol	None	Other (Specify)	BTEX/TMB	PNAs/TPH-DRO	moisture								REMARKS
SB-42 0-3"	6/12/01	9:40	G		S					1	2		X	X	X								82436
SB-43 0-3"		9:50	G		S					1	2		X	X	X								37
SB-44 0-2"		9:55	G		S					1	2		X	X	X								38
SB-45 0-3"		10:00	G		S					1	2		X	X	X								39
SB-46 0-3"		10:10	G		S					1	2		X	X	X								40
SB-47 0-3"		10:15	G		S					1	2		X	X	X								41
SB-48 0-3"		10:20	G		S					1	2		X	X	X								42
SB-49 0-2"		10:25	G		S					1	2		X	X	X								43
SB-50 0-4"		10:30	G		S					1	2		X	X	X								44
SB-50 0-4" DUP		10:30	G		S					1	2		X	X	X								82445

Special Instructions: *WATCH HOLD TIMES
BTEX/TMB/~~1,2-DCA~~/~~1,2-EDB~~/VHC are field preserved

Relinquished By: Lisa Gitel	Date: 6/15/01	Time: 14:00	Received By: FedEx	Date: 6/15/01	Time: 14:00
Relinquished By:	Date:	Time:	Received By: J Davis	Date: 6/18/01	Time: 900
Relinquished By:	Date:	Time:	Received By:	Date:	Time:

LABORATORY COMMENTS:
Init Lab Temp:
Rec Lab Temp: 4°C
Custody Seals: (Y) N N/A
Bottles Supplied by TestAmerica: Y N
Method of Shipment:

3

TestAmerica INCORPORATED

Nashville Division
2960 Foster Creighton
Nashville, TN 37204

Phone: 615-726-0177
Fax: 615-726-3404

To assist us in using the proper analytical methods, is this work being conducted for regulatory purposes?
Compliance Monitoring _____

241660

Client Name: Montgomery Watson Client #: 8446
Address: 41551 Eleven Mile Rd
City/State/Zip Code: Novi MI 48375
Project Manager: E. Geasler
Telephone Number: 248 3440205 Fax: 248 344 0217
Sampler Name: (Print Name) Kris Donaldson
Sampler Signature: Kris Donaldson

Project Name: USCG Passage Island
Project #: 2101151.171601
Site/Location ID: Keweenaw County State: MI
Report To: E. Geasler
Invoice To: E. Geasler
Quote #: _____ PO#: _____

TAT: X Standard; ___ Rush (surcharges may apply)
Date Needed: _____
Fax Results: Y (N)

QC Deliverables: ___ None; ___ Level 2 (Batch QC); X Level 3; ___ Level 4; Other: _____

SAMPLE ID	Date Sampled	Time Sampled	G = Grab, C = Composite	Field Filtered	Matrix (SL - Sludge, DW - Drinking Water, GW - Groundwater, S - Soil/Solid, WW - Wastewater, Specify Other)	HNO_3	HCl	NaOH	H_2SO_4	Methanol	None	Other (Specify)	BTEX/TMB	PNAs/TPH-DRO	Moisture	REMARKS
SB-51 0-3"	6/12/01	10:35	G		C					1	2		X	X	X	82446
SB-52 0-2"	↓	10:40	G		S					1	2		X	X	X	82447
SB-53 0-2"	↓	10:45	G		S					1	2		X	X	X	82448

Special Instructions:
WATCH HOLD TIMES
BTEX/TMB are field preserved

Relinquished By:	Date	Time:	Received By:	Date	Time:
Kris Donaldson	6/15/01		FedEx	6/15/01	
Relinquished By:	Date:	Time:	Received By:	Date: 6/16/01	Time: 900
Relinquished By:	Date:	Time:	Received By:	Date:	Time:

LABORATORY COMMENTS:
Init Lab Temp:
Rec Lab Temp: 4°C
Custody Seals: (Y) N N/A
Bottles Supplied by TestAmerica: Y N
Method of Shipment:

TestAmerica
INCORPORATED

Sample Identification

SB-42 0-3"

Matrix: Soil
% Dry Weight: 81.
Units: ug/kg dry weight
Dilution Factor: 5.
Analysis Method: 8015B/3550
Delivery Group: 241660
Instrument: PE-1
Grams Extracted: 25.2 g
Extract Vol: 1.0 ml

Lab Sample ID: 01-A82436
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/23/01
Analysis Time: 7:57
Sample QC Group: 5695

Extraction Date: 6/18/01

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Diesel Range)	83800	

TestAmerica
INCORPORATED

Sample Identification

SB-43 0-3"

Matrix: Soil
% Dry Weight: 85.
Units: ug/kg dry weight
Dilution Factor: 2.
Analysis Method: 8015B/3550
Delivery Group: 241660
Instrument: PE-1
Grams Extracted: 25.3 g
Extract Vol: 1.0 ml

Lab Sample ID: 01-A82437
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/23/01
Analysis Time: 8:16
Sample QC Group: 5695

Extraction Date: 6/18/01

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Diesel Range)	29400	

TestAmerica
INCORPORATED

Sample Identification

SB-44 0-2"

Matrix: Soil
% Dry Weight: 86.
Units: ug/kg dry weight
Dilution Factor: 10.
Analysis Method: 8015B/3550
Delivery Group: 241660
Instrument: PE-1
Grams Extracted: 25.4 g
Extract Vol: 1.0 ml

Lab Sample ID: 01-A82438
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/22/01
Analysis Time: 21:20
Sample QC Group: 5695

Extraction Date: 6/18/01

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Diesel Range)	1170000	

TestAmerica
INCORPORATED

Sample Identification

SB-45 0-3"

Matrix: Soil
% Dry Weight: 66.
Units: ug/kg dry weight
Dilution Factor: 5.
Analysis Method: 8015B/3550
Delivery Group: 241660
Instrument: PE-1
Grams Extracted: 25.4 g
Extract Vol: 1.0 ml

Lab Sample ID: 01-A82439
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/23/01
Analysis Time: 8:36
Sample QC Group: 5695

Extraction Date: 6/18/01

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Diesel Range)	107000	

TestAmerica
INCORPORATED

Sample Identification

SB-46 0-3"

Matrix: Soil
% Dry Weight: 73.
Units: ug/kg dry weight
Dilution Factor: 10.
Analysis Method: 8015B/3550
Delivery Group: 241660
Instrument: PE-1
Grams Extracted: 24.9 g
Extract Vol: 1.0 ml

Lab Sample ID: 01-A82440
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/22/01
Analysis Time: 21:59
Sample QC Group: 5695

Extraction Date: 6/18/01

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Diesel Range)	579000	

TestAmerica
INCORPORATED

Sample Identification

SB-47 0-3"

Matrix: Soil
% Dry Weight: 83.
Units: ug/kg dry weight
Dilution Factor: 10.
Analysis Method: 8015B/3550
Delivery Group: 241660
Instrument: PE-1
Grams Extracted: 25.2 g
Extract Vol: 1.0 ml

Lab Sample ID: 01-A82441
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/22/01
Analysis Time: 22:18
Sample QC Group: 5695

Extraction Date: 6/18/01

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Diesel Range)	236000	

TestAmerica
INCORPORATED

Sample Identification

SB-48 0-3"

Matrix: Soil
% Dry Weight: 88.
Units: ug/kg dry weight
Dilution Factor: 10.
Analysis Method: 8015B/3550
Delivery Group: 241660
Instrument: PE-1
Grams Extracted: 25.3 g
Extract Vol: 1.0 ml

Lab Sample ID: 01-A82442
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/23/01
Analysis Time: 8:55
Sample QC Group: 5695

Extraction Date: 6/18/01

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Diesel Range)	210000	

TestAmerica
INCORPORATED

Sample Identification

SB-49 0-2"

Matrix: Soil
% Dry Weight: 74.
Units: ug/kg dry weight
Dilution Factor: 10.
Analysis Method: 8015B/3550
Delivery Group: 241660
Instrument: PE-1
Grams Extracted: 25.1 g
Extract Vol: 1.0 ml

Lab Sample ID: 01-A82443
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/22/01
Analysis Time: 22:56
Sample QC Group: 5695

Extraction Date: 6/18/01

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Diesel Range)	201000	

TestAmerica
INCORPORATED

Sample Identification

SB-50 0-4"

Matrix: Soil
% Dry Weight: 64.
Units: ug/kg dry weight
Dilution Factor: 2.
Analysis Method: 8015B/3550
Delivery Group: 241660
Instrument: PE-1
Grams Extracted: 25.0 g
Extract Vol: 1.0 ml

Lab Sample ID: 01-A82444
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/23/01
Analysis Time: 9:14
Sample QC Group: 5695

Extraction Date: 6/18/01

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Diesel Range)	53100	

TestAmerica
INCORPORATED

Sample Identification

SB-50 0-4"DUP

Matrix: Soil
% Dry Weight: 71.
Units: ug/kg dry weight
Dilution Factor: 2.
Analysis Method: 8015B/3550
Delivery Group: 241660
Instrument: PE-1
Grams Extracted: 25.1 g
Extract Vol: 1.0 ml

Lab Sample ID: 01-A82445
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/23/01
Analysis Time: 9:33
Sample QC Group: 5695

Extraction Date: 6/18/01

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Diesel Range)	32400	

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Sample Identification

SB-51 0-3"

Matrix: Soil
% Dry Weight: 68.
Units: ug/kg dry weight
Dilution Factor: 2.
Analysis Method: 8015B/3550
Delivery Group: 241660
Instrument: PE-1
Grams Extracted: 25.2 g
Extract Vol: 1.0 ml

Lab Sample ID: 01-A82446
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/23/01
Analysis Time: 9:53
Sample QC Group: 5695

Extraction Date: 6/18/01

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Diesel Range)	43400	

TestAmerica
INCORPORATED

Sample Identification

SB-52 0-2"

Matrix: Soil
% Dry Weight: 75.
Units: ug/kg dry weight
Dilution Factor: 2.
Analysis Method: 8015B/3550
Delivery Group: 241660
Instrument: PE-1
Grams Extracted: 25.0 g
Extract Vol: 1.0 ml

Lab Sample ID: 01-A82447
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/23/01
Analysis Time: 10:12
Sample QC Group: 5695

Extraction Date: 6/18/01

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Diesel Range)	58400	

TestAmerica
INCORPORATED

Sample Identification

SB-53 0-2"

Matrix: Soil
% Dry Weight: 69.
Units: ug/kg dry weight
Dilution Factor: 2.
Analysis Method: 8015B/3550
Delivery Group: 241660
Instrument: PE-1
Grams Extracted: 25.1 g
Extract Vol: 1.0 ml

Lab Sample ID: 01-A82448
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/23/01
Analysis Time: 12:26
Sample QC Group: 5695

Extraction Date: 6/18/01

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Diesel Range)	44600	

TestAmerica
INCORPORATED

Sample Identification

SB-42 0-3"

Matrix: Soil
% Dry Weight: 81.
Units: ug/kg dry weight
Dilution Factor: 50.
Analysis Method: SW8260B
Delivery Group: 241660
Instrument: HP-36

Lab Sample ID: 01-A82436
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/20/01
Analysis Time: 1:33
Sample QC Group: 4776

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
71-43-2	Benzene	92.6	J
100-41-4	Ethylbenzene	117.	J
108-88-3	Toluene	660.	
95-63-6	1,2,4-Trimethylbenzene	191.	
108-67-8	1,3,5-Trimethylbenzene	123.	U
1330-20-7	Xylenes, Total	580.	

TestAmerica
INCORPORATED

Sample Identification

SB-43 0-3"

Matrix: Soil
% Dry Weight: 85.
Units: ug/kg dry weight
Dilution Factor: 50.
Analysis Method: SW8260B
Delivery Group: 241660
Instrument: HP-36

Lab Sample ID: 01-A82437
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/20/01
Analysis Time: 2:10
Sample QC Group: 4776

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
71-43-2	Benzene	82.4	J
100-41-4	Ethylbenzene	171.	
108-88-3	Toluene	559.	
95-63-6	1,2,4-Trimethylbenzene	271.	
108-67-8	1,3,5-Trimethylbenzene	64.7	J
1330-20-7	Xylenes, Total	771.	

TestAmerica
INCORPORATED

Sample Identification

SB-44 0-2"

Matrix: Soil
% Dry Weight: 86.
Units: ug/kg dry weight
Dilution Factor: 50.
Analysis Method: SW8260B
Delivery Group: 241660
Instrument: HP-36

Lab Sample ID: 01-A82438
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/20/01
Analysis Time: 2:46
Sample QC Group: 4776

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
71-43-2	Benzene	215.	....
100-41-4	Ethylbenzene	262.	....
108-88-3	Toluene	1160	....
95-63-6	1,2,4-Trimethylbenzene	593.	....
108-67-8	1,3,5-Trimethylbenzene	145.	....
1330-20-7	Xylenes, Total	1580	....

TestAmerica
INCORPORATED

Sample Identification

SB-45 0-3"

Matrix: Soil
% Dry Weight: 66.
Units: ug/kg dry weight
Dilution Factor: 50.
Analysis Method: SW8260B
Delivery Group: 241660
Instrument: HP-36

Lab Sample ID: 01-A82439
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/20/01
Analysis Time: 3:23
Sample QC Group: 4776

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
71-43-2	Benzene	205.	
100-41-4	Ethylbenzene	303.	
108-88-3	Toluene	1140	
95-63-6	1,2,4-Trimethylbenzene	523.	
108-67-8	1,3,5-Trimethylbenzene	136.	J
1330-20-7	Xylenes, Total	1480	

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Sample Identification

SB-46 0-3"

Matrix: Soil
% Dry Weight: 73.
Units: ug/kg dry weight
Dilution Factor: 50.
Analysis Method: SW8260B
Delivery Group: 241660
Instrument: HP-36

Lab Sample ID: 01-A82440
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/20/01
Analysis Time: 4:00
Sample QC Group: 4776

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
71-43-2	Benzene	137.	J
100-41-4	Ethylbenzene	295.	
108-88-3	Toluene	788.	
95-63-6	1,2,4-Trimethylbenzene	521.	
108-67-8	1,3,5-Trimethylbenzene	158.	
1330-20-7	Xylenes, Total	1400	

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Sample Identification

SB-47 0-3"

Matrix: Soil
% Dry Weight: 83.
Units: ug/kg dry weight
Dilution Factor: 50.
Analysis Method: SW8260B
Delivery Group: 241660
Instrument: HP-36

Lab Sample ID: 01-A82441
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/20/01
Analysis Time: 13:27
Sample QC Group: 4776

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
71-43-2	Benzene	120.	U
100-41-4	Ethylbenzene	54.2	J
108-88-3	Toluene	181.	
95-63-6	1,2,4-Trimethylbenzene	133.	
108-67-8	1,3,5-Trimethylbenzene	120.	U
1330-20-7	Xylenes, Total	295.	

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Sample Identification

SB-48 0-3"

Matrix: Soil
% Dry Weight: 88.
Units: ug/kg dry weight
Dilution Factor: 50.
Analysis Method: SW8260B
Delivery Group: 241660
Instrument: HP-36

Lab Sample ID: 01-A82442
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/20/01
Analysis Time: 14:03
Sample QC Group: 4776

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
71-43-2	Benzene	114.	U
100-41-4	Ethylbenzene	102.	J
108-88-3	Toluene	233.	
95-63-6	1,2,4-Trimethylbenzene	125.	
108-67-8	1,3,5-Trimethylbenzene	114.	U
1330-20-7	Xylenes, Total	318.	

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Sample Identification

SB-49 0-2"

Matrix: Soil
% Dry Weight: 74.
Units: ug/kg dry weight
Dilution Factor: 50.
Analysis Method: SW8260B
Delivery Group: 241660
Instrument: HP-36

Lab Sample ID: 01-A82443
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/20/01
Analysis Time: 14:40
Sample QC Group: 4776

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
71-43-2	Benzene	135.	U
100-41-4	Ethylbenzene	135.	U
108-88-3	Toluene	135.	U
95-63-6	1,2,4-Trimethylbenzene	135.	U
108-67-8	1,3,5-Trimethylbenzene	135.	U
1330-20-7	Xylenes, Total	135.	U

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Sample Identification

SB-50 0-4"

Matrix: Soil
% Dry Weight: 64.
Units: ug/kg dry weight
Dilution Factor: 50.
Analysis Method: SW8260B
Delivery Group: 241660
Instrument: HP-36

Lab Sample ID: 01-A82444
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/20/01
Analysis Time: 15:16
Sample QC Group: 4776

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
71-43-2	Benzene	156.	U
100-41-4	Ethylbenzene	156.	U
108-88-3	Toluene	156.	U
95-63-6	1,2,4-Trimethylbenzene	156.	U
108-67-8	1,3,5-Trimethylbenzene	156.	U
1330-20-7	Xylenes, Total	156.	U

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Sample Identification

SB-50 0-4"DUP

Matrix: Soil
% Dry Weight: 71.
Units: ug/kg dry weight
Dilution Factor: 50.
Analysis Method: SW8260B
Delivery Group: 241660
Instrument: HP-36

Lab Sample ID: 01-A82445
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/20/01
Analysis Time: 15:52
Sample QC Group: 4776

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
71-43-2	Benzene	141.	U
100-41-4	Ethylbenzene	141.	U
108-88-3	Toluene	141.	U
95-63-6	1,2,4-Trimethylbenzene	141.	U
108-67-8	1,3,5-Trimethylbenzene	141.	U
1330-20-7	Xylenes, Total	141.	U

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Sample Identification

SB-51 0-3"

Matrix: Soil
% Dry Weight: 68.
Units: ug/kg dry weight
Dilution Factor: 50.
Analysis Method: SW8260B
Delivery Group: 241660
Instrument: HP-36

Lab Sample ID: 01-A82446
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/20/01
Analysis Time: 16:29
Sample QC Group: 4776

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
71-43-2	Benzene	147.	U
100-41-4	Ethylbenzene	147.	U
108-88-3	Toluene	147.	U
95-63-6	1,2,4-Trimethylbenzene	147.	U
108-67-8	1,3,5-Trimethylbenzene	147.	U
1330-20-7	Xylenes, Total	147.	U

TestAmerica
INCORPORATED

Sample Identification

SB-52 0-2"

Matrix: Soil
% Dry Weight: 75.
Units: ug/kg dry weight
Dilution Factor: 50.
Analysis Method: SW8260B
Delivery Group: 241660
Instrument: HP-36

Lab Sample ID: 01-A82447
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/20/01
Analysis Time: 8:15
Sample QC Group: 4776

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
71-43-2	Benzene	133.	U
100-41-4	Ethylbenzene	133.	U
108-88-3	Toluene	133.	U
95-63-6	1,2,4-Trimethylbenzene	133.	U
108-67-8	1,3,5-Trimethylbenzene	133.	U
1330-20-7	Xylenes, Total	133.	U

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Sample Identification

SB-53 0-2"

Matrix: Soil
% Dry Weight: 69.
Units: ug/kg dry weight
Dilution Factor: 50.
Analysis Method: SW8260B
Delivery Group: 241660
Instrument: HP-36

Lab Sample ID: 01-A82448
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/20/01
Analysis Time: 8:51
Sample QC Group: 4776

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
71-43-2	Benzene	145.	U
100-41-4	Ethylbenzene	145.	U
108-88-3	Toluene	145.	U
95-63-6	1,2,4-Trimethylbenzene	145.	U
108-67-8	1,3,5-Trimethylbenzene	145.	U
1330-20-7	Xylenes, Total	77.5	J

TestAmerica INCORPORATED

Nashville Division
2960 Foster Creighton
Nashville, TN 37204

Phone: 615-726-0177
Fax: 615-726-3404

To assist us in using the proper analytical methods, is this work being conducted for regulatory purposes?
Compliance Monitoring _____

Client Name: Montgomery Watson Client #: 8446

24/651

Address: 41551 Eleven Mile Road

City/State/Zip Code: Novi MI 48375

Project Manager: Erica Geasler

Telephone Number: 248 449 3419 Fax: 8.12483440217

Sampler Name: (Print Name) Kris Donaldson

Sampler Signature: Kris Donaldson

Project Name: USCG Passage Island

Project #: 2101151.171601

Site/Location ID: Keweenaw County State: MI

Report To: Erica Geasler

Invoice To: Erica Geasler

Quote #: _____ PO#: _____

TAT
X Standard
___ Rush (surcharges may apply)

Date Needed: _____

Fax Results: Y (N)

SAMPLE ID	Date Sampled	Time Sampled	G = Grab, C = Composite	Field Filtered	Matrix: SL - Sludge, DW - Drinking Water, GW - Groundwater, S - Soil/Solid, WW - Wastewater, Specify Other	Preservation & # of Containers: HNO_3	HCl	NaOH	H_2SO_4	Methanol	None	Other (Specify)	Analyze For: BTEX/TMB	1,2-DCA/1,2-EDB	Volatile halocarbons	PCBs	PNAs/TPH-DRO	Cadmium, chromium, lead	moisture				QC Deliverables: X Level 3 (Batch QC)	REMARKS
SB-54 0-6"	6/12/01	10:50	G		S					1	4		X	X	X	X	X	X	X					82385
SB-54 0-6" DUP		10:50	G		S					1	4		X	X	X	X	X	X	X					86
SB-54 0-6" MS/MSD		10:50	G		S					1	4		X	X	X	X	X	X	X					85
SB55 0-4"		10:55	G		S					1	4		X	X	X	X	X	X	X					87
SB-56 0-4"		11:00	G		S					1	4		X	X	X	X	X	X	X					88
SB-57 0-4"		11:05	G		S					1	4		X	X	X	X	X	X	X					89
SB-58 0-4"		11:10	G		S					1	4		X	X	X	X	X	X	X					82390

Special Instructions: * WATCH HOLD TIMES
BTEX/TMB/1,2-DCA/1,2-EDB/VHC are field preserved

Relinquished By:	Date:	Time:	Received By:	Date:	Time:
Kirk Cotl	6/15/01	14:00	FedEx	6/15/01	14:00

Relinquished By:	Date:	Time:	Received By:	Date:	Time:
			J Gardner	6/16/01	900

LABORATORY COMMENTS:
Init Lab Temp:
Rec Lab Temp: 2°C
Custody Seals: (Y) N N/A
Bottles Supplied by TestAmerica: Y N
Method of Shipment:

4

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Sample Identification

SB-54 0-6"

Matrix: Soil
% Dry Weight: 76.
Units: ug/kg dry weight
Dilution Factor: 50.
Analysis Method: SW8260B
Delivery Group: 241651
Instrument: HP-36

Lab Sample ID: 01-A82385
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/20/01
Analysis Time: 12:50
Sample QC Group: 4773

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
67-64-1	Acetone	414.	J
71-43-2	Benzene	132.	U
108-86-1	Bromobenzene	132.	U
74-97-5	Bromochloromethane	132.	U
75-25-2	Bromoform	132.	U
74-83-9	Bromomethane	132.	U
78-93-3	2-Butanone	3290	U
104-51-8	n-Butylbenzene	132.	U
135-98-8	sec-Butylbenzene	132.	U
98-06-6	t-Butylbenzene	132.	U
75-15-0	Carbon disulfide	132.	U
56-23-5	Carbon tetrachloride	132.	U
108-90-7	Chlorobenzene	132.	U
75-00-3	Chloroethane	132.	U
67-66-3	Chloroform	132.	U
74-87-3	Chloromethane	132.	U
95-49-8	2-Chlorotoluene	132.	U
106-43-4	4-Chlorotoluene	132.	U
96-12-8	1,2-Dibromo-3-chloropropane	658.	U
124-48-1	Dibromochloromethane	132.	U
106-93-4	1,2-Dibromoethane	132.	U
74-95-3	Dibromomethane	132.	U
95-50-1	1,2-Dichlorobenzene	132.	U
541-73-1	1,3-Dichlorobenzene	132.	U
106-46-7	1,4-Dichlorobenzene	132.	U
75-71-8	Dichlorodifluoromethane	132.	U
75-34-3	1,1-Dichloroethane	132.	U
107-06-2	1,2-Dichloroethane	132.	U
75-35-4	1,1-Dichloroethene	132.	U
156-59-2	cis-1,2-Dichloroethene	132.	U

TestAmerica
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Sample Identification

SB-54 0-6"

Matrix: Soil
% Dry Weight: 76.
Units: ug/kg dry weight

Lab Sample ID: 01-A82385
Date Sampled: 6/12/01
Date Received: 6/16/01

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
156-60-5	trans-1,2-Dichloroethene	132.	U
78-87-5	1,2-Dichloropropane	132.	U
142-28-9	1,3-Dichloropropane	132.	U
594-20-7	2,2-Dichloropropane	132.	U
563-58-6	1,1-Dichloropropene	132.	U
10061-01-5	cis-1,3-Dichloropropene	132.	U
10061-02-6	trans-1,3-Dichloropropene	132.	U
100-41-4	Ethylbenzene	132.	U
87-68-3	Hexachlorobutadiene	132.	U
591-78-6	2-Hexanone	658.	U
98-82-8	Isopropylbenzene	132.	U
99-87-6	4-Isopropyltoluene	132.	U
108-10-1	4-Methyl-2-pentanone	658.	U
75-09-2	Methylene chloride	65.8	J
91-20-3	Naphthalene	329.	U
103-65-1	n-Propylbenzene	132.	U
100-42-5	Styrene	132.	U
630-20-6	1,1,1,2-Tetrachloroethane	132.	U
79-34-5	1,1,2,2-Tetrachloroethane	132.	U
127-18-4	Tetrachloroethene	132.	U
108-88-3	Toluene	132.	U
87-61-6	1,2,3-Trichlorobenzene	132.	U
120-82-1	1,2,4-Trichlorobenzene	132.	U
71-55-6	1,1,1-Trichloroethane	132.	U
79-00-5	1,1,2-Trichloroethane	132.	U
79-01-6	Trichloroethene	132.	U
96-18-4	1,2,3-Trichloropropane	132.	U
95-63-6	1,2,4-Trimethylbenzene	132.	U
108-67-8	1,3,5-Trimethylbenzene	132.	U
75-01-4	Vinyl chloride	132.	U
1330-20-7	Xylenes, Total	132.	U
75-27-4	Bromodichloromethane	132.	U
75-69-4	Trichlorofluoromethane	112.	J

TestAmerica
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Sample Identification

SB-54 0-6"DUP

Matrix: Soil
% Dry Weight: 86.
Units: ug/kg dry weight
Dilution Factor: 50.
Analysis Method: SW8260B
Delivery Group: 241651
Instrument: HP-36

Lab Sample ID: 01-A82386
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/19/01
Analysis Time: 19:32
Sample QC Group: 4773

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
67-64-1	Acetone	2910	U
71-43-2	Benzene	116.	U
108-86-1	Bromobenzene	116.	U
74-97-5	Bromochloromethane	116.	U
75-25-2	Bromoform	116.	U
74-83-9	Bromomethane	116.	U
78-93-3	2-Butanone	2910	U
104-51-8	n-Butylbenzene	116.	U
135-98-8	sec-Butylbenzene	116.	U
98-06-6	t-Butylbenzene	116.	U
75-15-0	Carbon disulfide	116.	U
56-23-5	Carbon tetrachloride	116.	U
108-90-7	Chlorobenzene	116.	U
75-00-3	Chloroethane	116.	U
67-66-3	Chloroform	116.	U
74-87-3	Chloromethane	116.	U
95-49-8	2-Chlorotoluene	116.	U
106-43-4	4-Chlorotoluene	116.	U
96-12-8	1,2-Dibromo-3-chloropropane	581.	U
124-48-1	Dibromochloromethane	116.	U
106-93-4	1,2-Dibromoethane	116.	U
74-95-3	Dibromomethane	116.	U
95-50-1	1,2-Dichlorobenzene	116.	U
541-73-1	1,3-Dichlorobenzene	116.	U
106-46-7	1,4-Dichlorobenzene	116.	U
75-71-8	Dichlorodifluoromethane	116.	U
75-34-3	1,1-Dichloroethane	116.	U
107-06-2	1,2-Dichloroethane	116.	U
75-35-4	1,1-Dichloroethene	116.	U
156-59-2	cis-1,2-Dichloroethene	116.	U

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Sample Identification

SB-54 0-6"DUP

Matrix: Soil
% Dry Weight: 86.
Units: ug/kg dry weight

Lab Sample ID: 01-A82386
Date Sampled: 6/12/01
Date Received: 6/16/01

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
156-60-5	trans-1,2-Dichloroethene	116.	U
78-87-5	1,2-Dichloropropane	116.	U
142-28-9	1,3-Dichloropropane	116.	U
594-20-7	2,2-Dichloropropane	116.	U
563-58-6	1,1-Dichloropropene	116.	U
10061-01-5	cis-1,3-Dichloropropene	116.	U
10061-02-6	trans-1,3-Dichloropropene	116.	U
100-41-4	Ethylbenzene	116.	U
87-68-3	Hexachlorobutadiene	116.	U
591-78-6	2-Hexanone	581.	U
98-82-8	Isopropylbenzene	116.	U
99-87-6	4-Isopropyltoluene	116.	U
108-10-1	4-Methyl-2-pentanone	581.	U
75-09-2	Methylene chloride	64.0	J
91-20-3	Naphthalene	291.	U
103-65-1	n-Propylbenzene	116.	U
100-42-5	Styrene	116.	U
630-20-6	1,1,1,2-Tetrachloroethane	116.	U
79-34-5	1,1,2,2-Tetrachloroethane	116.	U
127-18-4	Tetrachloroethene	116.	U
108-88-3	Toluene	116.	U
87-61-6	1,2,3-Trichlorobenzene	116.	U
120-82-1	1,2,4-Trichlorobenzene	116.	U
71-55-6	1,1,1-Trichloroethane	116.	U
79-00-5	1,1,2-Trichloroethane	116.	U
79-01-6	Trichloroethene	116.	U
96-18-4	1,2,3-Trichloropropane	116.	U
95-63-6	1,2,4-Trimethylbenzene	116.	U
108-67-8	1,3,5-Trimethylbenzene	116.	U
75-01-4	Vinyl chloride	116.	U
1330-20-7	Xylenes, Total	116.	U
75-27-4	Bromodichloromethane	116.	U
75-69-4	Trichlorofluoromethane	116.	U

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Sample Identification

SB-55 0-4"

Matrix: Soil
% Dry Weight: 90.
Units: ug/kg dry weight
Dilution Factor: 50.
Analysis Method: SW8260B
Delivery Group: 241651
Instrument: HP-36

Lab Sample ID: 01-A82387
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/19/01
Analysis Time: 20:09
Sample QC Group: 4773

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
67-64-1	Acetone	2780	U
71-43-2	Benzene	111.	U
108-86-1	Bromobenzene	111.	U
74-97-5	Bromochloromethane	111.	U
75-25-2	Bromoform	111.	U
74-83-9	Bromomethane	111.	U
78-93-3	2-Butanone	2780	U
104-51-8	n-Butylbenzene	111.	U
135-98-8	sec-Butylbenzene	111.	U
98-06-6	t-Butylbenzene	111.	U
75-15-0	Carbon disulfide	111.	U
56-23-5	Carbon tetrachloride	111.	U
108-90-7	Chlorobenzene	111.	U
75-00-3	Chloroethane	111.	U
67-66-3	Chloroform	111.	U
74-87-3	Chloromethane	111.	U
95-49-8	2-Chlorotoluene	111.	U
106-43-4	4-Chlorotoluene	111.	U
96-12-8	1,2-Dibromo-3-chloropropane	556.	U
124-48-1	Dibromochloromethane	111.	U
106-93-4	1,2-Dibromoethane	111.	U
74-95-3	Dibromomethane	111.	U
95-50-1	1,2-Dichlorobenzene	111.	U
541-73-1	1,3-Dichlorobenzene	111.	U
106-46-7	1,4-Dichlorobenzene	111.	U
75-71-8	Dichlorodifluoromethane	111.	U
75-34-3	1,1-Dichloroethane	111.	U
107-06-2	1,2-Dichloroethane	111.	U
75-35-4	1,1-Dichloroethene	111.	U
156-59-2	cis-1,2-Dichloroethene	111.	U

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Sample Identification

SB-55 0-4"

Matrix: Soil
% Dry Weight: 90.
Units: ug/kg dry weight

Lab Sample ID: 01-A82387
Date Sampled: 6/12/01
Date Received: 6/16/01

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
156-60-5	trans-1,2-Dichloroethene	111.	U
78-87-5	1,2-Dichloropropane	111.	U
142-28-9	1,3-Dichloropropane	111.	U
594-20-7	2,2-Dichloropropane	111.	U
563-58-6	1,1-Dichloropropene	111.	U
10061-01-5	cis-1,3-Dichloropropene	111.	U
10061-02-6	trans-1,3-Dichloropropene	111.	U
100-41-4	Ethylbenzene	111.	U
87-68-3	Hexachlorobutadiene	111.	U
591-78-6	2-Hexanone	556.	U
98-82-8	Isopropylbenzene	111.	U
99-87-6	4-Isopropyltoluene	111.	U
108-10-1	4-Methyl-2-pentanone	556.	U
75-09-2	Methylene chloride	278.	U
91-20-3	Naphthalene	278.	U
103-65-1	n-Propylbenzene	111.	U
100-42-5	Styrene	111.	U
630-20-6	1,1,1,2-Tetrachloroethane	111.	U
79-34-5	1,1,2,2-Tetrachloroethane	111.	U
127-18-4	Tetrachloroethene	111.	U
108-88-3	Toluene	111.	U
87-61-6	1,2,3-Trichlorobenzene	111.	U
120-82-1	1,2,4-Trichlorobenzene	111.	U
71-55-6	1,1,1-Trichloroethane	111.	U
79-00-5	1,1,2-Trichloroethane	111.	U
79-01-6	Trichloroethene	111.	U
96-18-4	1,2,3-Trichloropropane	111.	U
95-63-6	1,2,4-Trimethylbenzene	111.	U
108-67-8	1,3,5-Trimethylbenzene	111.	U
75-01-4	Vinyl chloride	111.	U
1330-20-7	Xylenes, Total	111.	U
75-27-4	Bromodichloromethane	111.	U
75-69-4	Trichlorofluoromethane	111.	U

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Sample Identification

SB-56 0-4"

Matrix: Soil
% Dry Weight: 66.
Units: ug/kg dry weight
Dilution Factor: 50.
Analysis Method: SW8260B
Delivery Group: 241651
Instrument: HP-36

Lab Sample ID: 01-A82388
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/19/01
Analysis Time: 20:46
Sample QC Group: 4773

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
67-64-1	Acetone	3790	U
71-43-2	Benzene	152.	U
108-86-1	Bromobenzene	152.	U
74-97-5	Bromochloromethane	152.	U
75-25-2	Bromoform	152.	U
74-83-9	Bromomethane	152.	U
78-93-3	2-Butanone	3790	U
104-51-8	n-Butylbenzene	152.	U
135-98-8	sec-Butylbenzene	152.	U
98-06-6	t-Butylbenzene	152.	U
75-15-0	Carbon disulfide	152.	U
56-23-5	Carbon tetrachloride	152.	U
108-90-7	Chlorobenzene	152.	U
75-00-3	Chloroethane	152.	U
67-66-3	Chloroform	152.	U
74-87-3	Chloromethane	152.	U
95-49-8	2-Chlorotoluene	152.	U
106-43-4	4-Chlorotoluene	152.	U
96-12-8	1,2-Dibromo-3-chloropropane	758.	U
124-48-1	Dibromochloromethane	152.	U
106-93-4	1,2-Dibromoethane	152.	U
74-95-3	Dibromomethane	152.	U
95-50-1	1,2-Dichlorobenzene	152.	U
541-73-1	1,3-Dichlorobenzene	152.	U
106-46-7	1,4-Dichlorobenzene	152.	U
75-71-8	Dichlorodifluoromethane	152.	U
75-34-3	1,1-Dichloroethane	152.	U
107-06-2	1,2-Dichloroethane	152.	U
75-35-4	1,1-Dichloroethene	152.	U
156-59-2	cis-1,2-Dichloroethene	152.	U

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Sample Identification

SB-56 0-4"

Matrix: Soil
% Dry Weight: 66.
Units: ug/kg dry weight

Lab Sample ID: 01-A82388
Date Sampled: 6/12/01
Date Received: 6/16/01

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
156-60-5	trans-1,2-Dichloroethene	152.	U
78-87-5	1,2-Dichloropropane	152.	U
142-28-9	1,3-Dichloropropane	152.	U
594-20-7	2,2-Dichloropropane	152.	U
563-58-6	1,1-Dichloropropene	152.	U
10061-01-5	cis-1,3-Dichloropropene	152.	U
10061-02-6	trans-1,3-Dichloropropene	152.	U
100-41-4	Ethylbenzene	152.	U
87-68-3	Hexachlorobutadiene	152.	U
591-78-6	2-Hexanone	758.	U
98-82-8	Isopropylbenzene	152.	U
99-87-6	4-Isopropyltoluene	152.	U
108-10-1	4-Methyl-2-pentanone	758.	U
75-09-2	Methylene chloride	75.8	J
91-20-3	Naphthalene	379.	U
103-65-1	n-Propylbenzene	152.	U
100-42-5	Styrene	152.	U
630-20-6	1,1,1,2-Tetrachloroethane	152.	U
79-34-5	1,1,2,2-Tetrachloroethane	152.	U
127-18-4	Tetrachloroethene	152.	U
108-88-3	Toluene	152.	U
87-61-6	1,2,3-Trichlorobenzene	152.	U
120-82-1	1,2,4-Trichlorobenzene	152.	U
71-55-6	1,1,1-Trichloroethane	152.	U
79-00-5	1,1,2-Trichloroethane	152.	U
79-01-6	Trichloroethene	152.	U
96-18-4	1,2,3-Trichloropropane	152.	U
95-63-6	1,2,4-Trimethylbenzene	152.	U
108-67-8	1,3,5-Trimethylbenzene	152.	U
75-01-4	Vinyl chloride	152.	U
1330-20-7	Xylenes, Total	152.	U
75-27-4	Bromodichloromethane	152.	U
75-69-4	Trichlorofluoromethane	152.	U

TestAmerica
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Sample Identification

SB-57 0-4"

Matrix: Soil
% Dry Weight: 66.
Units: ug/kg dry weight
Dilution Factor: 50.
Analysis Method: SW8260B
Delivery Group: 241651
Instrument: HP-36

Lab Sample ID: 01-A82389
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/19/01
Analysis Time: 21:23
Sample QC Group: 4773

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
67-64-1	Acetone	3790	U
71-43-2	Benzene	152.	U
108-86-1	Bromobenzene	152.	U
74-97-5	Bromochloromethane	152.	U
75-25-2	Bromoform	152.	U
74-83-9	Bromomethane	152.	U
78-93-3	2-Butanone	3790	U
104-51-8	n-Butylbenzene	152.	U
135-98-8	sec-Butylbenzene	152.	U
98-06-6	t-Butylbenzene	152.	U
75-15-0	Carbon disulfide	152.	U
56-23-5	Carbon tetrachloride	152.	U
108-90-7	Chlorobenzene	152.	U
75-00-3	Chloroethane	152.	U
67-66-3	Chloroform	152.	U
74-87-3	Chloromethane	152.	U
95-49-8	2-Chlorotoluene	152.	U
106-43-4	4-Chlorotoluene	152.	U
96-12-8	1,2-Dibromo-3-chloropropane	758.	U
124-48-1	Dibromochloromethane	152.	U
106-93-4	1,2-Dibromoethane	152.	U
74-95-3	Dibromomethane	152.	U
95-50-1	1,2-Dichlorobenzene	152.	U
541-73-1	1,3-Dichlorobenzene	152.	U
106-46-7	1,4-Dichlorobenzene	152.	U
75-71-8	Dichlorodifluoromethane	152.	U
75-34-3	1,1-Dichloroethane	152.	U
107-06-2	1,2-Dichloroethane	152.	U
75-35-4	1,1-Dichloroethene	152.	U
156-59-2	cis-1,2-Dichloroethene	152.	U

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Sample Identification

SB-57 0-4"

Matrix: Soil
% Dry Weight: 66.
Units: ug/kg dry weight

Lab Sample ID: 01-A82389
Date Sampled: 6/12/01
Date Received: 6/16/01

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
156-60-5	trans-1,2-Dichloroethene	152.	U
78-87-5	1,2-Dichloropropane	152.	U
142-28-9	1,3-Dichloropropane	152.	U
594-20-7	2,2-Dichloropropane	152.	U
563-58-6	1,1-Dichloropropene	152.	U
10061-01-5	cis-1,3-Dichloropropene	152.	U
10061-02-6	trans-1,3-Dichloropropene	152.	U
100-41-4	Ethylbenzene	152.	U
87-68-3	Hexachlorobutadiene	152.	U
591-78-6	2-Hexanone	758.	U
98-82-8	Isopropylbenzene	152.	U
99-87-6	4-Isopropyltoluene	152.	U
108-10-1	4-Methyl-2-pentanone	758.	U
75-09-2	Methylene chloride	379.	U
91-20-3	Naphthalene	379.	U
103-65-1	n-Propylbenzene	152.	U
100-42-5	Styrene	152.	U
630-20-6	1,1,1,2-Tetrachloroethane	152.	U
79-34-5	1,1,2,2-Tetrachloroethane	152.	U
127-18-4	Tetrachloroethene	152.	U
108-88-3	Toluene	152.	U
87-61-6	1,2,3-Trichlorobenzene	152.	U
120-82-1	1,2,4-Trichlorobenzene	152.	U
71-55-6	1,1,1-Trichloroethane	152.	U
79-00-5	1,1,2-Trichloroethane	152.	U
79-01-6	Trichloroethene	152.	U
96-18-4	1,2,3-Trichloropropane	152.	U
95-63-6	1,2,4-Trimethylbenzene	152.	U
108-67-8	1,3,5-Trimethylbenzene	152.	U
75-01-4	Vinyl chloride	152.	U
1330-20-7	Xylenes, Total	152.	U
75-27-4	Bromodichloromethane	152.	U
75-69-4	Trichlorofluoromethane	152.	U

TestAmerica
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Sample Identification

SB-58 0-4"

Matrix: Soil
% Dry Weight: 67.
Units: ug/kg dry weight
Dilution Factor: 50.
Analysis Method: SW8260B
Delivery Group: 241651
Instrument: HP-36

Lab Sample ID: 01-A82390
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/19/01
Analysis Time: 21:59
Sample QC Group: 4773

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
67-64-1	Acetone	3730	U
71-43-2	Benzene	149.	U
108-86-1	Bromobenzene	149.	U
74-97-5	Bromochloromethane	149.	U
75-25-2	Bromoform	149.	U
74-83-9	Bromomethane	149.	U
78-93-3	2-Butanone	3730	U
104-51-8	n-Butylbenzene	149.	U
135-98-8	sec-Butylbenzene	149.	U
98-06-6	t-Butylbenzene	149.	U
75-15-0	Carbon disulfide	149.	U
56-23-5	Carbon tetrachloride	149.	U
108-90-7	Chlorobenzene	149.	U
75-00-3	Chloroethane	149.	U
67-66-3	Chloroform	149.	U
74-87-3	Chloromethane	149.	U
95-49-8	2-Chlorotoluene	149.	U
106-43-4	4-Chlorotoluene	149.	U
96-12-8	1,2-Dibromo-3-chloropropane	746.	U
124-48-1	Dibromochloromethane	149.	U
106-93-4	1,2-Dibromoethane	149.	U
74-95-3	Dibromomethane	149.	U
95-50-1	1,2-Dichlorobenzene	149.	U
541-73-1	1,3-Dichlorobenzene	149.	U
106-46-7	1,4-Dichlorobenzene	149.	U
75-71-8	Dichlorodifluoromethane	149.	U
75-34-3	1,1-Dichloroethane	149.	U
107-06-2	1,2-Dichloroethane	149.	U
75-35-4	1,1-Dichloroethene	149.	U
156-59-2	cis-1,2-Dichloroethene	149.	U

TestAmerica
INCORPORATED

Sample Identification

SB-58 0-4"

Matrix: Soil
% Dry Weight: 67.
Units: ug/kg dry weight

Lab Sample ID: 01-A82390
Date Sampled: 6/12/01
Date Received: 6/16/01

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
156-60-5	trans-1,2-Dichloroethene	149.	U
78-87-5	1,2-Dichloropropane	149.	U
142-28-9	1,3-Dichloropropane	149.	U
594-20-7	2,2-Dichloropropane	149.	U
563-58-6	1,1-Dichloropropene	149.	U
10061-01-5	cis-1,3-Dichloropropene	149.	U
10061-02-6	trans-1,3-Dichloropropene	149.	U
100-41-4	Ethylbenzene	149.	U
87-68-3	Hexachlorobutadiene	149.	U
591-78-6	2-Hexanone	746.	U
98-82-8	Isopropylbenzene	149.	U
99-87-6	4-Isopropyltoluene	149.	U
108-10-1	4-Methyl-2-pentanone	746.	U
75-09-2	Methylene chloride	82.1	J
91-20-3	Naphthalene	373.	U
103-65-1	n-Propylbenzene	149.	U
100-42-5	Styrene	149.	U
630-20-6	1,1,1,2-Tetrachloroethane	149.	U
79-34-5	1,1,2,2-Tetrachloroethane	149.	U
127-18-4	Tetrachloroethene	149.	U
108-88-3	Toluene	149.	U
87-61-6	1,2,3-Trichlorobenzene	149.	U
120-82-1	1,2,4-Trichlorobenzene	149.	U
71-55-6	1,1,1-Trichloroethane	149.	U
79-00-5	1,1,2-Trichloroethane	149.	U
79-01-6	Trichloroethene	149.	U
96-18-4	1,2,3-Trichloropropane	149.	U
95-63-6	1,2,4-Trimethylbenzene	149.	U
108-67-8	1,3,5-Trimethylbenzene	149.	U
75-01-4	Vinyl chloride	149.	U
1330-20-7	Xylenes, Total	149.	U
75-27-4	Bromodichloromethane	149.	U
75-69-4	Trichlorofluoromethane	149.	U

TestAmerica
INCORPORATED

Sample Identification

SB-54 0-6"

Matrix: Solid Waste
% Dry Weight: 76.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8082
Delivery Group: 241651
Instrument: Shim-7

Lab Sample ID: 01-A82385
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/21/01
Analysis Time: 2:27
Sample QC Group: 5606

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
12674-11-2	Aroclor 1016	26.3	U
11104-28-2	Aroclor 1221	26.3	U
11141-16-5	Aroclor 1232	26.3	U
53469-21-9	Aroclor 1242	26.3	U
12672-29-6	Aroclor 1248	26.3	U
11097-69-1	Aroclor 1254	26.3	U
11096-82-5	Aroclor 1260	26.3	U

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TestAmerica
INCORPORATED

Sample Identification

SB-54 0-6"DUP

Matrix: Solid Waste
% Dry Weight: 86.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8082
Delivery Group: 241651
Instrument: Shim-7

Lab Sample ID: 01-A82386
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/21/01
Analysis Time: 2:51
Sample QC Group: 5606

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
12674-11-2	Aroclor 1016	23.3	U
11104-28-2	Aroclor 1221	23.3	U
11141-16-5	Aroclor 1232	23.3	U
53469-21-9	Aroclor 1242	23.3	U
12672-29-6	Aroclor 1248	23.3	U
11097-69-1	Aroclor 1254	23.3	U
11096-82-5	Aroclor 1260	23.3	U

TestAmerica
INCORPORATED

Sample Identification

SB-55 0-4"

Matrix: Solid Waste
% Dry Weight: 90.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8082
Delivery Group: 241651
Instrument: Shim-7

Lab Sample ID: 01-A82387
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/21/01
Analysis Time: 3:14
Sample QC Group: 5606

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
12674-11-2	Aroclor 1016	22.2	U
11104-28-2	Aroclor 1221	22.2	U
11141-16-5	Aroclor 1232	22.2	U
53469-21-9	Aroclor 1242	22.2	U
12672-29-6	Aroclor 1248	22.2	U
11097-69-1	Aroclor 1254	22.2	U
11096-82-5	Aroclor 1260	22.2	U

TestAmerica
INCORPORATED

Sample Identification

SB-56 0-4"

Matrix: Solid Waste
% Dry Weight: 66.
Units: ug/kg dry weight
Dilution Factor: 10.
Analysis Method: SW8082
Delivery Group: 241651
Instrument: Shim-7

Lab Sample ID: 01-A82388
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/21/01
Analysis Time: 3:37
Sample QC Group: 5606

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
12674-11-2	Aroclor 1016	303	U
11104-28-2	Aroclor 1221	303	U
11141-16-5	Aroclor 1232	303	U
53469-21-9	Aroclor 1242	303	U
12672-29-6	Aroclor 1248	303	U
11097-69-1	Aroclor 1254	303	U
11096-82-5	Aroclor 1260	303	U

TestAmerica
INCORPORATED

Sample Identification

SB-57 0-4"

Matrix: Solid Waste
% Dry Weight: 66.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8082
Delivery Group: 241651
Instrument: Shim-7

Lab Sample ID: 01-A82389
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/21/01
Analysis Time: 4:00
Sample QC Group: 5606

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
12674-11-2	Aroclor 1016	30.3	U
11104-28-2	Aroclor 1221	30.3	U
11141-16-5	Aroclor 1232	30.3	U
53469-21-9	Aroclor 1242	30.3	U
12672-29-6	Aroclor 1248	30.3	U
11097-69-1	Aroclor 1254	30.3	U
11096-82-5	Aroclor 1260	30.3	U

TestAmerica
INCORPORATED

Sample Identification

SB-58 0-4"

Matrix: Solid Waste
% Dry Weight: 67.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8082
Delivery Group: 241651
Instrument: Shim-7

Lab Sample ID: 01-A82390
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/21/01
Analysis Time: 4:22
Sample QC Group: 5606

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
12674-11-2	Aroclor 1016	29.9	U
11104-28-2	Aroclor 1221	29.9	U
11141-16-5	Aroclor 1232	29.9	U
53469-21-9	Aroclor 1242	29.9	U
12672-29-6	Aroclor 1248	29.9	U
11097-69-1	Aroclor 1254	29.9	U
11096-82-5	Aroclor 1260	29.9	U

TestAmerica
INCORPORATED

Sample Identification

SB-54 0-6"

Matrix: Soil
% Dry Weight: 76.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8310
Delivery Group: 241651
Instrument:
Grams Extracted: 30.0 g
Extract Vol: 2.00 ml

Lab Sample ID: 01-A82385
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 10:16
Sample QC Group: 5645

Extraction Date: 6/18/01

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
91-20-3	Naphthalene	88	U
208-96-8	Acenaphthene	88	U
120-12-7	Anthracene	58	U
206-44-0	Fluoranthene	38	
86-73-7	Fluorene	43	U
129-00-0	Pyrene	24	J J
56-55-3	Benzo(a)anthracene	9.6	J J
50-32-8	Benzo(a)pyrene	17	
205-99-2	Benzo(b)fluoranthene	20	
207-08-9	Benzo(k)fluoranthene	14	U
218-01-9	Chrysene	17	J
53-70-3	Dibenzo(a,h)anthracene	26	U
193-39-5	Indeno(1,2,3-cd)pyrene	26	J
208-96-8	Acenaphthylene	175	U
191-24-2	Benzo(g,h,i)perylene	36	J
85-01-8	Phenanthrene	58	

TestAmerica
INCORPORATED

Sample Identification

SB-54 0-6"DUP

Matrix: Soil
% Dry Weight: 86.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8310
Delivery Group: 241651
Instrument:
Grams Extracted: 30.4 g
Extract Vol: 2.00 ml

Lab Sample ID: 01-A82386
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 10:38
Sample QC Group: 5645

Extraction Date: 6/18/01

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
91-20-3	Naphthalene	77	U
208-96-8	Acenaphthene	77	U
120-12-7	Anthracene	50	U
206-44-0	Fluoranthene	26	
86-73-7	Fluorene	38	U
129-00-0	Pyrene	21	J
56-55-3	Benzo(a)anthracene	10	U
50-32-8	Benzo(a)pyrene	15	
205-99-2	Benzo(b)fluoranthene	21	
207-08-9	Benzo(k)fluoranthene	8	J
218-01-9	Chrysene	14	J
53-70-3	Dibenzo(a,h)anthracene	23	U
193-39-5	Indeno(1,2,3-cd)pyrene	24	J
208-96-8	Acenaphthylene	153	U
191-24-2	Benzo(g,h,i)perylene	28	J
85-01-8	Phenanthrene	49	U

TestAmerica
INCORPORATED

Sample Identification

SB-55 0-4"

Matrix: Soil
% Dry Weight: 90.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8310
Delivery Group: 241651
Instrument:
Grams Extracted: 30.6 g
Extract Vol: 1.00 ml

Lab Sample ID: 01-A82387
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 11:00
Sample QC Group: 5645

Extraction Date: 6/18/01

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
91-20-3	Naphthalene	37	U
208-96-8	Acenaphthene	37	U
120-12-7	Anthracene	24	U
206-44-0	Fluoranthene	13	
86-73-7	Fluorene	19	U
129-00-0	Pyrene	9	J
56-55-3	Benzo(a)anthracene	4.1	J
50-32-8	Benzo(a)pyrene	8	
205-99-2	Benzo(b)fluoranthene	8	
207-08-9	Benzo(k)fluoranthene	4	J
218-01-9	Chrysene	7	J
53-70-3	Dibenzo(a,h)anthracene	11	U
193-39-5	Indeno(1,2,3-cd)pyrene	9	J
208-96-8	Acenaphthylene	74	U
191-24-2	Benzo(g,h,i)perylene	6	J
85-01-8	Phenanthrene	16	J

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Sample Identification

SB-56 0-4"

Matrix: Soil
% Dry Weight: 66.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8310
Delivery Group: 241651
Instrument:
Grams Extracted: 30.1 g
Extract Vol: 2.00 ml

Lab Sample ID: 01-A82388
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 11:23
Sample QC Group: 5645

Extraction Date: 6/18/01

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
91-20-3	Naphthalene	100	U
208-96-8	Acenaphthene	100	U
120-12-7	Anthracene	67	U
206-44-0	Fluoranthene	21	U
86-73-7	Fluorene	50	U
129-00-0	Pyrene	27	U
56-55-3	Benzo(a)anthracene	13	U
50-32-8	Benzo(a)pyrene	14	
205-99-2	Benzo(b)fluoranthene	14	J
207-08-9	Benzo(k)fluoranthene	17	U
218-01-9	Chrysene	15	U
53-70-3	Dibenzo(a,h)anthracene	30	U
193-39-5	Indeno(1,2,3-cd)pyrene	27	J
208-96-8	Acenaphthylene	202	U
191-24-2	Benzo(g,h,i)perylene	26	J
85-01-8	Phenanthrene	65	U

TestAmerica
INCORPORATED

Sample Identification

SB-57 0-4"

Matrix: Soil
% Dry Weight: 66.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8310
Delivery Group: 241651
Instrument:
Grams Extracted: 30.2 g
Extract Vol: 2.00 ml

Lab Sample ID: 01-A82389
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 11:45
Sample QC Group: 5645

Extraction Date: 6/18/01

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
91-20-3	Naphthalene	100	U
208-96-8	Acenaphthene	100	U
120-12-7	Anthracene	67	U
206-44-0	Fluoranthene	62	
86-73-7	Fluorene	50	U
129-00-0	Pyrene	45	J
56-55-3	Benzo(a)anthracene	21.1	J
50-32-8	Benzo(a)pyrene	38	
205-99-2	Benzo(b)fluoranthene	36	
207-08-9	Benzo(k)fluoranthene	17	J
218-01-9	Chrysene	33	J
53-70-3	Dibenzo(a,h)anthracene	30	U
193-39-5	Indeno(1,2,3-cd)pyrene	42	J
208-96-8	Acenaphthylene	200	U
191-24-2	Benzo(g,h,i)perylene	42	J
85-01-8	Phenanthrene	35	J

TestAmerica
INCORPORATED

Sample Identification

SB-58 0-4"

Matrix: Soil
% Dry Weight: 67.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: SW8310
Delivery Group: 241651
Instrument:
Grams Extracted: 30.0 g
Extract Vol: 2.00 ml

Lab Sample ID: 01-A82390
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 12:07
Sample QC Group: 5645

Extraction Date: 6/18/01

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
91-20-3	Naphthalene	100	U
208-96-8	Acenaphthene	100	U
120-12-7	Anthracene	66	U
206-44-0	Fluoranthene	33	
86-73-7	Fluorene	49	U
129-00-0	Pyrene	27	J
56-55-3	Benzo(a)anthracene	10.9	J
50-32-8	Benzo(a)pyrene	22	
205-99-2	Benzo(b)fluoranthene	19	
207-08-9	Benzo(k)fluoranthene	12	J
218-01-9	Chrysene	16	J
53-70-3	Dibenzo(a,h)anthracene	30	U
193-39-5	Indeno(1,2,3-cd)pyrene	22	J
208-96-8	Acenaphthylene	199	U
191-24-2	Benzo(g,h,i)perylene	22	J
85-01-8	Phenanthrene	64	U

TestAmerica
INCORPORATED

Sample Identification

SB-54 0-6"

Matrix: Soil
% Dry Weight: 76.
Units: ug/kg dry weight
Dilution Factor: 2.
Analysis Method: 8015B/3550
Delivery Group: 241651
Instrument: PE-1
Grams Extracted: 25.4 g
Extract Vol: 1.0 ml

Lab Sample ID: 01-A82385
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/23/01
Analysis Time: 10:50
Sample QC Group: 5694

Extraction Date: 6/18/01

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Diesel Range)	28000	

TestAmerica
INCORPORATED

Sample Identification

SB-54 0-6"DUP

Matrix: Soil
% Dry Weight: 86.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: 8015B/3550
Delivery Group: 241651
Instrument: PE-1
Grams Extracted: 25.5 g
Extract Vol: 1.0 ml

Lab Sample ID: 01-A82386
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/23/01
Analysis Time: 11:28
Sample QC Group: 5694

Extraction Date: 6/18/01

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Diesel Range)	22100	

TestAmerica
INCORPORATED

Sample Identification

SB-55 0-4"

Matrix: Soil
% Dry Weight: 90.
Units: ug/kg dry weight
Dilution Factor: 2.
Analysis Method: 8015B/3550
Delivery Group: 241651
Instrument: PE-1
Grams Extracted: 25.5 g
Extract Vol: 1.0 ml

Lab Sample ID: 01-A82387
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/23/01
Analysis Time: 15:59
Sample QC Group: 5694

Extraction Date: 6/18/01

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Diesel Range)	61200	

TestAmerica
INCORPORATED

Sample Identification

SB-56 0-4"

Matrix: Soil
% Dry Weight: 66.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: 8015B/3550
Delivery Group: 241651
Instrument: PE-1
Grams Extracted: 25.1 g
Extract Vol: 2.0 ml

Lab Sample ID: 01-A82388
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/23/01
Analysis Time: 15:20
Sample QC Group: 5694

Extraction Date: 6/18/01

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Diesel Range)	39800	

TestAmerica
INCORPORATED

Sample Identification

SB-57 0-4"

Matrix: Soil
% Dry Weight: 66.
Units: ug/kg dry weight
Dilution Factor: 2.
Analysis Method: 8015B/3550
Delivery Group: 241651
Instrument: PE-1
Grams Extracted: 25.0 g
Extract Vol: 1.0 ml

Lab Sample ID: 01-A82389
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/23/01
Analysis Time: 13:43
Sample QC Group: 5694

Extraction Date: 6/18/01

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Diesel Range)	56800	

TestAmerica
INCORPORATED

Sample Identification

SB-58 0-4"

Matrix: Soil
% Dry Weight: 67.
Units: ug/kg dry weight
Dilution Factor: 1.
Analysis Method: 8015B/3550
Delivery Group: 241651
Instrument: PE-1
Grams Extracted: 25.2 g
Extract Vol: 1.0 ml

Lab Sample ID: 01-A82390
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/23/01
Analysis Time: 17:28
Sample QC Group: 5694

Extraction Date: 6/18/01

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
NA	TPH (Diesel Range)	29100	

TestAmerica
INCORPORATED

Sample Identification

SB-54 0-6"

Matrix: Soil
% Dry Weight: 76.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241651
Instrument:

Lab Sample ID: 01-A82385
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 17:37
Sample QC Group: 2788

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7440-43-9	Cadmium	1.78	....
7440-47-3	Chromium	15.5	....
7439-92-1	Lead	680	....

TestAmerica
INCORPORATED

Sample Identification

SB-54 0-6"DUP

Matrix: Soil
% Dry Weight: 86.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241651
Instrument:

Lab Sample ID: 01-A82386
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 17:37
Sample QC Group: 2788

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7440-43-9	Cadmium	1.16	B
7440-47-3	Chromium	17.4	
7439-92-1	Lead	418	

TestAmerica
INCORPORATED

Sample Identification

SB-55 0-4"

Matrix: Soil
% Dry Weight: 90.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241651
Instrument:

Lab Sample ID: 01-A82387
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 17:37
Sample QC Group: 2788

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7440-43-9	Cadmium	1.95	....
7440-47-3	Chromium	13.5	....
7439-92-1	Lead	603	....

TestAmerica
INCORPORATED

Sample Identification

SB-56 0-4"

Matrix: Soil
% Dry Weight: 66.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241651
Instrument:

Lab Sample ID: 01-A82388
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 17:37
Sample QC Group: 2788

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7440-43-9	Cadmium	2.4	....
7440-47-3	Chromium	17.1	....
7439-92-1	Lead	761	....

TestAmerica
INCORPORATED

Sample Identification

SB-57 0-4"

Matrix: Soil
% Dry Weight: 66.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241651
Instrument:

Lab Sample ID: 01-A82389
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 17:37
Sample QC Group: 2788

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7440-43-9	Cadmium	9.3	....
7440-47-3	Chromium	27.3	....
7439-92-1	Lead	786	....

TestAmerica
INCORPORATED

Sample Identification

SB-58 0-4"

Matrix: Soil
% Dry Weight: 67.
Units: mg/kg dry weight
Dilution Factor: 1.
Analysis Method: SW6010B
Delivery Group: 241651
Instrument:

Lab Sample ID: 01-A82390
Date Sampled: 6/12/01
Date Received: 6/16/01
Analysis Date: 6/28/01
Analysis Time: 17:37
Sample QC Group: 2788

FORM I

CAS NUMBER	ANALYTE	CONCENTRATION	FLAG
7440-43-9	Cadmium	1.48	U
7440-47-3	Chromium	20.1	
7439-92-1	Lead	417	

APPENDIX D

VALIDATION REPORT

DATA VALIDATION REPORT

United States Coast Guard Passage Island Light Station

Seventy-one soil samples were collected from the United States Coast Guard (USCG) Passage Island Light Station from June 6, 2001 through June 12, 2001. The samples were analyzed by Test America Laboratories, Inc., Nashville, Tennessee, for one or more of the following parameters: benzene, toluene, ethylbenzene, xylenes (BTEX), and trimethylbenzenes by U.S. EPA method SW-846 8260B; volatile organic compounds (VOCs) by U.S. EPA method SW-846 8260B, polynuclear aromatic hydrocarbons (PAHs) by U.S. EPA method SW-846 8270C; polychlorinated biphenyls (PCBs) by U.S. EPA method SW-846 8082; toxic characteristic leaching procedure (TCLP) metals by U.S. EPA method SW-846 1311/6010B; lead by U.S. EPA method SW-846 6010B; and cadmium and chromium by U.S. EPA method SW-846 6010B. Analytical results were evaluated in accordance with the data quality objectives (DQOs). The analytical data were validated and qualified based on the results of the data evaluation parameters and/or the quality control (QC) sample results provided by the laboratory. Raw data was not reviewed. The following summarizes the review of the analytical data that did not meet the quality control criteria.

The matrix spike/matrix spike duplicate (MS/MSD) associated with the lead analysis of sample SB-10(0-3”) indicated a percent recovery below the acceptance criteria. Since the sample concentration was greater than 4x the spike amount, the sample was not flagged.

The MS/MSD associated with the lead analysis of sample SB-21 (0-3”) indicated a percent recovery below the acceptance criteria. Since the sample concentration was greater than 4x the spike amount, the sample was not flagged.

The MS/MSD associated with the lead analysis of sample SB-38(0-3”) indicated a percent recovery below the acceptance criteria. Since this reflects a low bias, the sample was flagged “J” as estimated for lead.

The MS/MSD associated with the PCB analysis of sample SB-54(0-6”) indicated a percent recovery below the acceptance criteria for aroclor 1016. Since this reflects a low bias, the sample was flagged “J” as estimated for this compound. This MS/MSD also indicated a relative percent difference above the acceptance criteria for aroclor 1260. Since the compound was not detected in the associated sample and the associated LCS was within control limits, flags were not issued for this compound.

The MS/MSD associated with the metals analysis of sample SB-54(0-6”) indicated a percent recovery outside the acceptance criteria for lead. Since the sample concentration was more than 4x the spike amount, the sample was not qualified.

The laboratory control sample (LCS) associated with the PAH analysis of samples SB-42(0-3”), SB-43(0-3”), SB-44(0-3”), SB-45(0-3”), SB-46(0-3”), SB-47(0-3”), SB-48(0-3”), SB-49(0-2”), SB-50(0-4”), SB-50(0-4”)DUP, SB-51(0-3”), SB-52(0-2”), and SB-53(0-2”) indicated percent recoveries above the acceptance criteria for flouranthene and pyrene. Since this reflects a high

bias and the compounds were detected in all samples, the samples were flagged "J" as estimated for these compounds with the exception of samples SB-44(0-2"), SB-49(0-2"), and SB-48(0-3")(flouranthene) which were not flagged because the compounds were not detected.

The LCS associated with the VOC analysis of samples SB-54(0-6"), SB-54(0-6")DUP, SB-55(0-4"), SB-56(0-4"), SB-57(0-4"), and SB-58(0-4") indicated a percent recovery above the acceptance criteria for 2,2-dichloropropane. Since this reflects a high bias and the compound was not detected in the associated samples, flags were not issued for this compound.

The LCS associated with the PAH analysis of samples SB-54(0-6"), SB-54(0-6")DUP, SB-55(0-4"), SB-56(0-4"), SB-57(0-4"), and SB-58(0-4") indicated percent recoveries above the acceptance criteria for pyrene, benzo(a)anthracene, and chrysene. Since this reflects a high bias and the compounds were detected in the associated samples, the samples were flagged "J" as estimated for these compounds with the exception of samples SB-54(0-6")DUP (for benzo(a)anthracene) and SB-56(0-4"). These samples were not flagged because the compounds were not detected.

The continuing calibration verification (CCV) associated with the PAH analysis of samples SB-42(0-3"), SB-43(0-3"), SB-44(0-2"), SB-45(0-3"), SB-46(0-3"), SB-47(0-3"), and SB-48(0-3") indicated a percent difference outside the acceptance criteria with a low bias for acenaphthene. Since this reflects a low bias, the associated samples were flagged "J" as estimated for this compound.

The CCV associated with the PAH analysis of samples SB-49(0-2”), SB-50(0-4”), SB-50(0-4”)DUP, SB-51(0-3”), SB-52(0-2”), and SB-53(0-2”) indicated a percent difference outside the acceptance criteria with a low bias for dibenzo(a,h)anthracene. Since this reflects a low bias, the associated samples were flagged “J” as estimated for this compound. This CCV also indicated a percent difference outside the acceptance criteria with a high bias for benzo(g,h,I)perylene. Since this reflects a high bias, only samples that show detections of this compound were flagged “J” as estimated which were all of the above samples except SB-49(0-2”).

The CCV associated with the VOC analysis of samples SB-54(0-6”)DUP, SB-55(0-4”), SB-56(0-4”), SB-57(0-4”), and SB-58(0-4”) indicated percent differences outside the acceptance criteria with a high bias for bromochloromethane and hexachlorobutadiene. Since these reflect a high bias and the compounds were not detected in the associated samples, flags were not issued for these compounds.

The CCV associated with the VOC analysis of sample SB-54(0-6”) indicated percent differences outside the acceptance criteria with a high bias for bromomethane, bromochloromethane, and 2,2-dichloropropane. Since these reflect a high bias and the compounds were not detected in the associated sample, flags were not issued for these compounds.

All laboratory issued “J” flags reflect results that were report between the method detection limit (MDL) and the reporting limit (RL) and are considered estimated.

Based on the results of this data validation, all data are considered complete and valid as qualified.

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APPENDIX E

ASBESTOS AND LEAD BASED PAINT ASSESSMENT REPORT

ASBESTOS AND LEAD-BASED PAINT ASSESSMENT

PASSAGE ISLAND LIGHTHOUSE
ISLE ROYALE NATIONAL PARK
KEWEENAW COUNTY, MICHIGAN

JUNE 12, 2001

Prepared for:

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Environmental Testing & Consulting, Inc.
Romulus and Traverse City, Michigan

ETC Project # T-99113

ASBESTOS AND LEAD-BASED PAINT ASSESSMENT
PASSAGE ISLAND LIGHTHOUSE
KEWEENAW COUNTY, MICHIGAN

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- Niton Data
- Paint Chip Analysis
- Credentials

ASBESTOS AND LEAD-BASED PAINT ASSESSMENT
PASSAGE ISLAND LIGHTHOUSE
KEWEENAW COUNTY, MICHIGAN

INTRODUCTION

This report presents the findings of an asbestos and lead-based paint assessment conducted by Environmental Testing & Consulting, Inc. (ETC) at the Passage Island Lighthouse, located within the Isle Royale National Park, in Keweenaw County, Michigan. The purpose of this assessment was to identify and sample potential asbestos containing materials and lead based paint on the exterior surfaces of all the existing structures associated with the lighthouse. This assessment was conducted on June 12, 2001 by Jay Budd of ETC. It is the understanding of ETC that this assessment is to be used in conjunction with a Phase II environmental site assessment conducted by Montgomery Watson Americas, Inc. for the United States Coast Guard.

COLLECTION OF DATA AND SURVEY OF FACILITY

Building Description

ETC surveyed the exterior of eleven structures (See Attached Figure). These structures were in various sates of disrepair. Structures on the site included the following: the lighthouse and attached keepers dwelling, a signal house, the winch house, the paint storage shed, a pump house, a sump house, an outhouse, a solar panel, a tower, the helicopter pad and a former tower base. Only four of the listed structures contained potential asbestos containing building materials. These four buildings were the lighthouse with the attached keepers dwelling, the signal house, the pump house and the winch house. The other buildings or structures were constructed with concrete or wood sided with metal or wood roofing materials. The solar panel was unpainted aluminum.

Asbestos

All sample collection, analysis, and interpretation was completed in accordance with federal, state, and local regulations affecting these procedures. The facility was accessed and visually inspected for the presence of any ACM building materials, including all electrical, mechanical and fireproofing systems. Along with this, pertinent data such as material condition, location, friability, quantity and factors used to determine exposure were gathered. All bulk samples collected were analyzed using Polarized Light Microscopy (PLM) by ETC's laboratory in Romulus, Michigan.

Lead

In conducting this lead assessment, ETC followed procedures outlined in Chapter 7 of the Department of Housing and Urban Development's (HUD) "Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing" and the "XRF Performance Characteristics Sheet for the Niton Corporation: XL-309 Spectrum Analyzer" developed by HUD and the EPA published in August of 1994. ETC utilized a *Niton XL* portable X-Ray Fluorescence (XRF) Spectrum Analyzer to test selected surfaces for the presence of lead-based paint. The XRF provides a reading of milligrams of lead per square centimeter (mg Pb/cm^2) for each surface area tested. The serial number of the XRF instrument utilized in this project is U433D4647. This instrument is registered as a Radioactive Material with the State of Michigan Department of Public Health. The Registration Number for this instrument is 031070-01-I01.

ETC tested for the presence of lead-based paint on selected painted surfaces throughout the facility. ETC's lead testing results are applicable for the time that testing was conducted and for the condition of surfaces at the time they were tested. If questions arise regarding lead content on

surfaces that were not tested (or were inaccessible) by ETC, then additional testing services should be solicited to test those surfaces for lead.

In accordance to HUD guidelines, painted surfaces were grouped by color, item, texture, and substrate. Due to the probability of multiple layers of paint, which may hide observable differences or inherent variability in the paint's composition or depth, XRF analyzers may not accurately represent the true conditions under all circumstances.

All XRF lead paint analyzers display some variability in multiple readings from the same test surface due to inherent operating characteristics of current XRF technology. Therefore, XRF readings obtained by the testing instrument are classified as follows:

- **"Positive"** refers to a sample that registers an average lead concentration of equal to or greater than 0.3 mg/cm^2.
- **"Inconclusive"** refers to a sample that registers an average lead concentration between 0.0 mg/cm^2 and 0.3 mg/cm^2. Further analysis by a successful ELPAT (Environmental Lead Proficiency Analytical Testing) participant must be done in order to classify "inconclusive" surfaces as either positive or negative.

HUD and the EPA defines lead-based paint as a paint film with a concentration above the level of 0.5 percent lead by weight (> 0.5 % Pb) when measured by laboratory analysis. This definition of lead-based paint is described in the HUD document *"Lead-Based Paint: Interim Guidelines for Hazard Identification and Abatement in Public and Indian Housing."*

These samples will be analyzed using Palintest instrumentation, which uses Anodic Striping Voltammetry (ASV). The method has been reviewed and approved by NIOSH and EPA for portable analysis of lead samples. Additionally, Palintest and NIOSH have both performed extensive comparisons and tests using ELPAT samples that have verified the accuracy of the ASV technique. For the purposes of this explanation, the term Palintest is used for describing the techniques as they are the only company at this point that has an instrument using ASV on the market.

Basically, the ASV method involves digesting the samples (whether they be air, soil, paint or dust wipes) in a mild nitric acid solution using a ultra-sonicator (these are approved EPA protocols). The sonicator is a small bath that agitates the samples to allow the lead in the actual sample to leach into solution. The sonication process takes from 30-45 minutes. After the sample has leached into solution, a small amount of the solution is poured off and diluted further with a known amount of nitric acid.

At this point the sample is put into the Palintest machine and an electrode is placed into the sample. Current is circulated through the electrode and dissolved lead ions are plated (deposited) onto the electrode surface. The scanning phase begins as the current is automatically reversed at a predetermined time and voltage. Lead is stripped (falls off) the electrode at a precise potential unique to lead.

The instrument controls the cycle, captures then collates thousands of signal readings. The microprocessor within the Palintest instrument interprets these readings to identify each metal (lead) and determine the exact concentration. Because each metal (lead, copper, etc.) is stripped at a unique voltage, there are no known interference's, from other metals or from nonmetal substrates such as plaster or wood.

The instrument display gives a direct reading of the test result within 45 seconds (for paint, dust and soil, and 3 minutes for drinking water) which is stored in memory for inclusion in the later report. This method can be used to analyze all types of lead samples (water, air, paint, soil, etc.).

This method also has a very low detection limit allowing it to be used for confirmation of borderline XRF samples or for confirmation of chemical swab samples.

RESULTS

Asbestos PLM Results

During the assessment of this facility ETC collected and analyzed a total of thirty individual samples for the presence of asbestos fibers. These areas are grouped by type of material and location (e.g. asphalt shingles on the lighthouse).

The lighthouse was constructed using quarried stone and wood trim. The lighthouse had four different types of materials that were sampled. The types of materials that were sampled included roof flashing sealer, asphalt shingles, window glazing and a tar sealant. Of the materials collected from the lighthouse only the roof flashing sealer and the tar sealant were found to contain asbestos fibers. These materials are considered non-friable due to the sticky nature of the material. The roof flashing sealer can be found throughout the roof surface where the roofline intersects with a higher part of the building. An example of this is where the roof meets the chimney or the light tower itself. The tar sealant can be found on pipes extruding through the stone walls on the north and south side of the structure.

The signal house was constructed using aluminum siding, and asphalt roofing materials. ETC collected two homogeneous materials from the signal house. The two types of materials sampled were tarpaper and asphalt shingles. Of these two only the asphalt shingles contained asbestos fibers. The asphalt shingles are non-friable and appeared to be in good condition.

The winch house was similar in construction to that of the signal house. ETC collected roofing and tarpaper samples in addition to caulking that was found along the boarded up windows and doors. None of these materials contained asbestos.

The final sample was collected from the pump house that was constructed of concrete block and a wood framed roof. The roofing materials consisted of rolled asphalt sheeting. This material did not contain asbestos.

Lead Results

All of the structures mentioned above, with the exception of the solar panel, were tested for lead based paint. The solar panel, located on the south west side of the lighthouse, is constructed of unpainted aluminum supports. The lead based paint assessment was conducted using both paint chip sampling and an XRF device to determine the presence of lead based paint. When reviewing the attached paint chip sample results, it should be noted that according to the Occupational Safety and Health Administration (OSHA) that any detectable lead level is considered lead-based paint. All of the chip samples collected have some small amounts of lead based paint. In addition to the 20 paint chip samples, ETC used a Niton 309 XRF spectrum analyzer to test various painted surfaces from the structures present on site. In total 43 XRF readings (shots) were taken from the structures. ETC used some of the paint chip samples to confirm XRF readings. The roof flashing on the lighthouse and keepers dwelling is comprised of elemental (pure) lead. If the roofing material or the masonry is to be repaired or replaced the lead flashing should be segregated and either recycled or disposed of as hazardous waste in accordance with Resource Conservation and Recovery Act (RCRA) rules.

CONCLUSIONS AND RECOMMENDATIONS

Asbestos Removal

Asbestos containing materials on the lighthouse are comprised of a tar sealer and the flashing tar. These materials appeared to be in good condition and did not appear to be deteriorating. Unless these materials are going to be disturbed during a renovation or demolition of the building, they can be left in place. If renovation to the main building is going to disturb these materials then they need to be handled properly by trained individuals. The flashing tar that is present on the roofline of the lighthouse is a non-friable material and could be removed as such. This would eliminate the need to set up a negative pressure enclosure around the material to be abated. The tar sealant is also a non-friable material that when properly removed does not require the use of a negative pressure enclosure. Abatement measures for both of the materials are approximately the same. The tar sealant is located on two pipes extruding through the stone walls on the north and south side of the lighthouse. The tar sealant was also found on the 1st window from the east corner on the south side of the building. There is a total of approximately 8 square feet of this material. The approximate cost of removing this material is $300.

The flashing tar is located throughout the roof system of the light and keepers dwelling. This material can also be left in place if no renovation activities are scheduled to disturb this material. This material was used to waterproof any area where a vertical surface meets the roofline, such as the one that exists where the chimney comes out of the roof. This material is plastered on top of an elemental lead sheet. This sheet of lead was inserted into the masonry of the structure and folded underneath the roofing shingles to prevent rainwater from entering into the structure along the seam. There is approximately 20-30 square feet of this material. Removal cost of this material is approximately $500.

The signal house roof appeared to be in good condition at the time of this assessment. The roof shingles contains approximately 20% asbestos. This material is non-friable and can be left in place as long as no renovation or demolition activities disturb this material. There is approximately 1,632 square feet of this material on the roof of this building. Removal cost for this material is approximately $4,900.

Lead Removal

As mentioned previously in this report, the majority of painted surfaces throughout the facility are lead containing. The recommendations for this section of the report is going to have several abatement options in regards to the treatment of the painted surfaces depending on the wishes of the owner. The recommendations will be separated by structure.

<u>Lighthouse</u>

All of the painted surfaces on the lighthouse tested positive for lead based paint. These materials include the decorative wood pieces and soffits, and exterior window sashes. These surfaces were in a deteriorated state and need attention. The soffits and the decorative wood surfaces around the exterior of the lighthouse are cracked and peeling. These surfaces can be dealt with in a several ways. Scraping the loose paint and repainting the surface would cost approximately $30 per square foot. There is approximately 300 square feet of surfaces that need to be scraped and repainted. The approximate cost of the abatement would be $9,000 This price, however does not include the price of disposal of containerized paint chips or debris. If this material were to be abated by using chemical strippers the price of removal could increase to approximately $40 per square foot. The windows of the lighthouse are in a deteriorated state and could be abated in the way described above for about the same price per square foot. Each window would

encompass approximately 6 square feet, and each door could encompass approximately 24 square feet. There are about 15 windows and 2 doors that would need to be scraped and the cost would be approximately $3,300. The window sashes could be replaced for about $3,000, but would not include the outside trim. This trim would still need to be scrapped and that cost would be an additional $1,200. The top of the light tower appeared to be in relatively good condition at the time of this assessment. If an abatement of this surface were to occur this material would have to be scrapped to a solid substrate and repainted with a lead encapsulant. Cost of this abatement would be approximately $800. Total approximate cost for the lighthouse to be scraped and repainted would be $13,100.

Signal House

The painted surfaces on the signal house includes the soffits, window casings, and door frames. These materials contained very low levels of lead. These painted materials would only be considered lead-based paint by OSHA standards. These surfaces can be covered with an aluminum sheet to match the rest of the building. Covering the materials would cost approximately $660. Scraping the paint could be accomplished for approximately $30 per foot. The estimated cost for this type of abatement would be $9,900 for the entire building.

Pump house

The pump house contains a small amount of lead based paint. This paint is primarily on a door jamb and the interior roof. The structure is partially demolished and could be demolished in about four to five hours at $70 per hour. The total cost for abatement of this building is approximately $350. Before disposal of the debris, characterization of the debris would have to be conducted to determine that the waste is in fact non-hazardous. Scraping and removal of this paint would cost approximately the same

Winch house

The winch house, like the pump house, has lead based paint at low levels. The door, door frame, windows, and soffits are all painted with lead based paint. Removal of these components would be the easiest abatement method as the wood substrate is rotten and in need of replacement. As removal of the paint would be the preferred method of removal, the total replacement cost would be approximately $200. This price includes plywood for the doors and windows and 1"x 6" material for the fascia and soffits and painting to match the rest of the building.

Privy (outhouse)

The privy is a 6'X6' wood sided building with a cedar shingle roof. The paint on this building is peeling and deteriorating. The price to scrape this building and repaint it with an encapsulating paint would be approximately $30 per square foot. At 250 square feet the price for removal would be $ 7,200. If demolition of this building is the chosen option it would probably take as much as eight hours. At $70 per hour the removal cost for this building would be approximately $560. This price also does not include disposal fees.

Paint Storage

This building is constructed using cement block and a metal clad roof. The paint on the exterior is in a deteriorated condition and needs to be addressed. This building could be scraped and repainted with a lead encapsulant. The cost of this removal would be approximately $30 per square foot for removal. At 400 square feet, the removal cost would be approximately $1,200.

Radio Tower

The radio tower next to the lighthouse is painted with a lead-based paint. Since the island is remotely located in Lake Superior the use of a man lift is unlikely. The abatement cost of this tower would be approximately $60 per hour. The paint on this tower is in relatively good condition and could be scraped to a stable substrate and repainted with a lead encapsulant.

Former tower base

The former tower base consists of three concrete foundations approximately 500 feet to the northeast of the lighthouse. The only lead based paint on these foundations is a 2'X2' white square with a red circle in the center. The square is in good condition but could be scraped off and the remaining area painted over with a lead encapsulant. The estimated cost would probably be $100 for this removal.

Helicopter Pad

The helicopter pad has red paint on the timbers of the landing base. This material is in good condition and does not require attention.

Miscellaneous Painted Surfaces

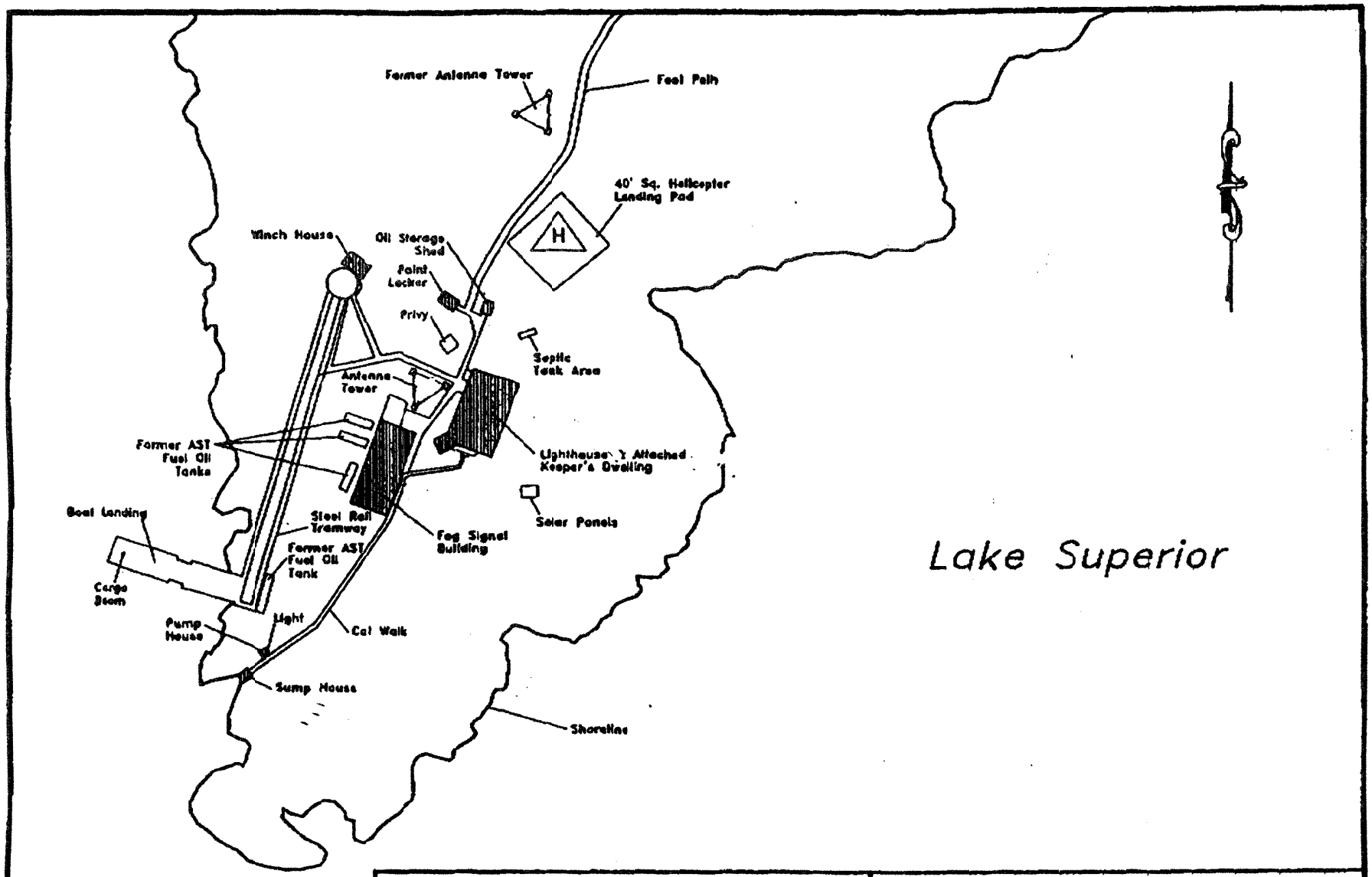
The catwalk and associated hand rail were tested by paint chip or XRF. Based on the results given it is determined that the paint used on these materials is negative for lead content. A concrete walk exists between the winch house and the lighthouse. There is a step that is painted with "caution yellow" that is positive for lead content. This paint is chipping and flaking and could be scraped off and repainted. The cost would be approximately $60. The flag pole on the west side of the lighthouse is also painted with a lead based paint. Removal and replacement of this structure would be the preferred method of removal. Since the flag pole is made of a cedar log finding a replacement on the island or on the mainland would probably cost approximately $100. The west entrance steps to the lighthouse are also painted with a lead based-paint. The paint on these steps are also flaking and chipping. They could be scraped and repainted for approximately $200.

It should be noted that the amounts given in this report by ETC are just estimates and a certified asbestos and lead contractor should be contracted for abatement costs. Disposal costs for this project can not be estimated as it is not known which method of removal will be used or the amounts of waste that would be generated. It should also be noted that the conditions documented in this report are only representative of conditions that existed on the island at the time of this assessment and may not reflect changes that have occurred since the date of the assessment. If there are any questions regarding this information or if ETC can provide you with assistance for contractor selection or screening, please do not hesitate to give me a call at (800) 661-3236. The opportunity to work with you on this project is greatly appreciated. Thank you for your time and consideration.

Sincerely,
Environmental Testing & Consulting, Inc.

Jay E. Budd
Senior Project Manager

Enclosures



CLIENT USCG					TITLE SITE PLAN PASSAGE ISLAND, KEWEENAW COUNTY, MI.
PROJ Environmental Site Assessment					
REVISION NO 1 11-21-97	DES BY				Woodward-Clyde
SCALE NOT TO SCALE	DR BY	DML	11-20-97		PROJ NO R96819
FILE [illegible]	CHK BY	CC	11-21-97		FIGURE 2

Polarized Light Microscopy Asbestos Analysis Report

Client: Montgomery Watson Americas, Inc.
4525 Wasatch Boulevard, Suite 200
Salt Lake City, Michigan 84124

Client Job/P.O. #:

Project Location: Passage Island Lighthouse

ETC Project #: T-99113
Sample Date: 6/18/01
Submitted Date: 6/20/01
Sampled by: JB
Analyzed by: KR

Signature:

Lab Code	Sample Code	Sample Description	Asbestos Found (Yes/No)	Percent and Type of Asbestos		Percent of Other Materials Found	
	01A	Lighthouse roofing, above north entrance.	No	-	Chrysotile	-	Particulate Matter
				-	Amosite	-	Cellulose
				-	Crocidolite	-	Fiberglass
				-	Tremolite	-	Quartz
						100	Other
	01B	Lighthouse roofing, on north side 14' from NE corner.	No	-	Chrysotile	-	Particulate Matter
				-	Amosite	5	Cellulose
				-	Crocidolite	-	Fiberglass
				-	Tremolite	-	Quartz
						95	Other
	01C	Lighthouse roofing, on south side 16' from southwest corner.	No	-	Chrysotile	-	Particulate Matter
				-	Amosite	5	Cellulose
				-	Crocidolite	-	Fiberglass
				-	Tremolite	-	Quartz
						95	Other
	02A	Flashing tar, on main entrance.	Yes	5	Chrysotile	-	Particulate Matter
				-	Amosite	-	Cellulose
				-	Crocidolite	-	Fiberglass
				-	Tremolite	-	Quartz
						95	Other
	02B	Flashing tar, on main entrance.	Yes	5	Chrysotile	-	Particulate Matter
				-	Amosite	-	Cellulose
				-	Crocidolite	-	Fiberglass
				-	Tremolite	-	Quartz
						95	Other
	02C	Flashing tar, in northwest corner where roof meets light tower.	Yes	15	Chrysotile	-	Particulate Matter
				-	Amosite	-	Cellulose
				-	Crocidolite	-	Fiberglass
				-	Tremolite	-	Quartz
						85	Other
	03A	Window glazing, 2nd window from west on north side.	No	-	Chrysotile	-	Particulate Matter
				-	Amosite	-	Cellulose
				-	Crocidolite	-	Fiberglass
				-	Tremolite	25	Other
						75	Calcite

Polarized Light Microscopy Asbestos Analysis Report

Client: Montgomery Watson Americas, Inc.
4525 Wasatch Boulevard, Suite 200
Salt Lake City, Michigan 84124

Client Job/P.O. #:

Project Location: Passage Island Lighthouse

ETC Project #: T-99113
Sample Date: 6/18/01
Submitted Date: 6/20/01
Sampled by: JB
Analyzed by: KR

Signature:

Lab Code	Sample Code	Sample Description	Asbestos Found (Yes/No)	Percent and Type of Asbestos		Percent of Other Materials Found	
	03B	Window glazing, west facing window on south side.	No	-	Chrysotile	-	Particulate Matter
				-	Amosite	-	Cellulose
				-	Crocidolite	-	Fiberglass
				-	Tremolite	20	Other
						80	Calcite
	03C	Window glazing, 1st window from west on north side.	No	-	Chrysotile	-	Particulate Matter
				-	Amosite	-	Cellulose
				-	Crocidolite	-	Fiberglass
				-	Tremolite	20	Other
						80	Calcite
	04A	Tar sealer, pipes on north side.	Yes	5	Chrysotile	-	Particulate Matter
				-	Amosite	-	Cellulose
				-	Crocidolite	-	Fiberglass
				-	Tremolite	85	Other
						10	Calcite
	04B	Tar sealer, pipes on south side.	Yes	30	Chrysotile	-	Particulate Matter
				-	Amosite	-	Cellulose
				-	Crocidolite	-	Fiberglass
				-	Tremolite	60	Other
						10	Calcite
	04C	Tar sealer, window on south side from east.	Yes	10	Chrysotile	-	Particulate Matter
				-	Amosite	-	Cellulose
				-	Crocidolite	-	Fiberglass
				-	Tremolite	85	Other
						5	Calcite
	05A	Pump house roofing, taken from north side.	No	-	Chrysotile	-	Particulate Matter
				-	Amosite	10	Cellulose
				-	Crocidolite	-	Fiberglass
				-	Tremolite	-	Other
						90	Calcite
	05B	Pump house roofing, taken from north side.	No	-	Chrysotile	-	Particulate Matter
				-	Amosite	20	Cellulose
				-	Crocidolite	-	Fiberglass
				-	Tremolite	75	Other
						5	Calcite

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Client Job/P.O. #:

Project Location: Passage Island Lighthouse

ETC Project #: T-99113
Sample Date: 6/18/01
Submitted Date: 6/20/01
Sampled by: JB
Analyzed by: KR

Signature:

Lab Code	Sample Code	Sample Description	Asbestos Found (Yes/No)	Percent and Type of Asbestos		Percent of Other Materials Found	
	05C	Pump house roofing, taken from north side.	No	-	Chrysotile	-	Particulate Matter
				-	Amosite	20	Cellulose
				-	Crocidolite	-	Fiberglass
				-	Tremolite	75	Other
						5	Calcite
	06A	Signal house roofing on east side of signal house.	Yes	15	Chrysotile	-	Particulate Matter
				-	Amosite	-	Cellulose
				-	Crocidolite	70	other
				-	Tremolite	10	Quartz
						5	Calcite
	06B	Signal house roofing on south side of signal house 4' from west end.	Yes	20	Chrysotile	-	Particulate Matter
				-	Amosite	10	Cellulose
				-	Crocidolite	10	Other
				-	Tremolite	60	Quartz
						-	Calcite
	06C	Signal house roofing on south side of signal house 6' from east end.	Yes	20	Chrysotile	-	Particulate Matter
				-	Amosite	10	Cellulose
				-	Crocidolite	10	Other
				-	Tremolite	60	Quartz
						-	Calcite
	07A	Tar paper, under aluminum siding on south side of signal house.	No	-	Chrysotile	-	Particulate Matter
				-	Amosite	80	Cellulose
				-	Crocidolite	20	Other
				-	Tremolite	-	Quartz
						-	Calcite
	07B	Tar paper, under aluminum siding on south side of signal house.	No	-	Chrysotile	-	Particulate Matter
				-	Amosite	80	Cellulose
				-	Crocidolite	20	Other
				-	Tremolite	-	Quartz
						-	Calcite
	07C	Tar paper, on west soide of signal house.	No	-	Chrysotile	-	Particulate Matter
				-	Amosite	80	Cellulose
				-	Crocidolite	20	Other
				-	Tremolite	-	Quartz
						-	Calcite

Polarized Light Microscopy Asbestos Analysis Report

Client: Montgomery Watson Americas, Inc.
4525 Wasatch Boulevard, Suite 200
Salt Lake City, Michigan 84124

Client Job/P.O. #:

Project Location: Passage Island Lighthouse

ETC Project #: T-99113
Sample Date: 6/18/01
Submitted Date: 6/20/01
Sampled by: JB
Analyzed by: KR

Signature:

Lab Code	Sample Code	Sample Description	Asbestos Found (Yes/No)	Percent and Type of Asbestos		Percent of Other Materials Found	
	08A	Winch house roofing on west side.	No	-	Chrysotile	-	Particulate Matter
				-	Amosite	58	Cellulose
				-	Crocidolite	30	Other
				-	Tremolite	-	Quartz
						12	Calcite
	08B	Winch house roofing on west side.	No	-	Chrysotile	-	Particulate Matter
				-	Amosite	60	Cellulose
				-	Crocidolite	30	Other
				-	Tremolite	-	Quartz
						10	Calcite
	08C	Winch house roofing on west side.	No	-	Chrysotile	-	Particulate Matter
				-	Amosite	60	Cellulose
				-	Crocidolite	30	Other
				-	Tremolite	-	Quartz
						10	Calcite
	09A	Tar paper winch house roof on west side.	No	-	Chrysotile	-	Particulate Matter
				-	Amosite	80	Cellulose
				-	Crocidolite	20	Other
				-	Tremolite	-	Quartz
						-	Calcite
	09B	Tar paper winch house roof on west side.	No	-	Chrysotile	-	Particulate Matter
				-	Amosite	80	Cellulose
				-	Crocidolite	20	Other
				-	Tremolite	-	Quartz
						-	Calcite
	09C	Tar paper winch house roof on west side.	No	-	Chrysotile	-	Particulate Matter
				-	Amosite	80	Cellulose
				-	Crocidolite	20	Other
				-	Tremolite	-	Quartz
						-	Calcite
	10A	Caulk winch house window on west side.	No	-	Chrysotile	-	Particulate Matter
				-	Amosite	-	Cellulose
				-	Crocidolite	75	Other
				-	Tremolite	-	Quartz
						25	Calcite

Polarized Light Microscopy Asbestos Analysis Report

Client: Montgomery Watson Americas, Inc.
4525 Wasatch Boulevard, Suite 200
Salt Lake City, Michigan 84124

Client Job/P.O. #:

Project Location: Passage Island Lighthouse

ETC Project #: T-99113
Sample Date: 6/18/01
Submitted Date: 6/20/01
Sampled by: JB
Analyzed by: KR

Signature:

Lab Code	Sample Code	Sample Description	Asbestos Found (Yes/No)	Percent and Type of Asbestos		Percent of Other Materials Found	
	10B	Caulk winch house door on west side.	No	-	Chrysotile	-	Particulate Matter
				-	Amosite	-	Cellulose
				-	Crocidolite	75	Other
				-	Tremolite	-	Quartz
						25	Calcite
	10C	Caulk winch house door.	No	-	Chrysotile	-	Particulate Matter
				-	Amosite	-	Cellulose
				-	Crocidolite	75	Other
				-	Tremolite	-	Quartz
						25	Calcite

ETC Bulk Field Sample Collection and Report Sheet

Page ___ of ___ Sampled on: 6/17/01
by ___ In Building ___
Signature: Gary E. Budd
Facility: Passage Isle Light
ETC Job #: 99113
Client: Mont. Watson

Same Day ___
24 Hour ___
3-5 Day ___
Weekend ___

Mastic Separatly ___
Point Count Method ___

AHERA ___
NON-AHERA ___

Chain of Custody

Released by: Gary Budd of Company: ETC on date: 6/17/01 at 5:00 am/pm
Accepted by: ___ of Company: ___ on date: ___ / ___ / ___ at ___ : ___ am / pm
Released by: ___ of Company: ___ on date: ___ / ___ / ___ at ___ : ___ am / pm
Accepted by: ___ of Company: ___ on date: ___ / ___ / ___ at ___ : ___ am / pm

(___-___-___) ___-___ Faxed Results ___
(___-___-___) ___-___ Phoned Results ___

DBASE INDEX	LAB ANALYST	LAB NUMBER	BUILDING	FUNC. AREA	HOMO. AREA	SAMPLE LETTER	FLOOR NUMBER	Room Number	Verify Homogenous Material Description	Exact Sample Location	Sample Color and Appearance	CHRYSOTILE	AMOSITE	CROCIDOLITE	TREMOLITE	ACTINOLITE	ANTHOPHYLLITE	% ASBESTOS	CALCITE	CELLULOSE	CERAMIC	BINDER	MINERAL WOOL	FIBERGLASS	PARTIC. MATTER	DIATOMS. EARTH	QUARTZ	OTHER	UNANALYZED	% NON ASBESTOS	CHECK TOTAL
	GB				01	A			Lighthouse Roofing	above North entrance								0										100	100	100
					01	B				on North side 14' from NE corner								0		5								95	100	100
					01	C				on South side 16' from SW corner								0		5								95	100	100
					02	A			Flashing Tar	on main entrance	Chrysotile only in mastic	5						5										95	95	100
					02	B				" "	" "	5						5										95	95	100
					02	C				on North West corner where roof meets light tower		15						15										85	85	100
					03	A			Window Glazing	2nd Window from West on North side	no fibers							0	75									25	100	
						B				West facing Window on South side								0	20									80	100	
						C				1st Window from West on North side								0	20									80	100	

Environmental Testing and Consulting, Inc.
[illegible] Detroit Westland, MI [illegible]
Phone: [illegible] Fax: [illegible]
[illegible]

ETC Bulk Field Sample Collection and Report Sheet

Page ___ of ___ Sampled on: 6/12/01
by ___ in Building ___
Signature: Gary Budd
Facility: Passage Isle light
ETC Job #: 99113
Client: Mont. Watson

Sample Day ___ 24 Hour ___ 3-5 Day ___ Weekend ___
Media Separately ___ Point Count Method ___
AHERA ___ NON-AHERA ___

Chain of Custody
Released by: Gary Budd of Company: ETC on date: 6/12/01 at 5:00 am/pm
Accepted by: ___ of Company: ___ on date: __/__/__ at __:__ am/pm
Released by: ___ of Company: ___ on date: __/__/__ at __:__ am/pm
Accepted by: ___ of Company: ___ on date: __/__/__ at __:__ am/pm
(___-___-___) ___-___ Faxed Results ___
(___-___-___) ___-___ Phoned Results ___

DBASE INDEX	LAB ANALYST	LAB NUMBER	BUILDING	FUNC. AREA	HOMO. AREA	SAMPLE LETTER	FLOOR NUMBER	Room Number	Verify Homogenous Material Description	Exact Sample Location	Sample Color and Appearance	CHRYSOTILE	AMOSITE	CROCIDOLITE	TREMOLITE	ACTINOLITE	ANTHOPHOLITE	% ASBESTOS	CALCITE	CELLULOSE	CERAMIC	BINDER	MINERAL WOOL	FIBERGLASS	PARTIC. MATTER	DIATOMS. EARTH	QUARTZ	OTHER	UNANALYZED	NON ASBESTOS	CHECK TOTAL
	KR				04	A			Tar Sealer	Pipes on North side	~~on window pipes~~	5						5	10									85		95	
						B				Pipes on South side	30% fibers	30						30	10									60		70	
						C				Window on South side from East		10						10	5									85		90	
					05	A			Pump house Roofing	Taken from North side	brown fibers w/ fungal growth white fiber							0		10								90		100	
						B												0	5	20								75		100	
						C												0	5	20								75		100	
					06	A			Signal house Roofing	On East side of Signal House		15						15	5							10		70		100	
						B				on South side of Signal house 4' from East end	60% quartz	20						20	0	10						60		10		80	
						C				on South side of Signal House 6' from East end	60% quartz	20						20	0	10						60		10		80	

Environmental Testing and Consulting, Inc. Phone: 313-[illegible] Fax: 313-[illegible]
[illegible] Wayne, MI 48[illegible] USA

ETC Bulk Field Sample Collection and Report Sheet

Page ___ of ___, Sampled on: ___/___/___
by _____ In Building _____
Signature _____
Facility _____
ETC Job # _____
Client _____

Same Day ___
24 Hour ___
3-5 Day ___
Weekend ___

Mastic Separator ___
Point Count Method ___

AHERA ___
NON-AHERA ___

Chain of Custody

Released by: Gary Budd of Company: ETC on date: 6/18/05 at 5:00 am/pm
Accepted by: _____ of Company: _____ on date: ___/___/___ at ___:___ am / pm
Released by: _____ of Company: _____ on date: ___/___/___ at ___:___ am / pm
Accepted by: _____ of Company: _____ on date: ___/___/___ at ___:___ am / pm

(___-___-___) _____-_____ Faxed Results ___
(___-___-___) _____-_____ Phoned Results ___

DBASE INDEX	LAB ANALYST	LAB NUMBER	BUILDING	FUNC. AREA	HOMO. AREA	SAMPLE LETTER	FLOOR NUMBER	Room Number	Verify Homogeneous Material Description	Exact Sample Location	Sample Color and Appearance	CHRYSOTILE	AMOSITE	CROCIDOLITE	TREMOLITE	ACTINOLITE	ANTHOPHOLITE	% ASBESTOS	CALCITE	CELLULOSE	CERAMIC	BINDER	MINERAL WOOL	FIBERGLASS	PARTIC. MATTER	DIATOMS. EARTH	QUARTZ	OTHER	UNANALIZED	NON ASBESTOS	CHECK TOTAL
	BR				07	A			Tar Paper	under Aluminum Siding on South side of Signal House								0		80								20		100
					07	B			"	"								0		80								20		100
					07	C			—	on West side of signal house								0		80								20		100
					08	A			Winch House Roofing	Winch house roof on West side								0	12	58								30		100
					08	B			—	—								0	10	60								30		100
					08	C			—	—								0	10	60								30		100
					09	A			Tar Paper	Same As 08 A								0		80								20		100
					09	B			—	Same As 08 B								0		80								20		100
	✓				09	C			—	Same As 08 C								0		80								20		100

ETC Bulk Field Sample Collection and Report Sheet

Page ___ of ___ Sampled on: 6/12/01
by ___ in Building ___
Signature: Ray S. Burdel
Facility: Passage Isle Light
ETC Job #: 99113
Client: Mont. Watson

Same Day ___
24 Hour ___
3-6 Day ___
Weekend ___

Mastics Separately ___
Point Count Method ___

AHERA ___
NON-AHERA ___

Chain of Custody

Released by: Ray Burdel of Company: ETC on date: 6/11/01 at 5:10 am / pm
Accepted by: Mark Mulak of Company: ETC on date: 6/11/01 at 5:00 am / pm
Released by: ___ of Company: ___ on date: ___/___/___ at ___:___ am / pm
Accepted by: ___ of Company: ___ on date: ___/___/___ at ___:___ am / pm

(___-___-___) ___-___ Faxed Results ___
(___-___-___) ___-___ Phoned Results ___

DBASE INDEX	LAB ANALYST	LAB NUMBER	BUILDING	FUNC. AREA	HOMO. AREA	SAMPLE LETTER	FLOOR NUMBER	Room Number	Verify Homogeneous Material Description	Exact Sample Location	Sample Color and Appearance	CHRYSOTILE	AMOSITE	CROCIDOLITE	TREMOLITE	ACTINOLITE	ANTHOPHOLITE	% ASBESTOS	CALCITE	CELLULOSE	CERAMIC	BINDER	MINERAL WOOL	FIBERGLASS	PARTIC. MATTER	DIATOMS. EARTH	QUARTZ	OTHER	UNANALYZED	NON ASBESTOS	CHECK TOTAL
	RF				10	A			Caulk	Winch house Window on West side								0	Ø									Ø		100	
	↓					B				Winch house door On West side								0	Ø									Ø		100	
						C				Winch house Door								0	Ø									Ø		100	

Passage Island Lighthouse
Isle Royale National Park
Keweenaw County, Michigan

TEST SITE: TEST DATE: 06/12/01

No. XL#	Date Time	Flr. Side	Room No.	Structure Feature	Condit. Substr.	I N	Depth Time	PbL +/-	PbK Range	Result
1	06/12/01	1	Calibrate			1	1.0	0.0	-1.1	
1	10:27:39						7	0.0	17.6	
2	06/12/01	1	Calibrate			1	1.0	0.3	-4.7	
2	10:28:00						8	0.1	19.7	
3	06/12/01	1	Calibrate			1	1.1	1.1	-3.7	Pos
3	10:28:18						7	0.2	19.5	
4	06/12/01	1	Outhouse	Ext Wall	Peeling	1	4.4	5.1	5.5	Pos
4	10:29:55		White	Siding	Wood		5	1.0	61.2	
5	06/12/01	1	Outhouse	Ext Wall	Peeling	1	1.3	0.9	0.0	Inc
5	10:30:18		White	Siding	Wood		5	0.3	23.6	
6	06/12/01	1	Outhouse	Ext Wall	Peeling	1	4.0	5.1	0.0	Pos
6	10:30:34		White	Siding	Wood		4	1.0	27.2	
7	06/12/01	1	Outhouse	Ext Wall	Peeling	1	4.5	5.1	0.0	Pos
7	10:30:53		White	Siding	Wood		6	1.0	19.6	
8	06/12/01	1	Paint Sto	Ext Wall	Peeling	1	2.3	3.3	0.7	Pos
8	10:31:43		White	Siding	Concrte		3	1.0	65.4	
9	06/12/01	1	Paint Sto	Ext Wall	Peeling	1	2.5	5.1	1.2	Pos
9	10:31:57		White	Siding	Concrte		5	1.0	37.0	
10	06/12/01	1	Paint Sto	Ext Wall	Peeling	1	2.0	2.1	-2.7	Pos
10	10:32:16		White	Siding	Concrte		4	0.6	41.2	
11	06/12/01	1	Helo Pad		Peeling	1	1.3	5.1	-8.0	Pos
11	10:33:09		Red	Siding	Wood		6	1.0	27.3	
12	06/12/01	1	Helo Pad		Peeling	1	1.5	5.1	5.1	Pos
12	10:33:31		Red	Siding	Wood		3	1.0	68.4	
13	06/12/01	1	Winch Hou		Peeling	1	1.1	0.1	-3.3	
13	10:34:59		Blue	Door	Wood		9	0.1	17.3	
14	06/12/01	1	Winch Hou	Door	Peeling	1	1.2	0.2	-1.1	
14	10:35:23		Blue	Header	Wood		7	0.1	17.1	
15	06/12/01	1	Winch Hou	Soffit	Peeling	1	1.1	0.1	-0.3	
15	10:36:09		Blue		Wood		8	0.1	21.0	

I-Inspector N-Note

Results by Test Number, Neg<0.9 Pos>=1.0 mg/cm2 Niton XL#

Passage Island Lighthouse
Isle Royale National Park
Keweenaw County, Michigan

TEST SITE: TEST DATE: 06/12/01

No. XL#	Date Time	Flr. Side	Room No.	Structure Feature	Condit. Substr.	I N	Depth Time	PbL +/-	PbK Range	Result
16	06/12/01	1	Catwalk	Boards	Peeling	1	1.2	0.1	-0.2	
16	10:37:04		Green		Wood		11	0.1	14.9	
17	06/12/01	1	Catwalk	Rail Gauge	Solid	1	2.6	3.8	-0.8	Pos
17	10:37:49		Yello		Metal		7	2.3	31.3	
18	06/12/01	1	Catwalk	Hand rail	Solid	1	1.0	0.0	-1.4	
18	10:38:37		White		Metal		6	0.0	21.5	
19	06/12/01	1	Catwalk	Hand rail	Solid	1	1.0	0.0	-0.9	
19	10:38:53		White		Metal		9	0.0	14.3	
20	06/12/01	1	Catwalk	Hand rail	Solid	1	1.0	0.0	-3.2	
20	10:39:13		White		Metal		9	0.0	16.6	
21	06/12/01	1	Catwalk	Boards	Peeling	1	1.5	0.2	-1.3	
21	10:40:09		Green		Wood		12	0.1	11.0	
22	06/12/01	1	Tower Bas	Former	Solid	1	1.4	1.2	-1.4	Pos
22	10:42:35		White		Concrte		7	0.3	30.4	
23	06/12/01	1	Tower Bas	Former	Solid	1	1.2	1.5	-1.2	Pos
23	10:43:00		Red		Concrte		7	0.3	18.7	
24	06/12/01	1	Tower	Current	Solid	1	1.3	5.1	4.0	Pos
24	10:47:28		Red		Metal		6	1.0	49.1	
25	06/12/01	1	Signal Ho		Peeling	1	1.1	0.1	0.0	
25	10:48:44		White		Wood		8	0.1	13.9	
26	06/12/01	1	Signal Ho		Peeling	1	1.2	0.1	0.9	
26	10:49:02		White		Wood		6	0.1	26.9	
27	06/12/01	1	Signal Ho		Peeling	1	1.3	0.1	-1.6	
27	10:49:16		White		Wood		12	0.1	12.8	
28	06/12/01	1	Signal Ho		Peeling	1	1.0	0.1	-1.1	
28	10:49:45		Green		Wood		7	0.0	17.1	
29	06/12/01	1	Signal Ho		Peeling	1	1.3	0.1	0.0	
29	10:50:03		Green		Wood		7	0.1	17.0	
30	06/12/01	1	Signal Ho		Peeling	1	1.1	0.1	-1.8	
30	10:50:31		Blue		Wood		13	0.1	10.8	

I-Inspector N-Note

Results by Test Number, Neg<0.9 Pos>=1.0 mg/cm2 Niton XL#

Passage Island Lighthouse
Isle Royale National Park
Keweenaw County, Michigan

TEST SITE:

TEST DATE: 06/12/01

No. XL#	Date Time	Flr. Side	Room No.	Structure Feature	Condit. Substr.	I N	Depth Time	PbL +/-	PbK Range	Result
31	06/12/01	1	Flag Pole		Peeling	1	2.5	4.3	-1.5	Pos
31	10:51:20		White		Wood		7	1.8	22.1	
32	06/12/01	1	Flag Pole		Peeling	1	2.7	1.6	0.0	Pos
32	10:51:38		White		Wood		3	0.7	30.7	
33	06/12/01	1	Flag Pole		Peeling	1	1.3	0.1	-0.8	
33	10:51:52		White		Wood		14	0.1	19.1	
34	06/12/01	1	Lighthous	West Entra	Peeling	1	3.7	3.4	6.0	Pos
34	10:53:30		Gray		Concrte		6	1.0	53.5	
35	06/12/01	1	Lighthous	Window	Peeling	1	4.9	0.3	-6.2	
35	10:54:01		Green	Sash	Wood		6	0.8	24.3	
36	06/12/01	1	Lighthous	Window	Peeling	1	1.1	1.2	-2.4	Pos
36	10:55:55		Green	Sash-Ext	Wood		7	0.2	20.1	
37	06/12/01	1	Lighthous	Window	Peeling	1	3.8	5.1	-1.5	Pos
37	10:56:36		White	Trim-Ext	Wood		7	1.0	23.0	
38	06/12/01	1	Lighthous	Soffit	Cracked	1	3.0	5.1	11.5	Pos
38	10:58:41		White		Wood		3	1.0	102.9	
39	06/12/01	1	Lighthous	Gingerbrea	Cracked	1	3.4	5.1	12.2	Pos
39	10:58:55		White	Trim-Ext	Wood		7	1.0	70.8	
40	06/12/01	1	Lighthous	Corner Cap	Solid	1	1.6	3.1	0.4	Pos
40	11:00:53		White		Concrte		6	0.5	25.6	
41	06/12/01	1	Lighthous	Light towe	Solid	1	1.5	0.1	-1.2	
41	11:01:48		Green		Metal		7	0.1	17.9	
42	06/12/01	1	Lighthous	Light towe	Solid	1	1.4	0.1	-2.9	
42	11:05:08		Green		Metal		9	0.1	16.3	
43	06/12/01	1	Lighthous	Light towe	Solid	1	1.0	0.0	-1.1	
43	11:05:29		Green		Metal		7	0.0	16.8	
44	06/12/01	1	Lighthous	Light towe	Solid	1	1.9	0.1	-0.9	
44	11:05:56		Green		Metal		11	0.1	14.3	
45	06/12/01	1	Lighthous	Light towe	Solid	1	2.3	1.4	0.2	Pos
45	11:06:21		Green		Metal		11	0.3	21.5	

I-Inspector N-Note

Results by Test Number, Neg<0.9 Pos>=1.0 mg/cm2

Niton XL#

Passage Island Lighthouse
Isle Royale National Park
Keweenaw County, Michigan

TEST SITE:

TEST DATE: 06/12/01

No. XL#	Date Time	Flr. Side	Room No.	Structure Feature	Condit. Substr.	I N	Depth Time	PbL +/-	PbK Range	Result
46	06/12/01	1	Lighthous	Light towe	Solid	1	2.7	0.1	0.0	
46	11:06:44		Green		Metal		10	0.2	11.3	

I-Inspector N-Note

Results by Test Number, Neg<0.9 Pos>=1.0 mg/cm2

Niton XL#

Lead Paint Analysis Summary

Client: Montgomery Watson Americas, Inc.
4525 South Wasatch Boulevard, Suite 200
Salt Lake City, UT 84124

Submitted Date: 6/19/01
Sample By: MC
Sample Date: 6/19/01

ETC Project #: T-99113-01
Client Project #:
Analyzed By: MC
Analyzed Date: 06/19/01
Field (F) or Lab (L) Analysis: Lab
Calibration #: 600146539
Battery Level #: 11.5
Internal QC: 0.0

Project Location: Passage Island Lighthouse

Lab Code	Sample Code	Sample Identification	Sample Weight (mg)	Results Lead (%/weight)	LOD Lead (%/weight)
	C-1	Pump House-gray	390.0	>1.28	0.03
	C-2	Pump House-white	430.0	0.32	0.01
	C-3	Light Green-lighthouse	640.0	>0.78	0.02
	C-4	Lighthouse-west stair-gray	530.0	>0.94	0.02
	C-5	Lighthouse-flag pole base	170.0	0.04	0.06
	C-6	Window boards-white	590.0	>0.85	0.02
	C-7	Window boards-blue	130.0	1.38	0.08
	C-8	Winch house-green	340.0	0.29	0.03
	C-9	Winch house soffit-green	190.0	0.53	0.05
	C-10	Signal House-white	340.0	0.01	0.01
	C-11	Signal House-gray	310.0	0.07	0.01
	C-12	Signal House-green	280.0	0.01	0.01
	C-13	Catwalk boards-green	140.0	0.03	0.02
	C-14	Paint storage building.	390.0	>1.28	0.03
	C-15	Concrete walk-yellow	440.0	>1.14	0.02

Lead Paint Analysis Summary

Client: Montgomery Watson Americas, Inc.
4525 South Wasatch Boulevard, Suite 200
Salt Lake City, UT 84124

Submitted Date: 6/19/01
Sample By: MC
Sample Date: 6/19/01

ETC Project #: T-99113-01
Client Project #:
Analyzed By: MC
Analyzed Date: 06/19/01
Field (F) or Lab (L) Analysis: Lab
Calibration #: 600146539
Battery Level #: 11.5
Internal QC: 0.0

Project Location: Passage Island Lighthouse

Lab Code	Sample Code	Sample Identification	Sample Weight (mg)	Results Lead (%/weight)	LOD Lead (%/weight)
	C-16	Tower-red	70.0	>7.14	0.14
	C-17	Outhouse-white	1000.0	>0.5	0.01
	C-18	Light corner	810.0	>0.62	0.01
	C-19	Helo-red.	30.0	>16.67	0.33
	C-20	Outhouse clean-up-white.	650.0	>0.77	0.02

APPENDIX F

CALCULATIONS FOR SITE-SPECIFIC BACKGROUND CONCENTRATIONS

MONTGOMERY WATSON

BY KMO DATE 8/9/01 CLIENT USCG Passage Island SHEET ____ OF ____

CHKD. BY EAG DESCRIPTION Background Metals Concentration Calcs JOB NO. ____

X_b = background mean
S_b = Standard Deviation
C_v = Coefficent of Variation
K = tolerance factor
TL = upper tolerance limit

$$\bar{X}_b = \frac{X_1 + X_2 + \ldots X_n}{n_b}$$

Lead

$$X_b = \frac{180 + 288 + 46.4 + 30.3 + 19.8 + 199}{6}$$

$$X_b = \frac{763.5}{6} = 127.25$$

$$S_b = \sqrt{\frac{(X_1 - \bar{X}_b)^2 + (X_2 - \bar{X}_b)^2 + (X_n - \bar{X}_b)^2}{(n_b - 1)}}$$

$$S_b = \sqrt{\frac{(180 - 127.25)^2 + (288 - 127.25)^2 + (46.4 - 127.25)^2 + (30.3 - 127.25)^2 + (19.8 - 127.25)^2 (199 - 127.25)^2}{5}}$$

$$S_b = \sqrt{\frac{2782.5 + 25840.56 + 6536.72 + 9399.30 + 11,545.5 + 5148.06}{5}}$$

$$S_b = \sqrt{\frac{61252.64}{5}} = 110.68$$

$$C_v = \frac{110.68}{127.25} = 0.87$$

$$TL = X_b + KS_b$$

$$TL = 127.25 + (3.0)(110.68)$$

$$TL = 459.4$$

FN-10 (10/78)

Appendix **C**

Archeological Cultural Resources Survey

CULTURAL RESOURCE SURVEY: PASSAGE ISLAND LIGHTHOUSE (20IR202), KEWEENAW COUNTY, MICHIGAN

A CULTURAL RESOURCE MANAGEMENT STUDY
PREPARED FOR SUBMISSION TO THE
MICHIGAN STATE HISTORIC PRESERVATION OFFICER

GREAT LAKES RESEARCH, INC.
ARCHAEOLOGY / CULTURAL RESOURCE MANAGEMENT

CULTURAL RESOURCE SURVEY: PASSAGE ISLAND LIGHTHOUSE (20IR202), KEWEENAW COUNTY, MICHIGAN

PREPARED AND SUBMITTED BY:

Mark C. Branstner, M.A.

Great Lakes Research, Inc.
319 W. Grand River Avenue
Williamston, MI 48895

GLR Report No. 2004-05

SUBMITTED TO:

MWH Americas, Inc.
41551 Eleven Mile Road
Novi, MI 48375

30 August 2004

The opinions, findings, and conclusions expressed in this document are those of the authors, Great Lakes Research, Inc., and are not necessarily those of our client, MWH Americas, Inc.

ABSTRACT / MANAGEMENT SUMMARY

In August 2004, Great Lakes Research, Inc. (GLR) was contracted by MWH Americas, Inc. of Novi, Michigan to perform a Phase I archaeological cultural resource survey and evaluation of an approximately 0.25 acre property located in Section 9, T67N R32W, Houghton Township, Keweenaw County, Michigan. The study area generally corresponds to the footprint of the Passage Island lighthouse complex (20IR202), which is located on the extreme south end of the island, approximately four miles northeast of the northeast extremity of Isle Royale in Lake Superior.

This survey was requested by the Michigan State Historic Preservation Officer (SHPO) and was predicated on the planned remediation of contaminated soils at the U.S. Coast Guard property. Although the Native American archaeological sensitivity of this remote property appeared relatively low, the general environmental setting was considered of increased historic period sensitivity due to the presence of the ca. 1881 Passage Island lighthouse complex.

Prefield archival research per prehistoric and historic Native American archaeological potentials in relation to the study area had indicated a very low sensitivity concern. This was predicated on (1) isolated nature of the island and (2) the exposed bedrock landform on which 20IR202 is located.

Archival research also indicated that the general study area had been developed as a lighthouse site no earlier than 1880 and that this land use had continued until the present day. The only significant change to the property has been its conversion to an automated rather than manned station. Although such a property could include archaeological deposits of significance, Phase I survey of this property determined that soils deposits were extremely thin and that artifacts included therein were largely limited to architectural debris, coal fragments, and ash/cinder deposits.

Based on a Phase I survey program that combined archival research with pedestrian reconnaissance and subsurface testing, it has been determined that there are no significant prehistoric or historic period archaeological resources within the Passage Island lighthouse (20IR202) study area. Therefore, GLR recommends that no further evaluation or mitigation of this project will be required for archaeological resources, and that its immediate release for soil remediation appears warranted.

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SECTION 1.0 - INTRODUCTION

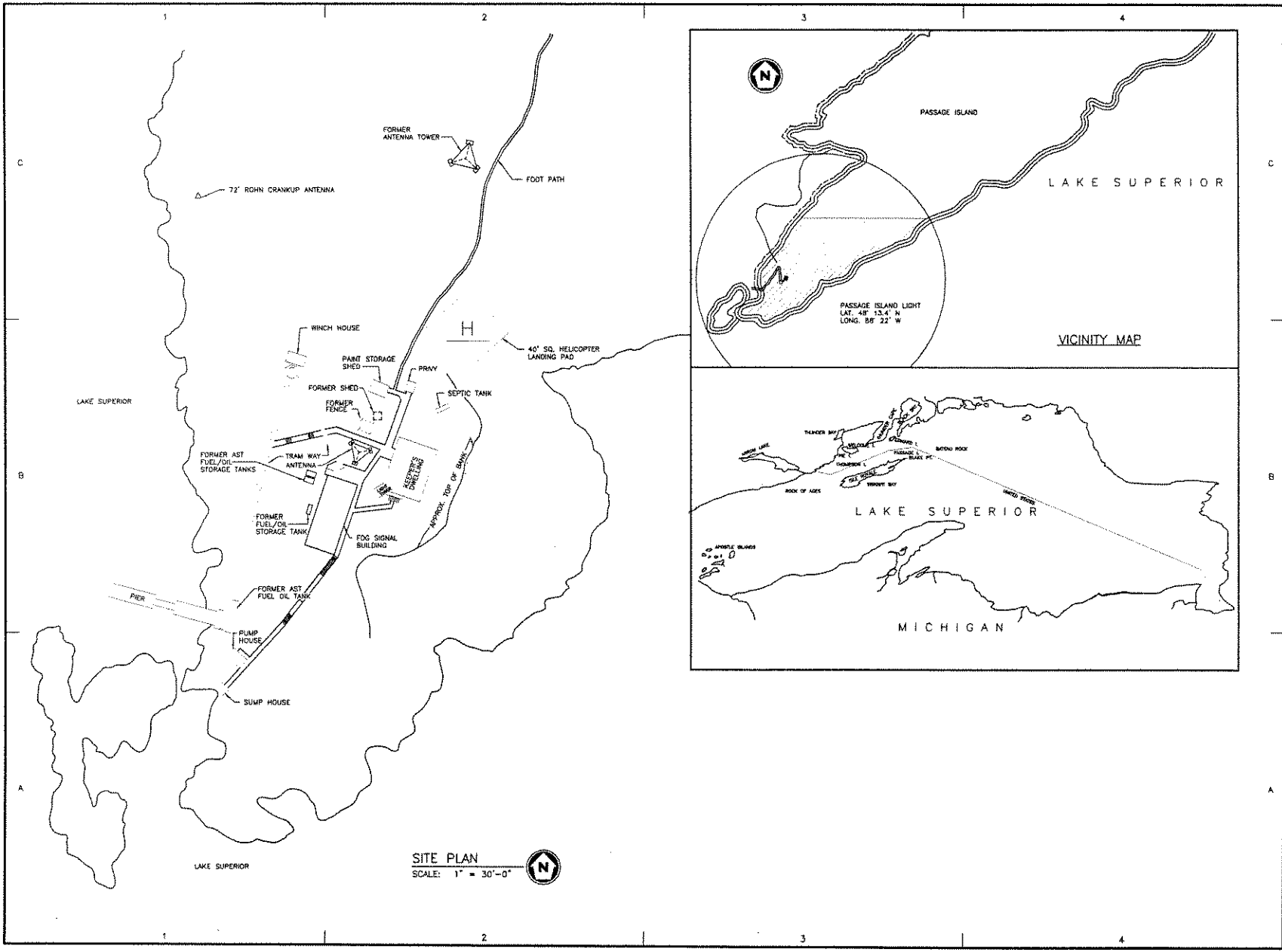
In August 2004, Great Lakes Research, Inc. (GLR) was contracted by MWH Americas, Inc. of Novi, Michigan to perform a Phase I archaeological cultural resource survey and evaluation of an approximately 0.25 acre property located in Section 9, T67N R32W, Houghton Township, Keweenaw County, Michigan (Figure 1). The study area generally corresponds to the footprint of the Passage Island lighthouse complex (20IR202), which is located on the extreme south end of the island, approximately four miles northeast of the northeast extremity of Isle Royale in Lake Superior. The only ready access to Passage Island is via hired boat from Isle Royale National Park.

This survey was requested by the Michigan State Historic Preservation Officer (SHPO) and was predicated on the planned remediation of contaminated soils at the U.S. Coast Guard property. Although the Native American archaeological sensitivity of this remote property appeared relatively low, the general environmental setting was considered of increased historic period sensitivity due to the presence of the ca. 1881 Passage Island lighthouse complex.

Following the completion of prefield archival research, which was conducted by the principal investigator, Mark C. Branstner (M.A. Anthropology, Wayne State University), the fieldwork phase of the project was implemented. Fieldwork was initially scheduled to be completed early in the week beginning 16 Aug 2004 in order to meet a contracted completion date of 20 Aug 2004, but weather conditions on Lake Superior precluded boat access to Passage Island during that period. The trip was rescheduled for the following week and principal investigator arrived at Isle Royale National Park on Wednesday, 25 Aug 2004. Unfortunately, although Lake Superior was calm, the entire area was fogged in, precluding off-island boat travel until Friday morning (27 Aug 2004). The survey was completed on Friday and the principal investigator returned to Isle Royale, under renewed small-craft advisories.

The following report represents our findings.

Figure 1. General location of project area (U.S. Coast Guard).



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CLEVELAND, OH 44199-2060

ISSUE		
MARK	DATE	DESCRIPTION

A/E PROJECT NO: j:\j\uscg\2002\649\c
CAD FILE NAME: C7147C01
DESIGNED BY: KMD
DRAWN BY: STR
EDITED BY: STR
CHECKED BY: EAG

SCALE: AS SHOWN PLOT SCALE: 1" = 30'

SHEET TITLE

PASSAGE ISLAND LIGHT STATION
KEWEENAW COUNTY MICHIGAN
SITE FEATURES MAP

SITE PLAN

REVIEWED BY: | REVIEWED BY: | REVIEWED BY:
PROJECT ENG. | BRANCH CHIEF | CONTRACTING KO
APPROVING OFFICER | DATE

PROJECT NUMBER	DRAWING NUMBER
09-C01052	7147-D
DISCIPLINE/SHT NO	SHEET 1 OF 2
C/01	

SECTION 2.0 – PHYSICAL ENVIRONMENT

Topographically, the Passage Island lighthouse project area is identical to the much larger Isle Royale, which is located approximately four miles to the southwest. As such, it is best described as a bedrock outcrop with vegetation present at any point where soil has accumulated (Farrand and Bell 1982). Elevation of the study area ranges from approximately 620-640 ft above mean sea level or approximately 20-40 ft above the immediately adjacent Lake Superior surface (600 ft above mean sea level).

At the time of the survey, the defined survey area (Figure 2) was best described as the crest of a bedrock outcrop, bounded on the south, east and west by wave-cut exposures leading down to Lake Superior, and to the north by forested portions of the island. Soils have developed, accumulated or been placed in general proximity to the various structures and in low areas between bedrock exposures. Vegetation was limited to grasses, weeds, and a few small woody shrubs.

SECTION 3.0 – CULTURAL ENVIRONMENT

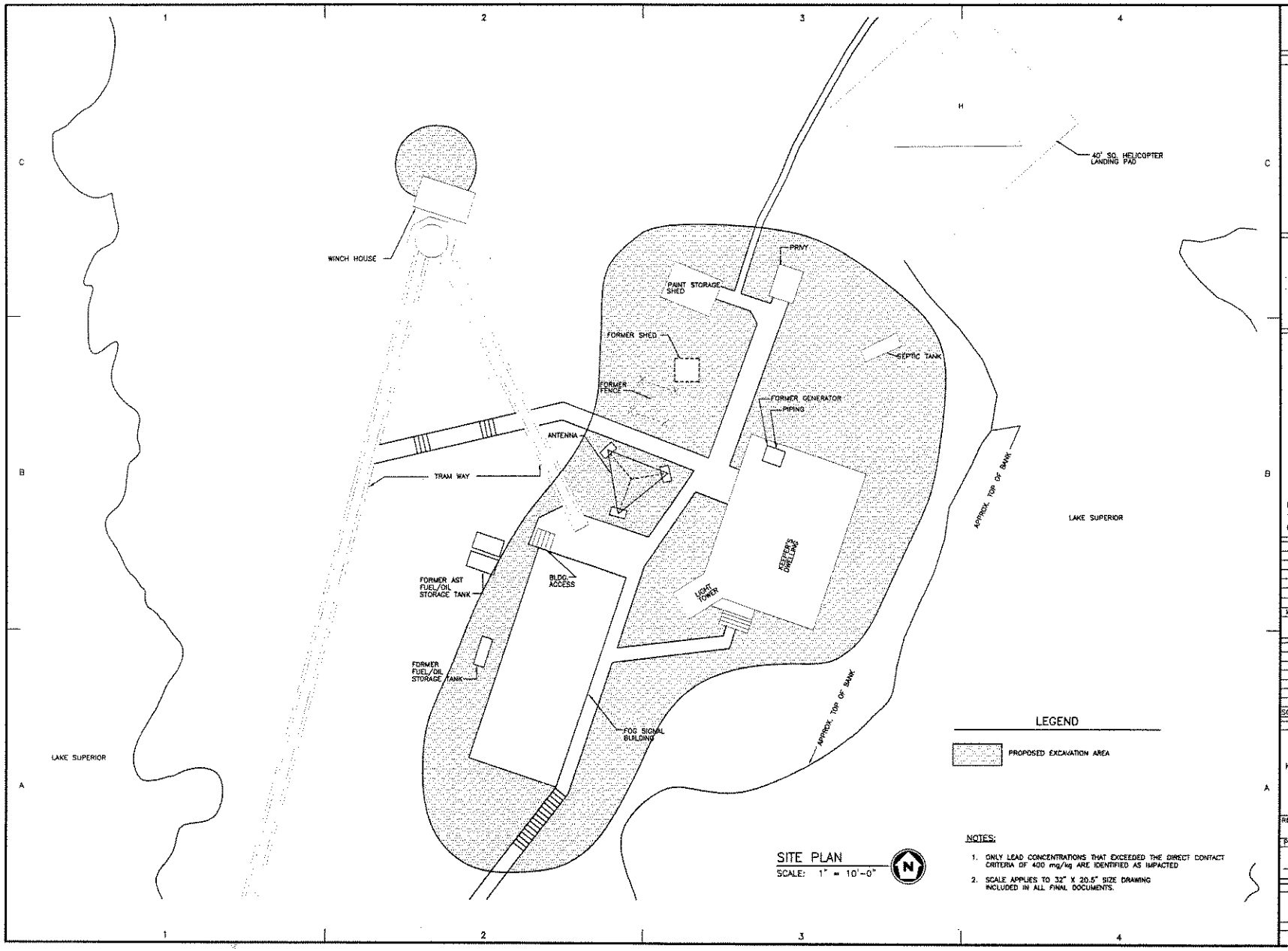
3.1 NATIVE AMERICAN RESOURCES

The general outline of the Native American occupation of the Upper Great Lakes has been presented by several authors (cf., Bieder 1995; Cleland 1992; Fitting 1975; Green et al. [eds.] 1986; Lovis 1990; R. Mason 1981). From these accounts, it is apparent that the region reflects approximately 10,000 - 12,000 years of Native American presence, and nearly 400 years of Euroamerican occupation and utilization. Coupling this time depth with the study area's location, it can be expected that the range of cultural resources potentially included within the survey area is large, and that nearly the entire range of archaeological resource types known for the Upper Great Lakes region may be encountered.

3.1.1 The Paleoindian Period

The Paleoindian period in Michigan was characterized by an environment recovering from the recent effects of deglaciation. Tundra and spruce woodland habitats prevailed, and the configuration of proglacial water bodies in what would become the Great Lakes was markedly different than that at present. Some areas of the state, specifically the Upper Peninsula, were deglaciated later and remained in a periglacial environment until more recent times than the more southern reaches of the Lower Peninsula. Currently available evidence suggests that the earliest human inhabitants of the area were organized into small nomadic bands moving across large territories as they followed the great herds of Pleistocene herbivores that served as a primary subsistence and economic resource (Fitting 1975). While Cleland (1965, 1966, 1976) has suggested that barren ground caribou provided some of the protein for this big game hunting, narrow spectrum economy, others have made the case that mastodon (e.g., Fisher 1984) and/or bison (e.g., Shay 1971) may also have contributed greatly to the seasonal subsistence cycle. Although the evidence is limited, excavations at Paleoindian sites in the northeastern United States indicate that a variety of small and medium-sized mammals, fish, and a variety of plants and nut resources were also being exploited (e.g., Meltzer and Smith 1986; Rusch and Penman 1984). Within the Upper Great Lakes region, the presence of white-

Figure 2. Plan view of study area (U.S. Coast Guard).



NOTES:

1. ONLY LEAD CONCENTRATIONS THAT EXCEEDED THE DIRECT CONTACT CRITERIA OF 400 mg/kg ARE IDENTIFIED AS IMPACTED
2. SCALE APPLIES TO 32" X 20.5" SIZE DRAWING INCLUDED IN ALL FINAL DOCUMENTS.

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MARK	DATE	DESCRIPTION

A/E PROJECT NO: J:\Uscg\2002\649\c
CAD FILE NAME: C7147C02
DESIGNED BY: KMD
DRAWN BY: STR
EDITED BY: STR
CHECKED BY: EAG

SCALE: AS SHOWN PLOT SCALE: 1" = 30'

SHEET TITLE

PASSAGE ISLAND LIGHT STATION
KEWEENAW COUNTY MICHIGAN
PROPOSED EXCAVATION EXTENTS

REVIEWED BY: | REVIEWED BY: | REVIEWED BY:
PROJECT ENG. | BRANCH CHIEF | CONTRACTING KO
APPROVING OFFICER | DATE

PROJECT NUMBER	DRAWING NUMBER
09-C01052	7147-D

DISCIPLINE/SHT NO: C/02
SHEET 2 OF 2

tailed deer, beaver and turtle bones, some of which are calcined, has been reported from the Late Paleoindian Sucices site in northwestern Wisconsin (Rusch and Penman 1984). Thus, while caribou or other large mammals may have served as a key economic resource, they were most likely only one component of a much more diverse subsistence system.

Upper Michigan's earliest human inhabitants presumably entered from the south, primarily via Wisconsin, and migrated north and east across the peninsula, following the large game and receding glaciers. In Wisconsin, the Paleoindian time period has been divided into two parts (R. Mason 1986a): the Early Stage (ca. 10,000-8000 BC) and the Late Stage (ca. 8000-6000 BC). Similar chronologies have been derived for lower Michigan and Ontario (Ellis and Dellar 1990; Fitting 1975). The Early Stage is characterized by fluted projectile points, often made from exotic cherts and fine grades of quartzite, although it is unknown whether these raw materials were acquired through trade or were brought in with the early peoples. Unfortunately, no Early Stage Paleoindian sites have been formally excavated in Wisconsin to date. There are a few fluted point sites in the southern portion of Wisconsin and Michigan and a number of isolated findspots have been located throughout each state (Fitting 1975; R. Mason 1986a).

The Late Stage of the Paleoindian period, while more visible than the Early Stage, is still poorly represented in Upper Peninsula. This period is characterized by collaterally flaked lanceolate projectile points, often manufactured from exotic cherts or Hixton silicified sandstone. As expected, the sites associated with this stage appear to be single component occupations by small groups of people. Evidence of occupation during the late Paleoindian period in the Upper Peninsula has been provided by the recent work of Buckmaster and Paquette (1989) along the south shore of Lake Superior in Marquette County. In this area they have recorded a series of Late Paleoindian or Plano period sites on outwash features of the Marquette re-advance (Buckmaster and Paquette 1989; Buckmaster and Ruggles 1991; Clark 1989). These sites are represented by Scottsbluff, Eden, Agate Basin and other collaterally flaked point styles, often found in dense concentrations, suggesting cremations or restricted activity areas. The Minocqua and Squirrel River phases (Salzer 1974) from northern Wisconsin clearly relate to this time period, and the distribution of these phases may extend across the north shore of Lake Michigan into the western Upper Peninsula. This is clearly a periglacial adaptation that extended eastward across the northern and eastern shores of Lake Huron.

Perhaps the oldest authenticated site lying in reasonable proximity to the current project area is the Keweenaw Peninsula's 20KE20, which has produced a radiocarbon date of 5920±350 BC. Although the sample from which this date was derived remains somewhat ambiguous, it may be associated with a hearth feature and a worked copper artifact (S. Martin [ed.] 1993). If the date is associated with the cultural deposits, it would minimally suggest a Late Paleoindian - Initial Archaic date for the area. Clearly, although the physical evidence remains scant, the presence of sites from at least the Late Paleoindian period onwards appears possible for the project area.

3.1.2 The Archaic Period

The Archaic period is traditionally set off from the preceding Paleoindian period based on a shift from the focal, large game hunting of the earlier period to the highly diffuse hunting and gathering strategy that marks the Archaic (Cleland 1966, 1976; Fitting 1975; Stoltman 1986). This shift most likely occurred in response to rapid environmental changes in the post-

glacial period, including major changes in post-glacial vegetation patterns. The initial shift from the glacial tundra environment to a spruce and fir-dominated landscape was followed by a shift towards the modern mixed northern deciduous forests. Thus, Archaic adaptations in the region were responding to a series of major environmental changes. Corresponding in part to these environmental variations, the Archaic period is typically divided into subperiods. In northern Michigan these include a combined Early-Middle Archaic period (ca. 6500-3000 BC) and a Late Archaic period (ca. 3000-1 BC) (Fitting 1975). In Wisconsin, a slightly different chronology has been offered, including the Early Archaic (ca. 6500-3000 BC), the Middle Archaic (3000-1200 BC, and the Late Archaic (1200-1 BC; Stoltman 1986). For the purposes of this discussion, Fitting's (1975) chronology will be used, in modified form, to discuss Initial (6500-3000 BC) and Terminal (3000-1 BC) Archaic horizons in the Upper Peninsula.

Coincident with the rapid environmental changes of the Archaic period were major readjustments in Great Lakes basin lake levels. The major stages, as relevant to the Archaic period, will be briefly outlined below (cf., Anderton 1993; Monaghan 1993). Around 9000 BC the Lake Superior basin saw some of its highest lake levels (ca. 1340 ft AMSL). By 6000 BC lake levels had reached their all time low (the Houghton Stage). However, due to isostatic rebound the Houghton Stage shoreline was at an elevation near, but possibly below, the modern level of Lake Superior (605 ft AMSL). Nevertheless, this represents a variation in excess of 600 ft AMSL in lake levels over an approximately 3000 year period. The Terminal Archaic period is dominated by the Nipissing stage of lake development. Nipissing I reached a level of approximately 630-650 ft AMSL between 3000 and 2500 BC. Between 2500 BC and the formation of modern Lake Superior (ca. 2000 BC), the lake levels generally remained between 620-605 ft AMSL. While the lake fluctuation was not as dramatic during the Late Archaic period, the process illustrates that the Great Lakes represent a dynamic, continually evolving system.

In the combined Michigan/Huron basin, high water levels were achieved by 9000 BC with the establishment of Lake Algonquin (ca. 720-725 ft AMSL). By 7500 BC the high water levels associated with glacial Lake Algonquin gave way to greatly reduced water levels known as the Chippewa and Stanley low stages in the Michigan and Huron basins, respectively. Although the actual elevation of Lake Chippewa is not known, it was at least 200-300 ft below the current level of Lake Michigan (580 ft AMSL). Like the Superior basin, the Michigan and Huron basins were marked by the Nipissing lake stage during the Archaic period. Beaches associated with the Nipissing maximum have been plotted at modern elevations between 600-605 ft AMSL in the Bay de Noc Region, while post-glacial rebound has raised them to approximately 635 ft AMSL in the Straits of Mackinac region. The final major shift in lake levels occurred with the Algoma transgression around 1200 BC, when lake levels ranged between 10-30 ft above their modern shores in both the Michigan and Huron basins. Modern lake levels (ca. 580 ft AMSL) were generally achieved by 2000 years ago. Thus, Archaic period sites might be located well below or well above the modern shorelines, reflecting the dynamic changes in the lake levels during this period.

Evidence for the Initial Archaic stage is nearly non-existent in northern Michigan and Wisconsin (Fitting 1975; Stoltman 1986). Two possible explanations for the lack of identified sites pertaining to this period have been offered by Stoltman (1986). The first is simply that archaeologists have not learned to differentiate Early Archaic sites from Late Paleoindian ones. Salzer's (1974) Squirrel River Phase, marked by side and corner-notched projectile points, is the best example of Early Archaic materials in northern Wisconsin. Fairchild (1970) has

offered a similar argument for the lack of Early Archaic sites in Michigan, suggesting that Middle Archaic occupations may have greater time depth than previously thought. The second rationale relates to the changing level of the Great Lakes. Recent research concerning settlement systems in the central Upper Peninsula of Michigan (Anderton 1993, 1995; Franzen 1987) indicates that Great Lakes paleoshorelines were regularly used for settlement in the Middle-Late Archaic Period. If a similar pattern exists for the Early Archaic stage, then many of these sites, based on the lake levels noted above, have been eroded away by mid-Holocene lake levels or lie under the current surface of the Upper Great Lakes. Alternately, the low carrying capacity (Fitting 1975) of the spruce/fir forests that dominated the region during this time period may not have been particularly conducive to human occupation. Regardless of the rationale, there are few documented Early Archaic sites in the region.

The end of the Early Archaic stage is marked by the appearance of large side-notched projectile points and the use of native copper (Fitting 1975; R. Mason 1981; Stoltman 1986). The increasing use of native copper during this period led to its designation as the *Old Copper* culture (Griffin 1961; Mason and Mason 1961; Ritzenthaler [ed.] 1957). Despite the Old Copper appellation, it should be noted that copper makes up only a small portion of the total assemblage of this period, and similar copper artifacts, while decreasing in number, are used and manufactured into the Initial Woodland Period.

A single Old Copper site, Oconto, has been excavated in northeastern Wisconsin (Ritzenthaler and Wittry 1957). While primarily a cemetery, containing both primary and secondary burials as well as cremations, the site also produced evidence for an associated settlement. In addition to copper beads and tools, these burials contained chert points and tools as well as a variety of antler artifacts. Another major site from this region is the Riverside site in Menominee County, Michigan (Hruska 1967). This Old Copper site also contains both burial and occupation components. If the artifact variability and radiocarbon dates are any indication, this site had probably been repeatedly occupied throughout the course of the Late Archaic and subsequent Initial Woodland periods. Three radiocarbon dates, ranging from 510 BC to AD 1, combined with an abundance of stemmed and expanding stemmed projectile point styles reminiscent of more southern tier Late Archaic complexes, reveal a substantial Archaic occupation.

The Late Archaic stage is generally distinguished from the earlier Archaic by a shift from notched to stemmed projectile (Durst/Dustin) points (Fitting 1975; Stoltman 1986). A burial complex known as Red Ochre has been identified in much of the Lake Michigan basin, including the Bay de Noc and Straits of Mackinac regions (Ritzenthaler and Quimby 1962). Red Ochre burials get their name from the inclusion of ground hematite with the inhumations. Specific traits associated with these burials (although not universal) include flexed burials in sand; large ellipsoidal ceremonial blades (light-colored chert); turkey-tail blades of Wyandot chert; and small ovate-triangular cache blades (Ritzenthaler and Quimby 1962). Recent compliance work in the city of St. Ignace revealed the presence of a second Late Archaic cultural complex in the Upper Peninsula. This complex is currently only represented by a partially disturbed burial with an associated cache of approximately 50 Meadowood style bifacial preforms made on Onondaga chert from the Niagara Falls region (Beld 1995). Of particular interest is the occurrence of one of these bifaces on Hixton Silicified Sandstone, arguing for large-scale east-west interactions among Archaic peoples across the Upper Peninsula. Unfortunately, the limited nature of the information on these Terminal Archaic adaptations in northern Michigan precludes more specific exploration of the relationships

between these cultural groups and those in the more southern parts of the state, other than to note that it appears to represent a continuation of the influence of more southern projectile point styles in an evolving local Late Archaic adaptation.

Recently, several Archaic period sites have been identified in Alger County. For example, the Popper site has been identified on Grand Island (Dunham and Branstner 1995). This site is comprised of a generalized quartzite lithic assemblage consisting of flakes, cores, and expedient tools, and a Late Archaic date has been derived from at least one of the site's hearth features (2100±50 BC; Dunham and Branstner 1995). Two additional sites from this region have also provided Archaic dates. Like Popper, these sites produced somewhat problematic, non-diagnostic quartzite lithic assemblages. The Miner's Beach site has produced Late Archaic dates from a hearth feature (1150±80 BC; Clark 1993) and the Trout Point site has produced slightly more recent thermoluminescence dates from quartzite FCR (150±200 BC; Benchley et al. 1988). Terminal Archaic dates have also recently been derived from two sites (20MQ90-91) located to the east Marquette County (950±60 BC and 1630±90 BC; CCRG 1995).

Although lacking internal chronology, the Bay de Noc and Mackinac Straits regions have several sites of reputed Archaic age. Two such sites include the Bergquist and Sack Bay sites in Delta County (Fitting 1975). These are riverine and lakeshore sites, respectively, and attest to the fact that sites of this stage can occur in both stable terrace and active eolian dune contexts. Both sites are attributed to the Archaic based on a lack of ceramics, rather than radiocarbon dates. The lack of fauna and flora from these sites makes subsistence statements speculative, although Fitting (1975) argues that the tool assemblages and locations would make Bergquist a fishing camp and Sack Bay a hunting camp. An Oceola-like point has also been identified at FS 09-10-02-418, on a Nipissing age beach barrier, indicating the presence of an Archaic lithic station. Likewise, the Nelson site in St. Ignace (Fitting 1974) contains both copper items and small notched projectiles that are clearly Late Archaic in age.

3.1.3 Initial Woodland Period

By definition, the Woodland period is traditionally marked by the introduction of ceramics. In Michigan, the appearance of this technological innovation occurs at different times across the state. Thus, north of the Canadian-Carolinian transition zone, ceramics did not appear until ca. AD 1 or a little earlier, whereas in southern lower Michigan they appeared as early as 600 BC (Fitting [ed.] 1972; Garland 1986; Ozker 1982). While the term Early Woodland has been applied to northern Michigan, it is perhaps more appropriate to refer to an Initial Woodland period for the Upper Peninsula, reflecting the lag in ceramic production in the northern Great Lakes region and an apparent continuation of the evolutionary trends that characterize the Archaic period. Thus, the Initial Woodland of the northern Great Lakes region is effectively coeval with the Middle Woodland of the southern Great Lakes, ca. AD 1-800 (R. Mason 1981).

The Riverside II, Reindle and Little Cedar River sites, in the Menominee River watershed, have been associated with the Early Woodland based on the presence of Dane Incised ceramics (Buckmaster 1979). Derived from the Illinois region, Dane Incised wares are also present in eastern and central Wisconsin, as well as the Green Bay area (R. Mason 1966). Thus, suggesting the cultural affiliation of these peoples is more closely tied to areas to the

southwest, rather than to the east. No other Early Woodland ceramic types are known from Upper Peninsula sites.

The appearance of thin, tool-impressed, sandy paste ceramics generally serves as the hallmark of the Initial Woodland in the region. Sites associated with the Initial Woodland North Bay and Laurel Traditions are best represented regionally along the north shore of Lake Michigan and the Straits of Mackinac (Buckmaster 1979; Brose 1970a; Fitting [ed.] 1974; R. Mason 1966, 1969). In general terms, the North Bay and Laurel traditions are similar in regard to the composition of the artifact assemblages (Janzen 1968a; R. Mason 1966, 1969; Stoltman 1973). Each cultural assemblage includes cordmarked or smoothed ceramic vessels decorated with a variety of plain, dentate, or pseudo-scallop shell stamping. The lithic assemblages are generally comprised of small tools, particularly scrapers and wedges, stemmed or notched projectile points, and bipolar cores. One of the most important sites of this period in the Lake Superior basin is Naomikong Point (Janzen 1968a). Materials recovered at this site demonstrate the broad regional similarities which mark the Laurel culture (e.g., Stoltman 1973; Wilford 1941; Wright 1972), with the most notable consisting of the smooth-bodied rim-decorated ceramics, characteristic end scrapers, and thin side-notched projectile points (Janzen 1968a). Copper artifacts often appear in Initial Woodland assemblages. Salzer (1986a:273) has suggested that many of the so-called Old Copper artifacts may actually have been produced by Initial Woodland peoples. A similar conclusion has been reached by Susan Martin and her co-authors, who recovered a possible copper beadmaker's toolkit from the Lac La Belle site (20KE20), located only about one or two miles inland from the current study area. Textiles preserved through contact with the copper blanks, beads and awls were radiocarbon dated to the 5th century AD (Martin 1994; Martin [ed.] 1993).

The Initial Woodland period in the Bay de Noc region is known from several sites in Menominee, Delta, and Schoolcraft counties. Two well-reported sites from the western Upper Peninsula include Summer Island (Brose 1970a) and Burnt Bluff (Fitting [ed.] 1968). The former, along with sites such as the Winter site (Richner 1973), attests to the potential for clear stratification of occupational materials in coastal dune contexts. Faunal remains and the presence of oval residential structures suggest that several extended families may have occupied this site during the spring and summer. The archaeological remains of a similar structure have recently been identified at the Timid Mink site in Iron County (Hill 1995). The conoidal, tool-impressed ceramics from the Summer Island site, lacking the cord-impressed surfaces common to North Bay materials, are more closely related to southern Laurel types from the Straits of Mackinac region. Corner-notched and expanding stemmed projectiles, small scrapers, and wedges/bipolar cores also conform to a Laurel affiliation. An aquatic emphasis is present in the faunal assemblage. Cleland (1976) has presented the case that shallow water fishing with nets, as well as individualized fishing, was the dominant spring/summer subsistence mode for Initial Woodland populations, who aggregated during the spring and dispersed during other seasons of the year. This is consistent with the model proposed by Brose (1970a) for the Summer Island site, where it is argued that large mammals probably filled out the seasonal economy. At this time, this model also appears to hold true for the Straits of Mackinac Initial Woodland populations as well.

The site of Spider Cave on Bay de Noc is unusual in that it appears to represent a ritual locale. The name of the site is derived from the presence of several cave paintings, including an anthropomorphic spider. Projectile point fragments, representing a range of regional Initial Woodland styles, are interpreted as having been shot into the cave from a distance, fracturing

upon impact with the wall of the cave (Cleland and Peske 1968). It is still not clear what this activity might represent, although Richner (1973) speculates that these activities might relate to hunting success. He further notes in his analysis the marked similarity of the lithic assemblage from the Winter site with that from the Burnt Bluff material reported by Cleland and Peske (1968). A nearby cave also contains evidence for ritual activity, including the skeletal remains of seven subadults (Janzen 1968b).

The southern Laurel tradition is well-represented in the Straits of Mackinac Region (Fitting 1979; Fitting [ed.] 1974). At present, radiocarbon dates notwithstanding, it is difficult to place a refined chronological control on the several sites of this time period. For example, Lovis and Holman (1976) have argued on the basis of the radiocarbon chronology from Fort Michilimackinac and the Wycamp Creek site that the Initial Woodland intrusion into the northern Lower Peninsula was a late phenomenon, initiating ca. AD 400. Examples of such occupations include the Steiner site (Fitting 1979), the Arrowhead Drive site on Bois Blanc Island (Bettarel and Harrison 1962), as well as the Gyftakis and MacGregor sites in St. Ignace (Fitting [ed.] 1974). Straits region sites include both coastal and inland locations. Coastal locations at the Straits and along Lake Michigan reveal high artifact densities suggestive of repetitive use, with abundant ceramics and stone tool inventories. Inland sites display lower artifact densities overall. At face value, one could postulate a coastal/interior pattern of seasonal use, with spring/summer aggregation in coastal zones and dispersal into smaller social units during fall and winter. While no compelling model of Initial Woodland seasonal dynamics has been developed for the region, such a pattern of seasonal mobility is quite likely.

The best known Initial Woodland site on the south shore of Lake Superior is Naomikong Point (Janzen 1968a). Other recognized Initial Woodland sites within the Hiawatha National Forest include the Gooseneck Lake IV site (Franzen 1987), the Indian River site (Franzen 1987), the multicomponent Williams Landing locale (Dunham and Branstner 1995), and the Carp River site (Dunham et al. 1993). The Carp River site has been interpreted as a transitional Middle-Late Woodland fishing encampment at the mouth of the Carp River. Faunal evidence from the site suggests an emphasis on spring-spawning species (e.g., sturgeon, walleye, etc.), although fall spawning species (e.g., whitefish and lake trout) are also represented. The location of the site is also consistent with that of transitional Middle-Late Woodland fishing village based on current regional settlement subsistence models (Cleland 1976, 1982a; Martin 1989), as the mouth of the Carp River would provide excellent access to both river-spawning spring species and deep water-spawning fall species.

There has been a tendency to ascribe Middle or Late Archaic dates to aceramic sites situated on mid-Holocene landforms. However, this has been found to be a problematic assumption, as demonstrated from a series of recently excavated sites on Lake Superior, in the Upper Peninsula of Michigan. For example, although the Popper site is situated on a Nipissing age feature and has generated an aceramic assemblage, the site has produced late Initial Woodland radiocarbon dates (AD 765±350 [Anderton 1993]), as well as Archaic dates (2100± 50 BC [Dunham and Branstner 1995]). Similarly, Terminal Archaic (1,150±80 BC) and late Initial Woodland (AD 870±50) dates have also been derived from aceramic features at Miner's Beach (Clark 1993). Finally, a ca. 350 BC - AD 50 range has been determined for the aceramic Trout Point site, which is situated on a mid-Holocene landform (Benchley et al. 1988). These sites clearly illustrate the problem of dating sites based on the presence/absence of ceramics, and argue for the presence of aceramic Initial Woodland sites in the Lake Superior basin.

3.1.4 The Terminal Woodland Period

In the Upper Great Lakes region, the Terminal Woodland is generally distinguished from the Initial Woodland by a trend towards greater regional diversity as well as changes in technology and subsistence patterns beginning as early as ca. AD 600 (Buckmaster 1979; Clark 1991; S. Martin 1989). The subsistence patterns appear to be keyed to seasonally dense, abundant plant and animal resources such as spawning fish and wild rice (Cleland 1976). Technological changes include the bow and arrow, indicated by the use of small triangular points, and the use of deep water gill nets, represented by grooved net sinkers (Clark 1991; Cleland 1976, 1982a; S. Martin 1989). Ceramic styles begin to reflect significant diversity encompassing Oneota, Blackduck, and Iroquoian influences, as well as localized forms such as Mackinac and Juntenen wares (Brose 1970a; McPherron 1967; R. Mason 1966, 1981; Salzer 1986b).

Perhaps the most compelling economic model for the larger region is the one proposed by Cleland (1976; 1982a), who presents a case for the advent of deep water gillnet fishing by Terminal Woodland peoples based on changes in site location, fauna, and artifacts. Several lines of evidence are used to draw this conclusion. First, there is the technological component, which involves a shift from individualized fishing gear, such as hooks, gorges and toggle harpoons, to a technology incorporating netsinkers, presumably employed to weight deep water nets. Second, shifts from shallow water site locations during the Middle Woodland to the addition of sites proximal to deep water habitats during the Late Woodland are used as parallel lines of evidence to demonstrate a settlement system transformation to fall aggregate sites. Finally, faunal data are incorporated into the discussion to demonstrate the increasing use of deep water, autumn-spawning fish species during the Late Woodland. In concert, the three sets of information are used to infer an increased reliance on abundant, deep water fish species, such as lake trout and whitefish, extracted with gillnets and processed for storage by larger social aggregates. It should be noted that the incorporation of deep water fishing of fall spawning species into Terminal Woodland subsistence strategies does not decrease the importance of other resources, such as shallow water spring spawning species (S. Martin 1989).

Cultural affiliations for the Bay de Noc region are clearly tied to the south and west in Wisconsin. The presence of Madison wares in some abundance, rather than Straits sequence ceramics, reveals that the Bay de Noc region is part of a different cultural system (Brose 1970a; Buckmaster 1979). This is further attested to by the fact that Oneota ceramic wares occur across the region at many Terminal Woodland sites (e.g., Sturgeon River site [Buckmaster 1983; Martin and Martin 1980]; Ogontz Bay site [CCRG 1991a]). Two sites in this portion of the HNF provide interesting information concerning the settlement and subsistence of the region. The 10 Mile Rapids site, which is situated inland on the Sturgeon River, has produced cordmarked ceramics, a triangular point, and a slate elbow pipe, as well as a faunal assemblage consisting primarily of sturgeon and beaver bone (CAI 1984). Both the site's location at a rapids and the recovered faunal assemblage indicate that it was a spring encampment focusing on spawning sturgeon. The Ogontz Bay site, situated on the shore of the Stonington Peninsula, has produced Sand Point ceramics, a variety of stone tools, and a very diverse faunal assemblage, including fish, mammals, and birds (CCRG 1991a). The faunal assemblage suggests a focus on spring spawning fish species (especially, walleye and bass). Other faunal data are intriguing, including a cache of black bear mandibles, human-modified painted turtle shell, beaver incisors, and a bald eagle talon. These finds may indicate specific

resource procurement and may, particularly in reference to the eagle claw, reflect ideological behaviors.

In the Mackinac Straits region, Holman (1978) has outlined a cycle of seasonal mobility during the AD 700 - 1000 Mackinac phase. Using site catchment analysis as her analytic method and exploring seasonal resource availability adjacent to known Mackinac phase sites, she reconstructs two potential mobility models. Both incorporate a cycle of coastal spring/summer/autumn movement to repetitively occupied locations, with late autumn/winter dispersal into dissected interior lacustrine environments. The basic difference between her two models revolves around the location of autumn deep water locations, one incorporating the coastal zone of Lake Michigan and the other keying on the Straits of Mackinac. The result replicates historically documented cycles of Ojibwa mobility in the region. However, it should be noted that neither model suggests the use of horticulture/agriculture in the subsistence economy, and that while we have the ability to differentiate time periods within the Late Woodland, there is currently no reason to suggest additional large scale transformation of the settlement system during the period.

With the latter point in mind, the chronology of the Straits region can be reconstructed from McPherron's (1967) analysis of the Juntunen site on Bois Blanc Island in the Straits of Mackinac. This sequence begins ca. AD 800 with the inception of the Mackinac phase, characterized by subconoidal, flared rim, cord-decorated pottery termed Mackinac ware. These early Late Woodland styles lack collars or castellations. Mackinac wares decline by ca. AD 1000. The subsequent Bois Blanc phase displays an increase in Blackduck-related decorative styles. Vessels of this phase incorporate decorative/manufacturing techniques such as rim and shoulder appliqués, low castellations, globular vessel shapes, and generally straight rim sections. Decoration often includes bands of closely spaced corded tool impressions, brushing, and overlapping punctates. The western complexion of the Straits area ceramic sequence changes markedly with the introduction of Juntunen wares which define the Juntunen phase (ca. AD 1200-1500). McPherron (1967) argues that these ceramics are more closely comparable to Iroquoian styles from southern Ontario.

In the Lake Superior basin, few Terminal Woodland sites have been formally excavated. Naomikong Point contains a Terminal Woodland component (Janzen 1968a). Ceramic styles across much of the eastern part of the Superior basin indicate an affinity towards the south and east, including Juntunen wares and Iroquoian motifs. In the central and western Upper Peninsula, along Lake Superior, the ceramic wares are more westerly in association. For example, the Sand Point site in Baraga County, which has produced Black Duck and Oneota-like ceramic assemblages, appears to represent a village and funerary mound (Cremin 1980). Similarly, the Williams Landing locale on Grand Island has produced Madison points and Sand Point-like ceramics (Dunham and Branstner 1995; CCRG 1991b). The 1994 excavations at the latter site identified subsurface features and a possible former living floor associated with the Terminal Woodland occupation of the site (Dunham and Branstner 1995). One feature, a small pit, contained a miniature ceramic vessel as well as the carbonized remains of cherry and acorn. These excavations also revealed three grooved sandstone net sinkers, reflecting the use of the adjoining bay for deep water fishing.

Finally, as indicated by the potential date ranges derived from Miner's Beach and the Popper site, which can be interpreted as representing transitional Initial/Terminal Woodland occupations, aceramic Terminal Woodland assemblages may also be present (Anderton 1993;

Clark 1993; Dunham and Branstner 1995). The Yellow Feather site (FS 09-10-01-292) in the Rapid River District of the Hiawatha National Forest has also produced an aceramic assemblage with apparent Terminal Woodland radiocarbon dates (AD 900±200; Anderton 1993). The absence of ceramics in certain Terminal Woodland assemblages suggests that ceramics may have only been used for specific activities or in specific parts of the seasonal round, or that they may have been replaced within particular contexts by containers constructed of other perishable materials. For example, birchbark containers were extensively used by the peoples of the Upper Great Lakes region during the historic period (Densmore 1979; Ritzenthaler and Ritzenthaler 1991). In any case, the possibility of aceramic Woodland sites appears quite likely in the region.

3.1.5 The Historic Period

Oral traditions and early graphic representations of the Native Americans document that the Historic period in the Upper Great Lakes had its roots firmly in the Terminal Woodland (Cleland 1985; Rajnovich 1994; Warren 1984). This perspective is confirmed by the archaeological record, which indicates a significant continuity between the prehistoric Terminal Woodland and the early or protohistoric period of the late sixteenth and early seventeenth centuries AD. In fact, the only way to clearly separate archaeological assemblages of this transitional period is via the presence or absence of European trade goods, with the presence of such goods indicating at least the beginnings of culture contact (Brose 1983; C. Mason 1986; Quimby 1966). By the late 17th century it can be expected that at least secondary culture contact would have been prevalent across the region. By the early 18th century, European missions and military outposts had been established throughout the region (Stone and Chaput 1978).

European contact with the Upper Great Lakes Native American populations can be traced to at least the early 17th century, when French fur traders and Jesuit priests began making their first tentative contacts with indigenous peoples. This process was accelerated in the 1650s, when the Huron-speaking peoples of the Georgian Bay region were pushed west by Iroquoian expansion (Stone and Chaput 1978; C. Mason 1986). Two decades later, the first permanent European settlement was established within a few miles of the current study area. Founded in 1671 and persisting through at least the first decade of the 1700s, the Jesuit mission at St. Ignace expanded to include a small military garrison, a community of voyageurs, and at least two Native American villages; one Ottawa and one Huron. While the French presence has not been convincingly relocated, a number of archaeological sites relating to the contemporary Native American presence have been identified. These include the ca. 1671-1705 Tionontate Huron village (S. Branstner 1987, 1989; Fitting 1980; Fitting [ed.] 1976; Stone 1972), and a number of temporally related burial sites, including Lasanen (Cleland [ed.] 1971), Gros Cap (Nern and Cleland 1974), and Richardson (Greenman 1958).

Historic Native American sites are also well represented in the Bay de Noc region. Notable occupations include those described at Rock Island (R. Mason 1986b) and Summer Island (Brose 1970b). These occupations are associated with protohistoric and earlier historic period occupations of the seventeenth and eighteenth centuries. Nineteenth century activity in this region is documented on General Land Office (GLO) maps placing gardens, villages, and sugar bushes throughout the area (Martin 1977). One community originated in the later 19th century at Indian Point around the old St. Lawrence Church (Dunham et al. 1994; Martin 1977). This community appears to have shifted to the east, becoming the Nahma Indian

community in the 20th century. A lumber camp associated with the latter community, Lambert's Camp, was also occupied in the first half of the 20th century (Anderton et al. 1995).

Several sites are known from this period along Lake Superior. In addition to the other components at the site, Naomikong Point includes both a 19th century component and the Crane clan village, which was located near Tahquamenon Bay (Martin 1977). Sugar camp locales possibly associated with this mid-19th century community have been tentatively identified (Dunham et al. 1994) and the continued presence of the Bay Mills Reservation further demonstrates the historic Native American use of the area. The area around Munising also saw historic period Native American activity. Evidence for 18th and 19th century use of the Williams Landing locale on Grand Island has been documented through possible structural features and artifacts as well as historical references (Dunham and Branstner 1995; CCRG 1991b; Roberts 1991).

As would be expected, historic period Native American sites in the Upper Great Lakes region are typically located along the Great Lakes shoreline or interior lakes, where the occupants subsisted on a mixed economy that included fishing, maple sugaring, wild rice gathering, hunting, and horticulture (e.g., Cleland 1976, 1982b, 1993). Fitting (1976) has suggested that deep water fishing became more important during the early historic period. While numerous Native American village and cemetery sites are known in the Upper Great Lakes region from this period (C. Mason 1986), few have been formally documented in the region. However, the discovery of components relating to historic period Native American activities (e.g., burials, camps, and maple sugaring sites) can be expected at any time. Given the culture continuity between the Terminal Woodland and Historic Native American populations, sensitivity modeling parameters for such resources will be similar to those presented for prehistoric resources of the preceding Terminal Woodland period. While it can be presumed that Europeans were occasionally present at historic period Native American sites (e.g., Alexander Henry [1966]), it does not seem likely that these presences will be readily discernible. Later Historic Native American sites, like Euroamerican sites, will be typically associated with transportation routes.

3.2 EUROAMERICAN RESOURCES

3.2.1 Colonial and Territorial Periods (ca. 1650-1836)

As stated above, the European presence in the Upper Great Lakes region can be traced to the French traders, explorers and priests of the early 17th century. Although present at an early date, the physical impact of their presence remained minimal. 17th century components known or postulated for Michigan are limited to the ca. 1671-1705 Jesuit mission and military garrison at St. Ignace, the slightly earlier Jesuit mission at Sault Ste. Marie, the short-lived 1680s Fort St. Joseph on the St. Clair River, and the subsequent Fort St. Joseph on the St. Joseph River. Although materials associated with these sites have been noted, e.g., Fort St. Joseph (Hulse 1981), none of the sites have been authoritatively relocated or investigated. None of these sites are in direct relation to the current study area.

European resources of the 18th century are divided between French sites of the pre-1760 period and British resources of the post-1760 period. French sites are largely limited to Fort Repentigny at Sault Ste. Marie; Fort St. Joseph in southwest Michigan; St. Ignace and Fort Michilimackinac at the Straits of Mackinac; and the extensive French settlements

surrounding Fort Pontchartrain and along the Detroit River. Although the ca. 1750-1760 Fort Repentigny site may have been relocated (Fitting 1975; Stephenson 1991), archaeological research has not proceeded past the initial testing stages. Archaeological recoveries relating to Michigan's French period occupation are almost exclusively limited to work at Fort Michilimackinac (e.g., Heldman 1991a; Heldman and Grange 1981; Noble 1983; Scott 1985, 1991; Stone 1975). While the official French presence was limited to the posts and missions, French voyageurs and Metis often lived in the local Native American communities (cf., Bieder 1995; Trask 1989). While the presence of such French components can be assumed at the various villages of the region, it does not appear likely that they can be differentiated from the contemporary Native American archaeological settings and assemblages. Therefore, given the locations of the current study area, it appears unlikely that resources relating directly to French period occupation will be included.

When the French relinquished control of Upper Canada to the British in 1760, changes were more administrative than substantive. Land use during the 1760-1796 period remained almost entirely devoted to the fur trade, with the only significant settlements associated with the administration of that trade, e.g., Fort Michilimackinac (pre-1780), Fort Mackinac (post-1780), Green Bay, and Sault Ste. Marie. Archaeological recoveries relating to the British colonial period are conspicuously limited to the Straits of Mackinac (e.g., Grange 1987; Heldman 1991b; Martin 1985) and a number of sites in southeast Michigan. British period settlements are not generally associated with the current study area.

Other British period settlements in the Upper Great Lakes include the ca. 1815-1828 Fort Collyer [Collier] site on Drummond Island, Michigan (20CH50) and occupations at Ft. St. Joseph on St. Joseph Island, Ontario (Emerson et al. 1977). Between 1989-1994, excavations conducted by the Michigan State University Museum at the Ft. Collyer military installation and associated village site have focused on the mapping and initial testing of the extensive complex. Although portions of the site have been impacted by limestone quarrying, survey and mapping efforts have resulted in the identification of more than 80 structural remains, including structural platforms, chimney and hearth remains, several submerged wharves, two wells and a cemetery. Formal testing has included both the enlisted men's and officers' barracks, probable kitchen/mess house and storage structures, and a number of indeterminate structures of non-military origin (Demers 1990, 1992, 1995). Again, British period settlements are not generally associated with the current study area.

While 1796 is the date officially designated for the British surrender of the Upper Great Lakes region, British fur traders operated in the project area until the 1830s (Gilman 1974). In the late eighteenth through the early 19th century the Northwest Company still operated in Lake Superior and may have had a wintering post on Munising Bay (Roberts 1991). It can be presumed that administrative and/or fur-trade posts during this period would have included residential populations as well, i.e., British, French, Native American and Metis, and the European and Metis traders were present in Native American communities. Again, while some British period resources have been relocated in the region through archival and archaeological research, it does not appear that the current study area will include a significant number of identifiably British sites.

As had been the case in 1760, the 1796 American succession resulted in few immediate changes to Michigan's cultural landscape (Gilpin 1970). The American Fur Company became quite active in the region by 1810 and began to dominate the Chequamegon area trade during

the 1820s (Gilman 1974; Heldman 1991a). American posts were established at the locations of the former British installations and in many cases incorporated the buildings and personnel of their competitors. By the 1830s the fur trade was beginning to wane in the region, and the American Fur Company began to rely more on commercial fishing ventures and land speculation than the fur trade itself (Nute 1926; Roberts 1991). The American Fur Company ceased formal operations in the Lake Superior basin around 1840.

Archaeological resource potentials for Michigan's territorial period have been summarized by Branstner (1999) and have been shown to include urban centers, e.g., Detroit, Monroe and Ann Arbor; residential and commercial facilities relating to the agrarian settlement of southern lower Michigan; terminal fur trade era posts scattered throughout the state; and military sites, e.g., Forts Mackinac, Gratiot and Brady. Proven archaeological resources of the territorial period are generally limited to a few urban residential sites in Detroit, e.g., the Renaissance Center (Demeter 1990; Mudar 1978), and military sites, e.g., Fort Brady at Sault Ste. Marie (Demers 1990), Fort Mackinac (Prahl and Branstner 1984), and Fort Gratiot at Port Huron (Hawkins and Stamps 1989).

In the Upper Peninsula, potential archaeological resources from this period should be similar to those of the earlier Colonial period. British and American fur trading posts operated in the area and missionaries continued their work as before (e.g., Pitezal 1959). In fact, this period may be more poorly represented than previous periods, in that the fur trade was in decline and Native American communities were dispersing (Bieder 1995; Gilman 1974). Aside from the trading posts in the north, most of Michigan's early American settlement was constricted to the southern portion of the state, along the Great Lakes and the major rivers (Gilpin 1970).

3.2.2 Michigan Statehood Period (1838-2004)

Between statehood and the onset of the Civil War, a number of factors effected major changes in Michigan's cultural landscape. During the speculative years of the late 1830s, emigrant agriculturalists, merchants and industrial entrepreneurs from New England began to arrive at Detroit. What had only seemed a trickle in the late territorial period quickly amounted to a flood. The discovery of metal ore reserves (first copper, then iron) began large scale speculative interest in Michigan's Upper Peninsula in the 1840s (Dunbar and May 1980; Krause 1992; Lankton and Hyde 1982). The completion of the Sault Ste. Marie Canal in 1855 (Dunbar and May 1980) made the transportation and exploitation of these ores more logistically feasible. The vast pine stands in the Upper Peninsula were also coming under the ax at this time (Karamanski 1989).

Although economically successful copper mining operations within the Keweenaw region would not begin until the late 1850s and early 1860s, the initial speculative period of the 1840s prompted extensive mineralogical surveys. While these surveys proved that the copper deposits were limited to the Keweenaw and Isle Royale (Karamanski and Zeitlin 1988), they also resulted in the discovery of a resource of at least equivalent significance. Running survey lines in 1844, one of the government survey teams under the direction of William Burt stumbled upon what was to become known as the Marquette Range, a tremendous deposit of high-grade iron ore. Within two years, the first attempt at mining and processing this ore was taking place at the Carp River Forge (Michigan History Division n.d.). For the remainder of

the 19th century copper and iron extraction would remain the driving forces behind the settlement and economic development of the western Upper Peninsula.

The earliest timber harvesting activities were confined to the shores of the Great Lakes and along the drivable rivers. Rail transport became more accessible in the 1880s and gradually opened up much of the interior regions. The early focus of the Upper Peninsula lumber industry was the pine. Hardwood charcoal was also in demand as a result of the region's copper and iron industries and, as noted above, increased shipping tied to the iron and lumber industries required cordwood fuel. The expansion of mining and lumbering throughout the Lake Superior region, as well as the growth of industrial centers in the southern part of the state, called for building materials which were produced in the lumber mills.

The lumber boom had peaked in activity by the first decade of the 20th century. While hardwood was still actively harvested up to the Second World War, pulpwood gradually emerged as the principal manifestation of commercial logging in the 20th century. The actions of the timber industry also resulted in a generally failed agricultural settlement of cut-over lands. Farms were established by lumber companies and private individuals to supply the lumber camps with food and fodder. Despite the efforts of farmers to tame the stump fields, by the onset of the Great Depression, the adverse climate and poor soils conspired against the successful agrarian development of most of the Upper Peninsula.

The 19th century development of the Upper Peninsula was therefore founded on a triumvirate of immensely successful extractive industries: copper, iron and, during the post-Civil War period, lumber (Karamanski 1989). This pattern persisted through the end of the 19th century and on into the early decades of the 20th century. As in the Lower Peninsula, the actions of the timber industry also resulted in the agricultural settlement of cut-over lands, and in similar fashion, the majority of these settlers eventually failed. Shortly after the First World War, the economic potential of both the extractive and agricultural industries had been largely exhausted, and the regional economy collapsed. By the 1930s, the majority of the mines had closed and the Upper Peninsula was reverting to second-growth forest. The economic collapse led much of the former timber lands to revert to state and federal management. After the Second World War, the triad of pulpwood, tourism and recreation formed the economic basis of the region

3.3 ARCHAEOLOGICAL SENSITIVITY OF STUDY AREA

3.3.1 Native American Resources

Based on the research presented above, it is apparent that evidence for virtually the entire range of Native American land use is potentially available within the Keweenaw Peninsula and Isle Royale, ranging in date from the Late Paleoindian through the Historic periods. While numerous prehistoric Native American sites have been identified on Isle Royale, particularly with respect to prehistoric copper mining, none have yet been recorded on Passage Island. While no formal surveys appear to have been conducted at the latter location, its small size and general isolation likely precludes a significant number of Native American resources. The location of the current study area, on a highly exposed location consisting primarily of bedrock, should also reduce the specific area's Native American archaeological sensitivity.

3.3.2 Euroamerican Resources

Although nearby Isle Royale has been occupied and exploited by Euroamericans since at least the early decades of the 19th century, little can be said about similar activities on Passage Island. As of the present date, only two resources have been identified.

The first of these is the wreck of an unnamed launch (20US255) in a deep cove near center of Passage Island. As of 1984, the hull was intact up to the gunnels on the starboard and up to the deck on the port side. The hull bulged outward amidships on the port side. The stern, rudder, screw and exhaust were undamaged; the engine and fuel tank were present amidships. The steering quadrant was present, but not in its original position. The cabin was missing. Debris was scattered across the forward deck, some of it charred.

The other site is the Passage Island lighthouse (20IR202). According to Hyde (1986:181):

> ... Congress agreed in March 1874 to spend $18,000 for a light on Passage Island, but would build it only after the Canadian government had erected a lighthouse on Colchester Reef near the mouth of the Detroit River. As a result of this international diplomacy, construction did not begin until 1881. The work was completed the following year, and the light was first exhibited on July 1, 1882. It marks the northeastern end of Isle Royale, guiding vessels in Thunder Bay, and it is the northernmost American lighthouse on the Great Lakes ... The surviving buildings at Passage Island include the original light tower, keeper's house, and fog signal building [as well as several smaller buildings]. The octagonal tower is 8 feet in diameter at the base and 44 feet tall, built into one corner of the rectangular dwelling. Both are made of coursed rubble masonry construction. The Fresnel lens still in place was built by Barbier, Benard & Turenne of Paris in 1880.

Thus, it would appear that historic period Euroamerican archaeological sensitivities in relation to the current study area are limited to the post-1880 Passage Island lighthouse complex (Figures 3-6).

Figure 3. 20IR202: View of lighthouse south façade, viewed to north.

Figure 4. 20IR202: General view of lighthouse complex, viewed to south.

Figure 5. 20IR202: Lighthouse and fog signal building, viewed to southeast. Note bedrock in foreground.

Figure 6. 20IR202: Tramway and winch house, viewed to northwest.

SECTION 4.0 - RESULTS OF INVESTIGATIONS

4.1 ARCHIVAL RESEARCH

Field investigations were preceded by a period of archival research to determine what, if anything, could be predictively said per prehistoric or historic archaeological sensitivities prior to the onset of fieldwork. To assess generalized archaeological potentials, the site files of the Michigan Department of History, Arts and Libraries were reviewed. To assess historic period archaeological potentials, the holdings of the Library of Michigan in Lansing were also examined. The results of these inquiries have been presented in the preceding section.

4.2 FIELD METHODS

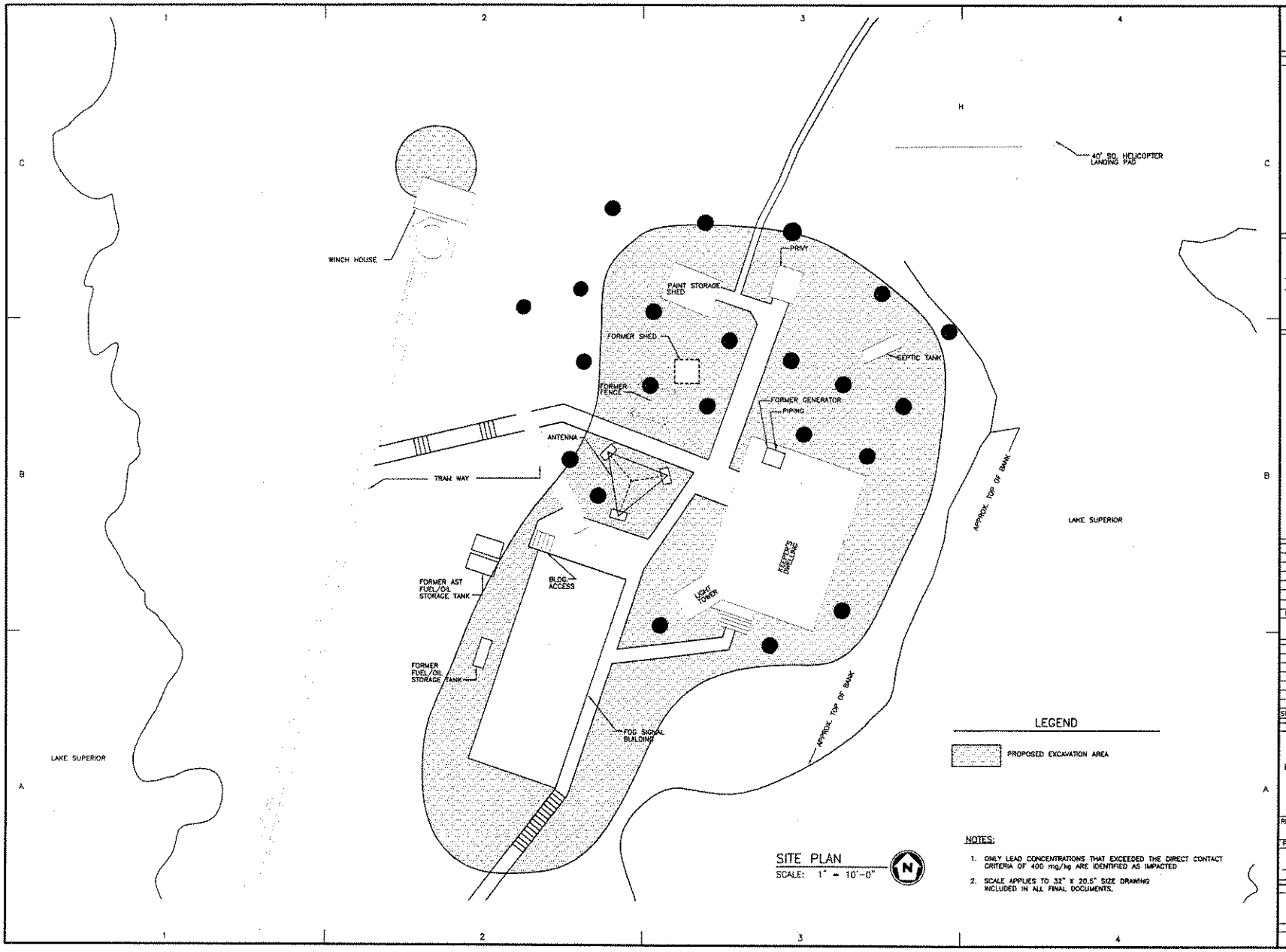
Prefield and fieldwork identified those areas within the study parcels that were totally lacking in subsurface archaeological potentials. These areas generally included (1) areas severely impacted by previous development, (2) areas where grade or slope are too great for prehistoric or historic period occupation, and (3) those areas where poor drainage would have precluded occupation. Where possible, these areas were identified during prefield research and verified through surface reconnaissance.

4.3 RESULTS OF FIELD INVESTIGATIONS

Upon arriving at the project area, it was determined that the testable areas within the approximately 0.25-acre survey parcel were in fact even smaller in size. Obstacles included numerous structures, including the residence/lighthouse, fog signal building, outhouse, paint shed, winch house, and tower pylons, as well as sidewalks and extensive bedrock exposures. As such, the original plan of shovel testing the entire area on a regular 5-m grid did not prove feasible.

In response, it was determined to focus shovel test units on delimited areas that appeared to have some depth of soil, as identified by vegetation. Ultimately, a total of 22 shovel test units were excavated, scattered across available areas of the site (Figure 7). Most shovel test units exhibited varying depths (10-30 cm) of dark brown/black sandy soils overlying sterile light brown to medium browns sands, gravels and bedrock, depending on their location. Artifact recoveries were limited to several items per test unit, with typical recoveries including nails (both square and round), window glass, and bottle glass; due to the small quantities of recovered materials and their lack of analytical content, none were curated. Although none of the recovered artifacts were particularly diagnostic, all were consistent with a post-1880 period of occupation. Spatial patterning of deposits within the tested area included the recovery of coal near the north end of the fog signal building, which appeared to correspond to the tramway location, and deposits of coal cinder and ash along the north line of the tested area, between the outhouse and the helicopter landing pad. It appeared that the ash and cinder had been consciously and consistently dumped in this area, and then buried under dark-colored humic soils. Significant quantities of domestic refuse were not discovered, and it is concluded that such materials were deposited off-site.

Figure 7. Plan view of study area with approximate shovel test locations (U.S. Coast Guard/GLR).



NOTES:

1. ONLY LEAD CONCENTRATIONS THAT EXCEEDED THE DIRECT CONTACT CRITERIA OF 400 mg/kg ARE IDENTIFIED AS IMPACTED
2. SCALE APPLIES TO 32" X 20.5" SIZE DRAWING INCLUDED IN ALL FINAL DOCUMENTS.

MWH
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U. S. COAST GUARD
CIVIL ENGINEERING UNIT
CLEVELAND

USCG, CEU CLEVELAND
1240 EAST 9TH STREET
CLEVELAND, OH 44199-2060

ISSUE

MARK	DATE	DESCRIPTION

A/E PROJECT NO: F:\\uscg\2002\649\c
CAD FILE NAME: C7147C02
DESIGNED BY: KMD
DRAWN BY: STR
EDITED BY: STR
CHECKED BY: EKG

SCALE: AS SHOWN PLOT SCALE: 1" = 30'

SHEET TITLE

PASSAGE ISLAND LIGHT STATION
KEWEENAW COUNTY MICHIGAN
PROPOSED EXCAVATION EXTENTS

REVIEWED BY: | REVIEWED BY: | REVIEWED BY:
PROJECT ENG. | BRANCH CHIEF | CONTRACTING KO
APPROVING OFFICER | DATE

PROJECT NUMBER	DRAWING NUMBER
09-C01052	7147-D
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Based on the results of the Phase I archaeological survey of the Passage Island lighthouse complex (20IR202), it is concluded that the site does not include a Native American component and that Euroamerican archaeological materials are limited to architectural debris, coal fragments and ashes associated with the former use of this ca. 1881 lighthouse complex. The latter materials do not appear significant at the level that would elevate them to National Register of Historic Places eligibility.

SECTION 5.0 - CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

Prefield archival research per prehistoric and historic Native American archaeological potentials in relation to the study area had indicated a very low sensitivity concern. This was predicated on (1) isolated nature of the island and (2) the exposed bedrock landform on which 20IR202 is located.

Archival research also indicated that the general study area had been developed as a lighthouse site no earlier than 1880 and that this land use had continued until the present day. The only significant change to the property has been its conversion to an automated rather than manned station. Although such a property could include archaeological deposits of significance, Phase I survey of this property determined that soils deposits were extremely thin and that artifacts included therein were largely limited to architectural debris, coal fragments, and ash/cinder deposits.

5.2 RECOMMENDATIONS

Based on a Phase I survey program that combined archival research with pedestrian reconnaissance and subsurface testing, it has been determined that there are no significant prehistoric or historic period archaeological resources within the Passage Island lighthouse (20IR202) study area. Therefore, GLR recommends that no further evaluation or mitigation of this project will be required for archaeological resources, and that its immediate release for soil remediation appears warranted.

REFERENCES CITED

Anderton, John B.

1993 *Paleoshoreline Geoarchaeology in the Northern Great Lakes, Hiawatha National Forest*. U.S. Department of Agriculture, Forest Service, Hiawatha National Forest, Heritage Program Monograph 1. Escanaba, Michigan.

1995 *Paleoshoreline Geoarchaeology in the Northern Great Lakes: An Interdisciplinary Approach to Prehistoric Coastal Settlement*. Ph.D. Dissertation, UW-Madison (Geography).

Anderton, John B., Sean B. Dunham, and Mark C. Branstner

1995 *1994 Cultural Resource Surveys: Hiawatha National Forest*. U.S. Department of Agriculture, Forest Service, Hiawatha National Forest, Escanaba, Michigan. Great Lakes Research Associates, Inc., Williamston, Michigan.

Barnett, LeRoy

1985 Lac La Belle[:] Keweenaw's First Ship Canal. *Michigan History* 69(1):40-46.

Beld, Scott

1995 Ms. report submitted to Great Lakes Research Associates, Inc., Williamston, Michigan.

Benchley, E.D., Derrick J. Marcucci, Cheong-Yip Yuen, and Kristen L. Griffin

1988 *Final Report of Archaeological Investigation and Data Recovery at the Trout Point 1 Site, Alger County, Michigan*. University of Wisconsin-Milwaukee Archaeological Research Laboratory, Report of Investigations 89.

Bettarel, Robert L., and S. Harrison

1962 An Early Ossuary in Michigan. *The Michigan Archaeologist* 8(4):37-42.

Bieder, Robert E.

1995 *Native American Communities in Wisconsin 1600-1960: A Study of Tradition and Change*. The University of Wisconsin Press, Madison.

Branstner, Mark C.

1999 The Euro-American Archaeological Record of Michigan's Territorial Period 1796-1836. In *Retrieving Michigan's Buried Past: Prehistoric and Historic Archaeology in the Great Lakes State*, ed. by J.R. Halsey, pp. 317-322.

Branstner, Susan M.

1987 *Archaeological Investigations at the Indian Village Associated with the Marquette Mission Site, St. Ignace, Michigan (20MK82/20MK99): 1986*. Michigan State University Museum, East Lansing. Submitted to St. Ignace Downtown Development Authority, Michigan.

1989 *Cultural Resource Monitoring and Analysis of I-75 Business Loop Improvements, St. Ignace, Michigan*. Submitted to the Michigan Departments of Transportation and State, State of Michigan.

Brose, David S.

1970a *The Archaeology of Summer Island: Changing Settlement Systems in Northern Lake Michigan*. Museum of Anthropology, University of Michigan, Anthropological Papers 41.

1970b Summer Island III: An Early Historic Site in the Upper Great Lakes. *Historical Archaeology* 6:3-33.

1983 Rethinking the French Presence in the Upper Great Lakes. *In Lulu Linear Punctated: Essays in Honor of George Irving Quimby,* edited by R.C. Dunnell and Donald K. Grayson, pp. 209-252. University of Michigan, Museum of Anthropology, Anthropological Papers 72:209-252.

Buckmaster, Marla M.

1979 *Woodland and Oneota Settlement and Subsistence Systems in the Menominee River Watershed*. Ph.D. dissertation, Department of Anthropology, Michigan State University, East Lansing.

1983 *A Phase II Archaeological Evaluation of the Sturgeon River Site (20DE75), Delta County, Michigan. Northern Michigan*. Northern Michigan University Archaeological Laboratory, Archaeological Report. Marquette, Michigan.

Buckmaster, M.M., and J. Paquette

1989 The Gorto Site: Preliminary Report on a Late Paleo-Indian Site in Marquette County, Michigan. *The Wisconsin Archaeologist* 69:101-124.

Buckmaster, M.M., and David L. Ruggles

1991 *Mount Mesnard: A Prehistoric Quarry*. Paper presented at the 36th Annual Midwest Archaeological Conference. La Crosse, Wisconsin.

Clark, Caven P.

1991 *Group Composition and the Role of Unique Raw Materials in the Terminal Woodland Substage of the Lake Superior Basin*. Ph.D. dissertation, Michigan State University, University Microfilms, Ann Arbor.

1993 *Archaeological Survey and Site Testing at Pictured Rocks National Lakeshore, Alger County, Michigan: 1991*. Midwest Archaeological Center Technical Report 23. U.S. Department of the Interior, National Park Service, Lincoln, Nebraska.

Cleland, Charles E.

1965 Barren Ground Caribou (*Rangifer arcticus*) from an Early Man Site in Southeastern Michigan. *American Antiquity* 30:350-351.

1966 *The Prehistoric Ecology and Ethnozoology of the Upper Great Lakes Region*. University of Michigan, Museum of Anthropology, Anthropological Papers 29.

1976 The Focal-Diffuse Model: An Evolutionary Perspective on the Prehistoric Cultural Adaptations of the Eastern United States. *Midcontinental Journal of Archaeology* 1:59-76.

1982a The Inland Shore Fishery of the Northern Great Lakes: Its Development and Importance in Prehistory. *American Antiquity* 47(4):761-784.

1982b Indians in a Changing Environment. In *The Great Lakes Forests: An Environmental and Social History,* edited by Susan Flader. University of Minnesota Press, Minneapolis.

1985 Naub-Cow-Zo-Win Discs and Some Observations on the Origin and Development of Ojibwa Iconography. *Arctic Anthropology* 22(2):131-140.

1992 *Rites of Conquest: The History and Culture of Michigan's Native Americans.* University of Michigan Press, Ann Arbor.

1993 Economic and Adaptive Change Among Lake Superior Chippewa of the 19th century. In D. Rodgers and S. Wilson (eds.), *Approaches to Culture Contact: Ethnohistory and Archaeological Perspectives on Change.* Plenum Press, New York.

Cleland, Charles E. (editor)

1971 *The Lasanen Site: An Historical Burial Locality in Mackinac County, Michigan.* Publications of The Museum, Anthropological Series 1. Michigan State University, East Lansing.

Cleland, C.E., and G. R. Peske

1968 The Spider Cave Site. In *The Prehistory of the Burnt Bluff Area*, ed. by J. Fitting, pp. 20-60. University of Michigan, Museum of Anthropology, Anthropological Papers 34.

Commonwealth Associates, Inc. (CAI)

1984 *1983 Cultural Resource Survey of the Hiawatha National Forest.* United States Department of Agriculture, Forest Service, Hiawatha National Forest, Escanaba, Michigan. CAI, Jackson, Michigan.

Commonwealth Cultural Resources Group (CCRG)

1991a *1990 Cultural Resource Survey: Hiawatha National Forest.* United States Department of Agriculture, Forest Service, Hiawatha National Forest, Escanaba, Michigan. CCRG, Jackson, Michigan.

1991b *1990 Cultural Resource Survey of Parcels on Grand Island Hiawatha National Forest.* United States Department of Agriculture, Forest Service, Hiawatha National Forest, Escanaba, Michigan. Commonwealth Cultural Resource Group, Inc., Jackson, Michigan.

1995 *Final Phase II Archaeological Investigation, K.I. Sawyer Air Force Base, Marquette County, Michigan.* U.S. Department of the Air Force, Air Force Department of Environmental Excellence. Commonwealth Cultural Resource Group, Inc., Jackson, Michigan.

Cremin, William M.

1980 Sand Point (20BG14): A Lakes Phase Site on the Keweenaw Peninsula, Baraga County, Michigan. *The Michigan Archaeologist* 26(3-4):7-16.

Demers, Paul A.

1990 1989 Archaeological Investigations at the Fort Brady Site (20CH51), Sault Ste. Marie, Michigan. Technical report prepared for Lake Superior State University, Sault Ste. Marie, Michigan.

1991 *Report on the St. Mary's River Archaeological Survey: Archaeological Reconnaissance and Limited Testing on the Lower St. Mary's River, Chippewa County, Michigan.* Report submitted to the Michigan Bureau of History, Project No. S90-281. Lansing.

1992 *Report on the Fort Drummond Archaeological District Survey (20CH50, 20CH55), Drummond Island, Michigan.* National Register of Historic Places Grant Completion Report S91-297. Bureau of Michigan History, Michigan Department of State, Lansing, Michigan.

1995 *Report on the Fort Drummond Site (20CH50) Excavations: The 1992 and 1994 Field Seasons.* Ms. on file, Department of Anthropology, Michigan State University, East Lansing.

Densmore, Frances
1979 *Chippewa Customs.* Minnesota Historical Society Press, Saint Paul.

Dunbar, Willis F., and George S. May
1980 *Michigan: A History of the Wolverine State.* William B. Erdmans Publishing Co., Grand Rapids, Michigan.

Dunham, Sean B., and Mark C. Branstner
1995 *1994 Phase II Cultural Resource Evaluations: Hiawatha National Forest.* USDA-Forest Service, Hiawatha National Forest, Escanaba, Michigan. Great Lakes Research Associates, Inc., Williamston, Michigan.

Ellis, Chris J., and D. Brian Dellar
1990 Paleo-Indians. In *The Archaeology of Southern Ontario to AD 1650*, edited by Chris J. Ellis and Neal Ferris, pp. 37-63. Occasional Publication of the London Chapter, Ontario Archaeological Society 5. London, Ontario.

Emerson, J.N., H.E. Devereux, and M.J. Ashworth
1977 *A Study of Fort St. Joseph.* Parks Canada, History and Archaeology 14. Ottawa.

Fairchild, Jerry D.
1970 The Kralosky Site. *The Michigan Archaeologist* 16(1):33-42.

Fisher, Daniel.
1984 Taphonomic Analysis of Late Pleistocene Mastodon Occurrences: Evidence of Butchery by North American Paleo-Indians. *Paleobiology* 10:338-357.

Fitting, James E.
1974 The Nelson Site (SIS 34). In Contributions to the archaeology of the St. Ignace Area, edited by J.E. Fitting. *The Michigan Archaeologist* 20:121-138.

1975 *The Archaeology of Michigan: A Guide to the Prehistory of the Great Lakes Region.* Cranbrook Institute of Science Bulletin 56. Bloomfield Hills, Michigan.

1976 Patterns of Acculturation at the Straits of Mackinac. In *Cultural Change and Continuity: Essays in Honor of James Bennett Griffin,* edited by Charles E. Cleland. Academic Press, New York.

1979 Middle Woodland Cultural Development in the Straits of Mackinac Region: Beyond the Hopewell Frontier. In *Hopewell Archaeology: The Chillicothe Conference*, edited by David S. Brose and N'omi Greber, pp. 109-112. MCJA Special Paper 3. Kent State University Press.

1980 *Te Oskonchiae: The Village of the Tionontate Huron at Michilimackinac, 1671-1701*. Ms. on file, Bureau of History, Michigan Department of State, Lansing.

Fitting, J.E. (editor)

1968 *The Prehistory of the Burnt Bluff Area*. University of Michigan, Museum of Anthropology, Anthropological Papers 34.

1972 *The Schultz Site at Green Point: A Stratified Occupation Area in the Saginaw Valley of Michigan*. Museum of Anthropology, University of Michigan, Memoirs 4.

1974 Contributions to the Archaeology of the St. Ignace Area. *Michigan Archaeologist* 20 (3-4):117-286.

1976 Archaeological Excavations at the Marquette Mission Site, St. Ignace, Michigan 1972. *The Michigan Archaeologist* 22:103-282.

Franzen, John G.

1987 *Test Excavation and Locational Analysis of Prehistoric Sites in the Hiawatha National Forest, Michigan: 1985 Season*. Cultural Resource Management Report 5. USDA-Forest Service, Hiawatha National Forest, Escanaba, Michigan.

Garland, Elizabeth B.

1986 Early Woodland Occupations in Michigan: A Lower St. Joseph Valley Perspective. In *Early Woodland Archaeology*, edited by K. Farnsworth and T. Emerson. Center for American Archaeology, Kampsville Seminars in Archaeology 2:47-83. Kampsville, Illinois.

Gilman, Rhoda R.

1974 The Fur Trade in the Upper Mississippi Valley, 1630-1850. *The Wisconsin Magazine of History* 58:3-18 (Autumn).

Gilpin, Alec R.

1970 *The Territory of Michigan*. Michigan State University Press, East Lansing.

Grange, Roger T., Jr.

1987 *Excavations at Fort Mackinac, 1980-1982: The Provision Storehouse*. Archaeological Completion Report Series 12. Mackinac Island State Park Commission, Mackinac Island, Michigan.

Green, William, James Stoltman and Alice Kehoe (eds.)

1986 Introduction to Wisconsin Archaeology: Background for Cultural Resource Planning. *The Wisconsin Archeologist* 67(3-4):163-392.

Greenman, Emerson F.

1958 An Early Historic Cemetery at St. Ignace. *The Michigan Archaeologist* 4:28-35.

Griffin, James B.
1961 *Lake Superior Copper and the Indians: Miscellaneous Studies of Great Lakes Prehistory*. Anthropological Papers 11, Museum of Anthropology, University of Michigan, Ann Arbor.

Hawkins, Bruce, and Richard Stamps
1989 *Report of the Preliminary Excavations at Fort Gratiot (1814-1879) in Port Huron, Michigan*. Odyssey Research Monographs 2(1). Oakland University, Rochester, Michigan.

Heldman, Donald P.
1991a An Archaeological View from Fort Michilimackinac Toward the West. In *French Colonial Archaeology*, edited by John A. Walthall, pp. 201-217. University of Illinois Press, Urbana, Illinois.

1991b *Excavation of Solomon and Levy's Trading Post (1765-1780) at Fort Michilimackinac, 1983-1988*. Mackinac Island State Park Commission, Mackinac Island, Michigan.

Heldman, D.P., and Roger T. Grange, Jr.
1981 *Excavations at Fort Michilimackinac, 1978-79: The Rue de la Babillarde*. Archaeological Completion Report Series 3. Mackinac Island State Park Commission, Mackinac Island, Michigan.

Henry, Alexander
1966 *Travels and Adventures in Canada and the Indian Territories between the Years 1760 and 1776*. University Microfilms, Ann Arbor.

Hill, Mark A.
1995 The Timid Mink Site: A Middle Woodland Domestic Structure In Michigan's Western Upper Peninsula. *The Wisconsin Archeologist* 76(3-4):338-364.

Hinsdale, Wilbert B.
1931 *Archaeological Atlas of Michigan*. Michigan Handbook Series 4. University of Michigan, Ann Arbor.

Hixon, W.W. (publisher)
[1930] *Plat Book of Keweenaw County, Michigan*. Rockford, Illinois.

Holman, Margaret B.
1978 *The Settlement System of the Mackinac Phase*. Ph.D. dissertation, Department of Anthropology, Michigan State University, East Lansing.

Hruska, Robert
1967 The Riverside Site: A Late Archaic Manifestation in Michigan. *The Wisconsin Archaeologist* 48(3):145-260.

Hulse, Charles A.
1981 An Archaeological Evaluation of Fort St. Joseph (20BE23), Berrien County, Michigan. *The Michigan Archaeologist* 27:55-76.

Hyde, Charles K.
1986 *The Northern Lights*. Two Peninsula Press, Lansing, Michigan.

Janzen, Donald E.

1968a *The Naomikong Point Site and the Development of Laurel in the Lake Superior Basin*. University of Michigan, Museum of Anthropology, Anthropological Papers 36. Ann Arbor.

1968b Excavations and Survey at Burnt Bluff in 1965. In *The Prehistory of the Burnt Bluff Area*, edited by James E. Fitting, pp. 61-94. University of Michigan, Museum of Anthropology, Anthropological Papers 34.

Karamanski, Theodore J.

1989 *Deep Woods Frontier: A History of Logging in Northern Michigan*. Wayne State University Press, Detroit, Michigan.

Karamanski, T.J., and Richard Zeitlin, with Joseph Derose

1988 *Narrative History of Isle Royale National Park*. Mid-American Research Center, Loyola University of Chicago.

Krause, David J.

1992 *The Making of a Mining District*. Wayne State University Press, Detroit.

Lankton, Larry D., and Charles K. Hyde

1982 *Old Reliable[:] An Illustrated History of the Quincy Mining Co*. Quincy Mine Hoist Association, Inc., Hancock, Michigan.

Lovis, William A.

1990 Native American Resources. In *1990 Great Lakes Gas Transmission Company Pipeline Expansion Projects (TCPL-2): Phase I Cultural Resource Inventory Surveys of Pipeline Corridor and Access Roads Associated with Loops 11-14 and Loops 16-17 in Michigan*, edited by Mark C. Branstner, pp. 11-25. Braun Environmental Laboratories, Inc., Minneapolis, Minnesota, and Great Lakes Gas Transmission Co., Detroit, Michigan.

Lovis, W.A., and Margaret Holman

1976 Subsistence Strategies and Population: A Hypothetical Model for the Development of Late Woodland in the Straits of Mackinac/Sault Ste. Marie Area. *The Michigan Academician* 8(3):267-276.

Martin, Patrick E.

1985 *The Mill Creek Site and Pattern Recognition in Historical Archaeology*. Archaeological Completion Report Series 10. Mackinaw Island State Park Commission, Mackinac Island, Michigan.

1987 *Archaeological Investigations at Fayette State Park*. Submitted to Bureau of History, Michigan Department of State, Lansing.

Martin, Susan R.

1977 *A Preliminary Cultural Resource Management Study of the Hiawatha National Forest, Michigan*. United States Department of Agriculture, Forest Service, Hiawatha National Forest, Escanaba, Michigan. Archaeological Survey Report 20, Michigan State University Museum, East Lansing, Michigan.

1989 A Reconsideration of Aboriginal Fishing Strategies in the Northern Great Lakes Region. *American Antiquity* 54(3):594-604.

1994 A Possible Beadmaker's Kit from North America's Lake Superior Copper District. *Beads* 6:49-60.

Martin S.R. [ed.]
1993 20KE20: Excavations at a Prehistoric Copper Workshop. *The Michigan Archaeologist* 39(3-4):127-193.

Martin, S.R., and Patrick Martin
1980 *An Archaeological Survey of the Proposed Route of US-2 Between Thompson and Rapid River, Michigan.* Michigan Department of Transportation and Michigan Department of State. Michigan Technological University, Houghton, Michigan.

Mason, Carol I.
1986 The Historic Period in Wisconsin Archaeology. *The Wisconsin Archeologist* 67(3-4):370-392.

Mason, Carol I., and Ronald Mason
1961 The Age of the Old Copper Culture *The Wisconsin Archeologist* 42(4):143-155.

Mason, Ronald J.
1966 *Two Stratified Sites on the Door Peninsula of Wisconsin.* University of Michigan, Museum of Anthropology, Anthropological Papers 26.

1969 Laurel and North Bay: Diffusional Networks in the Upper Great Lakes. *American Antiquity* 34:295-302.

1981 *Great Lakes Archaeology*. Academic Press, New York.

1986a The Paleoindian Tradition. *The Wisconsin Archeologist* 67(3-4):179-206.

1986b *Rock Island: Historical Indian Archaeology in the Lake Michigan Basin.* MCJA Special Paper 6. Kent State University Press.

McPherron, Alan
1967 *The Juntunen Site and the Late Woodland Prehistory of the Upper Great Lakes Area.* University of Michigan, Museum of Anthropology, Anthropological Papers 30.

Meltzer, D., and Bruce D. Smith
1986 Paleo-Indian and Early Archaic Subsistence Strategies in Eastern North America. In *Foraging, Collecting and Harvesting: Archaic Period Subsistence and Settlement in the Eastern Woodlands*, edited by Sarah Nesius, pp. 3-31. Center for Archaeological Investigations, Southern Illinois University, Occasional Paper 6. Carbondale.

Michigan History Division (publisher)
n.d. *Carp River Forge: A Report*. Michigan Department of State, Lansing.

Monaghan, G. William
1993 *Geological and Lake-Level History in the Upper Great Lakes Region: Significance for Archaeological Site Locationing in the Hiawatha National Forest.* In *1992 Cultural Resource Surveys: Hiawatha National Forest* Sean Dunham and Mark Branstner eds. United States Department of Agriculture, Forest Service, Hiawatha National Forest, Escanaba, Michigan. Great Lakes Research Associates, Inc., Williamston, Michigan.

Monette, Clarence J.
1990 *Lac La Belle.* Copper Country Local History Series 38. Privately published, Lake Linden, Michigan.

Mudar, Karen
1978 The Effects of Socio-Cultural Variables on Food Preferences in Early 19th century Detroit. *Conference on Historic Site Archaeology Papers* 12:323-391.

Nern, Craig, and Charles E. Cleland
1974 The Gros Cap Cemetery Site, St. Ignace, Michigan: A Reconsideration of the Greenlees Collection. *The Michigan Archaeologist* 20:1-58.

Noble, Vergil
1983 In Dire Straits: Subsistence Patterns at Mackinac. *The Michigan Archaeologist* 29(3):29-48.

Nute, Grace Lee
1926 The American Fur Company's Fishing Enterprises on Lake Superior. *Mississippi Valley Historical Review* 12:483-503.

Otis, Allison T., W.D. Honey, T.C. Hogg, and K. Lakin
1986 *The Forest Service and the Civilian Conservation Corps: 1933-1942.* United States Department of Agriculture, Forest Service. Pacific Crest Research and Services Corporation, Corvallis, Oregon.

Ozker, Doreen
1982 *An Early Woodland Community at the Schultz Site 20SA2 in the Saginaw Valley and the Nature of the Early Woodland Adaptation in the Great Lakes Region.* University of Michigan, Museum of Anthropology, Anthropological Papers 70.

Pitezal, John H.
1959 *Life and shades of a Missionary Life.* Western Book Concern, Cincinnati.

Prahl, E.J., and Mark C. Branstner
1984 *Archaeological Investigations on Mackinac Island, 1983: The Watermain and Sewer Project.* Mackinac Island State Park Commission, Archaeological Completion Report Series 8, Mackinac Island, Michigan.

Quimby, George I.
1966 *Indian Culture and European Trade Goods.* University of Wisconsin Press.

Rajnovich, Grace
1994 *Reading Rock Art: Interpreting the Indian Rock Paintings of the Canadian Shield.* Natural Heritage/Natural History Inc., Toronto.

Richner, Jeffrey J.
1973 *Depositional History and Tool Industries at the Winter Site: A Lake Forest Middle Woodland Cultural Adaptation*. M.A. Thesis, Department of Anthropology, Western Michigan University, Kalamazoo.

Ritzenthaler, Robert E. (ed.)
1957 The Old Copper Culture in Wisconsin. *The Wisconsin Archeologist* 38(4):183-332.

Ritzenthaler, R.E., and George Quimby
1962 The Red Ochre Culture of the Upper Great Lakes and Adjacent Areas. *Fieldiana: Anthropology* 36(11):243-275.

Ritzenthaler, R.E., and Pat Ritzenthaler
1991 *The Woodland Indians of the Western Great Lakes*. Waveland Press, Inc., Prospect Heights, Illinois.

Ritzenthaler, R.E., and Warren Wittry
1957 The Oconto Site - An Old Copper Manifestation. *The Wisconsin Archeologist* 38(4):222-243.

Roberts, Norene A.
1991 *Cultural Resources Overview and National Register Evaluation of Historic Structures, Grand island National Recreation Area, Michigan*. United States Department of Agriculture, Forest Service, Hiawatha National Forest, Escanaba, Michigan. R/V Cultural Resource Consultants, Minneapolis, Minnesota.

Romig, Walter
1986 *Michigan Place Names*. Wayne State University Press, Detroit.

Rusch, L.A., and J.T. Penman
1984 *Transportation Archaeology in Wisconsin: The 1983 Field Season*. Manuscript on file, Division of Historic Preservation, State Historical Society of Wisconsin, Madison.

Salzer, Robert J.
1974 The Wisconsin North Lakes Project: A Preliminary Report. In *Aspects of Upper Great Lakes Anthropology: Papers in Honor of Lloyd A. Wilford*, edited by Elden Johnson. Minnesota Prehistoric Archaeology Series 11:40-54. Minnesota Historical Society, St. Paul.

1986a The Woodland Tradition - An Introduction. *The Wisconsin Archeologist* 67(3-4):239-242.

1986b The Middle Woodland Stage. *The Wisconsin Archeologist* 67(3-4):263-282.

Scott, Elizabeth M.
1985 *French Subsistence at Fort Michilimackinac, 1715-1781: The Clergy and the Traders*. Archaeological Completion Report Series 9. Mackinac Island State Park Commission, Mackinac Island, Michigan.

1991 A Feminist Approach to Historical Archaeology: 18th century Fur Trade Society at Michilimackinac. *Historic Archaeology* 25(4):42-53.

Shay, C. Thomas
1971 *The Itasca Bison Kill Site: An Ecological Analysis.* Minnesota Historical Society Press. St. Paul.

Stephenson, Christine N.
1991 *National Register of Historic Places Archaeological Testing of the Fort Repentigny Site (20CH56), Sault Ste. Marie, Michigan - 1990 Excavations.* Report prepared for the Michigan Department of State, Lansing. Department of Anthropology, Michigan State University, East Lansing, Michigan.

Stoltman, James B.
1973 *The Laurel Culture in Minnesota.* Minnesota Archaeology Series 8. Minnesota Historical Society, St. Paul, Minnesota.

1986 The Archaic Tradition. *The Wisconsin Archaeologist* 13:153-170.

Stone, Lyle
1972 *Archaeological Investigations of the Marquette Mission Site, St. Ignace, Michigan 1971: A Preliminary Report.* Reports in Mackinac History and Archaeology 1. Mackinac Island State Park Commission, Lansing, Michigan.

1975 *Fort Michilimackinac: 1715-1781: An Archaeological Perspective on the Revolutionary Frontier.* Publications of the Museum, Michigan State University, Anthropological Series, Volume 2, East Lansing.

Stone, L.M., and Donald Chaput
1978 History of the Upper Great Lakes Area. In *The Northeast*, edited by Bruce Trigger. *Handbook of North American Indians* 15:602-609, series edited by William Sturtevant. Smithsonian Institution, Washington, D.C.

United States Geological Survey (USGS)
1985 *Passage Island, Michigan.* Reston, Virginia.

Warren, William
1984 *History of the Ojibwa People.* Minnesota Historical Society Press, St. Paul.

Western Historical Co.
1883 *History of the Upper Peninsula of Michigan.* The Western Historical Company, Chicago.

Wilford, Lloyd
1941 A Tentative Classification of the Prehistoric Cultures of Minnesota. *American Antiquity* 6(3):231-249.

Wright, Gary A.
1972 Historic Flooding in the Saginaw Basin. In *The Schultz Site At Green Point*, edited by J.E. Fitting. University of Michigan, Museum of Anthropology, Memoirs 4:43-52.

Appendix **D**

Leachate and Total Lead Soil Sampling Report

November 23, 2005

Ms. Lynn Keller
U.S. Coast Guard Civil Engineering Unit Cleveland
1240 East Ninth Street, Rm 2179
Cleveland, Ohio 44199-2060

Subject: Final Leachate and Total Lead Soil Sampling Summary
United States Coast Guard Passage Island Light Station, Keweenaw County, Michigan
Contract Number: DTCG83-02-D-3CL026
Task Order Number:HSCG83-05-J-3CL355
Project Number: 05-C01052

Dear Ms. Keller:

MWH Americas, Inc., (MWH) is pleased to provide this letter report documenting the soil sampling activities performed for the U. S. Coast Guard (USCG) at the USCG Passage Island Light Station, located on Passage Island in Keweenaw County, Michigan. MWH mobilized to the site on June 8, 2005 and work was completed on June 9, 2005. A summary of the soil sampling activities and analytical results are discussed below.

SITE SAMPLING ACTIVITIES

The USCG Passage Island Light Station is located on Passage Island in Keweenaw County, Michigan. The site includes approximately 6.3 acres and contains 12 structures: a lighthouse with attached keeper's dwelling, a fog signal building, a privy, a winch house, a former pump house, a paint storage shed, a steel rail tramway, a solar panel, a helicopter landing pad, an antenna tower, a former antenna tower, and a boat landing/dock. The lighthouse and associated buildings were constructed in 1881. A site map depicting the site features and composite soil sampling locations is provided as Figure 1 in Attachment A.

Analytical results of previous soil samples, collected by MWH in 2001, indicated concentrations of lead exceeding Michigan Department of Environmental Quality (MDEQ) Part 201 of the Natural Resource and Environmental Protection Act, 1994 Public Act 4, as amended, Residential Generic Cleanup Criteria and Screening Levels (MDEQ Criteria). Soil sampling was performed by MWH at the USCG Passage Island Light Station on June 9, 2005 following recommendations from the MDEQ to provide data to evaluate the leachability of impacted soil to surface water.

Ten soil samples (SS-1 through SS-10) and associated QA/QC samples were collected from the site on June 9, 2005 and submitted for Synthetic Precipitation Leaching Procedure (SPLP) lead analysis via United States Environmental Protection Agency (USEPA) Methods SW-846 1312/6010B, total lead analysis via USEPA Method SW-846 6010B, and fine/coarse fraction lead via MDEQ Standard Operating Procedure (SOP) 213 Revision 2/USEPA Method SW-846 6010B.

The locations of the soil samples were chosen to represent the array of the lead concentrations in the soil, based on the previous lead sampling analytical results from the Site Assessment (SA) performed in 2001. Figure 1 in Attachment A depicts the sample locations.

Samples were collected using a stainless steel trowel. The sampling device was decontaminated between each sample by cleaning with a non-phosphate detergent and rinsing with distilled tap water.

The samples were preserved on ice and submitted to CT Laboratories in Baraboo, Wisconsin, for analysis. A summary of the laboratory analytical results is presented in Table 1 in Attachment B. The laboratory analytical results and data validation report are presented in Attachment C.

SOIL SAMPLING ANALYTICAL RESULTS

Per MDEQ Remediation and Redevelopment Division Operational Memorandum #2 (Op Memo #2), the analytical results of the total and fine fraction and coarse fraction lead analysis samples were compared to MDEQ Part 201 Residential Direct Contact criteria of 400 mg/kg. Due to the proximity of the soil to the surface water, the total lead analysis was also compared to MDEQ Part 201 calculated site-specific groundwater to surface water interface (GSI) Protection Criteria of 740 mg/kg. This criteria was developed using an MDEQ calculation spreadsheet and a water hardness value for Lake Superior of 44 mg calcium carbonate per liter, as provided by the National Park Service (NPS). Analytical results for total lead soil samples ranged from 693 mg/kg to 10,800 mg/kg. Additionally, the fine fraction lead analysis were compared to MDEQ Part 201 Particulate Soil Inhalation Criteria of 100,000 mg/kg. Fine fraction lead analysis for samples collected ranged from 746 mg/kg to 8,030 mg/kg. The total lead results were composited and averaged from the fine fraction lead and coarse fraction lead analytical results. The total lead results are consistent with the results from the SA performed in 2001.

SYNTHETIC PRECEPITATION LEACHING PROCEDURE ANALYTICAL RESULTS

The analytical results of the SPLP lead samples were compared to the Resource Conservation and Recovery Act (RCRA) Toxicity Characteristic Leaching Procedure (TCLP) level for lead of 5,000 micrograms per liter (µg/l), as no SPLP lead criterion or action level has been established. TCLP and SPLP methods are similar in procedure. However, whereas TCLP is used to simulate metals leaching within a sanitary landfill, SPLP is used to evaluate the potential for leaching metals into ground and surface waters, providing a more realistic

assessment of metal mobility under actual field conditions. The extraction fluid utilized in the SPLP process is intended to simulate acidic precipitation. The soil analytical results ranged from 5.27 μg/l to 166 μg/l, which is considerably less than the TCLP Criteria of 5,000 μg/l. The TCLP Criteria is the level established by the USEPA that is considered safe if leaching to groundwater for human consumption. Therefore, the impacted soils are not leaching to the environment at a concentration that is hazardous to human health or the environment.

CORRELATION ANALYSIS

The analytical results of the SPLP lead samples were compared to the analytical results of the total lead samples, coarse fraction lead samples, and fine fraction lead samples. A correlation coefficient was calculated for each data set based on all 10 data points. These calculations show that SPLP lead results were more closely correlated to fine fraction lead results than coarse fraction or total lead results. When the outlying sample with the highest concentrations, SS-7, was removed from the calculation, the correlation coefficients showed even more separation, with the fine fraction lead results remaining the most closely correlated to SPLP lead results. In an attempt to predict SPLP lead results from fine fraction lead results, multipliers were calculated. These values ranged from a low of 17X to a high of 149X, with an average of 55X.

In order to be conservative, if SPLP lead values are to be predicted from fine fraction lead values, the fine fraction lead values should be divided by the low-end multiplier of 17. This will give the highest range of SPLP values based on fine fraction lead values. For example, a fine fraction lead value of 1,000 mg/kg would predict an SPLP lead value of 58.8 ug/L.

SUMMARY

Of the 10 soil samples collected, all exceeded the MDEQ Direct Contact Criteria of 400 mg/kg. Although the potential for a shallow aquifer to exist at the site is highly unlikely, the groundwater cannot be ruled out as a pathway unless it is demonstrated to not be complete. The USCG plans to mitigate the groundwater pathway by restricting use at the site through a deed restriction. However, the potential exists for stormwater runoff to carry lead from the soil to the surface water. Due to the proximity of the surface water, total lead was also compared to the calculated soil GSI Protection Criteria of 740 mg/kg. Eight samples (SS-2, SS-3, and SS-5 through SS-10) exceeded the soil GSI Protection Criteria. All of these samples were located near site structures. Fine Fraction samples results were compared to Soil Particulate Inhalation Criteria, and no samples exceeded this criteria.

The soil samples were additionally submitted for analysis of SPLP lead to develop a correlation between total lead and leachability. The purpose of the SPLP analysis is to gain knowledge of the likelihood the lead would leach from the soil in its natural environment and affect stormwater runoff and/or surface water. No SPLP criteria has been promulgated by MDEQ or USEPA, therefore, the SPLP results were compared against the more-applicable TCLP criteria of 5,000 μg/l, which is readily accepted as the value which wastes are likely to leach concentrations of contaminants that may be harmful to human health or the environment. SPLP results for all 10 samples were less than the RCRA TCLP criteria of 5,000 μg/l, by a minimum factor of 30X. All SPLP results exceeded the calculated GSI

Criteria for Surface Water Protected for Drinking Water Use (4.2 µg/l). This criteria is based on the hardness, in milligrams of calcium carbonate per liter, and as such, is artificially low. In addition, the nearest use of surface water as a drinking water source is a minimum of seven miles from Passage Island. Therefore, based on comparison to the RCRA TCLP level of 5,000 µg/l, it appears unlikely that the lead content in the soil will leach to affect human health or the environment. Therefore, a cleanup criterion greater than the MDEQ Direct Contact Criteria of 400 mg/kg may be warranted. MWH considers this pathway to be incomplete, as soil is not leaching to surface water at toxic levels.

MWH appreciates the opportunity to support the USCG with their environmental program. Please feel free to contact me at (248)-449-3419 with any questions or concerns.

Sincerely,

MWH AMERICAS, INC.

Erica A. Geasler

Erica Geasler, P.E.
Task Order Manager

Appendices: Attachment A – Soil Sample Location Map
Attachment B – Table 1 Soil Analytical Results
Attachment C – Lead in Soil Analytical Results Graph – June 2005
Attachment D – Laboratory Analytical Results and Data Validation Report

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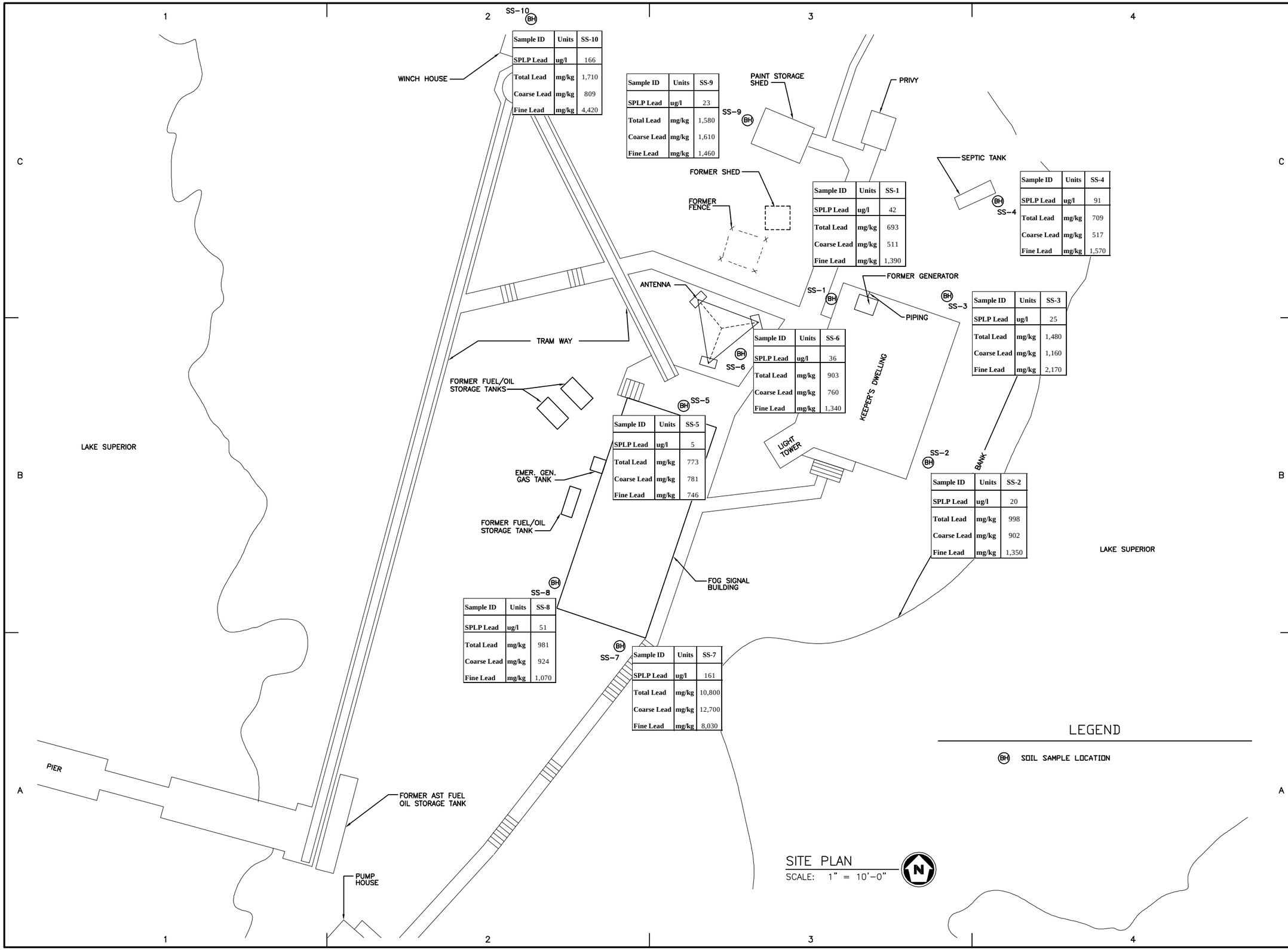
ATTACHMENT A

SOIL SAMPLE LOCATION MAP



Sample ID	Units	SS-10
SPLP Lead	ug/l	166
Total Lead	mg/kg	1,710
Coarse Lead	mg/kg	809
Fine Lead	mg/kg	4,420

Sample ID	Units	SS-9
SPLP Lead	ug/l	23
Total Lead	mg/kg	1,580
Coarse Lead	mg/kg	1,610
Fine Lead	mg/kg	1,460

Sample ID	Units	SS-1
SPLP Lead	ug/l	42
Total Lead	mg/kg	693
Coarse Lead	mg/kg	511
Fine Lead	mg/kg	1,390

Sample ID	Units	SS-4
SPLP Lead	ug/l	91
Total Lead	mg/kg	709
Coarse Lead	mg/kg	517
Fine Lead	mg/kg	1,570

Sample ID	Units	SS-3
SPLP Lead	ug/l	25
Total Lead	mg/kg	1,480
Coarse Lead	mg/kg	1,160
Fine Lead	mg/kg	2,170

Sample ID	Units	SS-6
SPLP Lead	ug/l	36
Total Lead	mg/kg	903
Coarse Lead	mg/kg	760
Fine Lead	mg/kg	1,340

Sample ID	Units	SS-5
SPLP Lead	ug/l	5
Total Lead	mg/kg	773
Coarse Lead	mg/kg	781
Fine Lead	mg/kg	746

Sample ID	Units	SS-2
SPLP Lead	ug/l	20
Total Lead	mg/kg	998
Coarse Lead	mg/kg	902
Fine Lead	mg/kg	1,350

Sample ID	Units	SS-8
SPLP Lead	ug/l	51
Total Lead	mg/kg	981
Coarse Lead	mg/kg	924
Fine Lead	mg/kg	1,070

Sample ID	Units	SS-7
SPLP Lead	ug/l	161
Total Lead	mg/kg	10,800
Coarse Lead	mg/kg	12,700
Fine Lead	mg/kg	8,030

LEGEND

BH SOIL SAMPLE LOCATION

MWH
NOVI, MICHIGAN
(248) 344-0205

CONSULTANTS

U. S. COAST GUARD

CIVIL ENGINEERING UNIT CLEVELAND

USCG, CEU CLEVELAND
1240 EAST 9TH STREET
CLEVELAND, OH 44199-2060

ISSUE

MARK	DATE	DESCRIPTION

A/E PROJECT NO: j:\j\uscg\2002\670\c
CAD FILE NAME: C6606C01
DESIGNED BY: KMD
DRAWN BY: STR
EDITED BY: STR
CHECKED BY: EAG

SCALE: AS SHOWN PLOT SCALE: 1" = 30'

SHEET TITLE

SITE ASSESSMENT
PASSAGE ISLAND LIGHT STATION
KEWEENAW COUNTY MICHIGAN
SAMPLE LOCATIONS & SITE PLAN

REVIEWED BY:	REVIEWED BY:	REVIEWED BY:
PROJECT ENG.	BRANCH CHIEF	CONTRACTING KO

APPROVING OFFICER DATE

PROJECT NUMBER	DRAWING NUMBER
09-C01052	6606-D

DISCIPLINE/SHT NO C/01

SHEET 1 OF 1

ATTACHMENT B

TABLE 1
SOIL ANALYTICAL RESULTS

TABLE 1

Soil Analytical Results,
USCG Passage Island Light Station
Keweenaw County, Michigan
Page 1 of 1

		Criteria																		
Sample ID	**Units**	**Statewide Default Background Level**	**Drinking Water**	**GSI***	**Direct Contact**	**Indoor Air**	**Inhalation**	**Target Detection Limit**	**RCRA TCLP Regulatory Limit**	**SS-1**	**SS-2**	**SS-3**	**SS-4**	**SS-5**	**SS-6**	**SS-7**	**SS-8**	**SS-9**	**SS-10**	**DUP-1**
SPLP Lead	**ug/l**	NA	NA	NA	NA	NA	NA	NA	5000	42	20	25	91	5	36	161	51	23	166	76
Total Lead	**mg/kg**	21	70	740	400	NLV	100,000	1	NA	693	998	1,480	709	773	903	10,800	981	1,580	1,710	4,730
Coarse Lead	**mg/kg**	21	70	740	400	NLV	100,000	NA	NA	511	902	1,160	517	781	760	12,700	924	1,610	809	5,320
Fine Lead	**mg/kg**	21	70	740	400	NLV	100,000	NA	NA	1,390	1,350	2,170	1,570	746	1,340	8,030	1,070	1,460	4,420	1,010

NOTES:

1. ug/l: micrograms per liter
2. mg/kg: milligrams per kilogram
3. Boxed data indicates criteria exceedance
4. SPLP: Synthetic Precipitation Leaching Procedure
5. TCLP: Toxicity Characteristic Leaching Procedure
6. RCRA: Resource Conservation and Recovery Act

CRITERIA:

Criteria is Michigan Department of Environmental Quality (MDEQ), Part 201 of the Natural Resources and Environmental Protection Act,

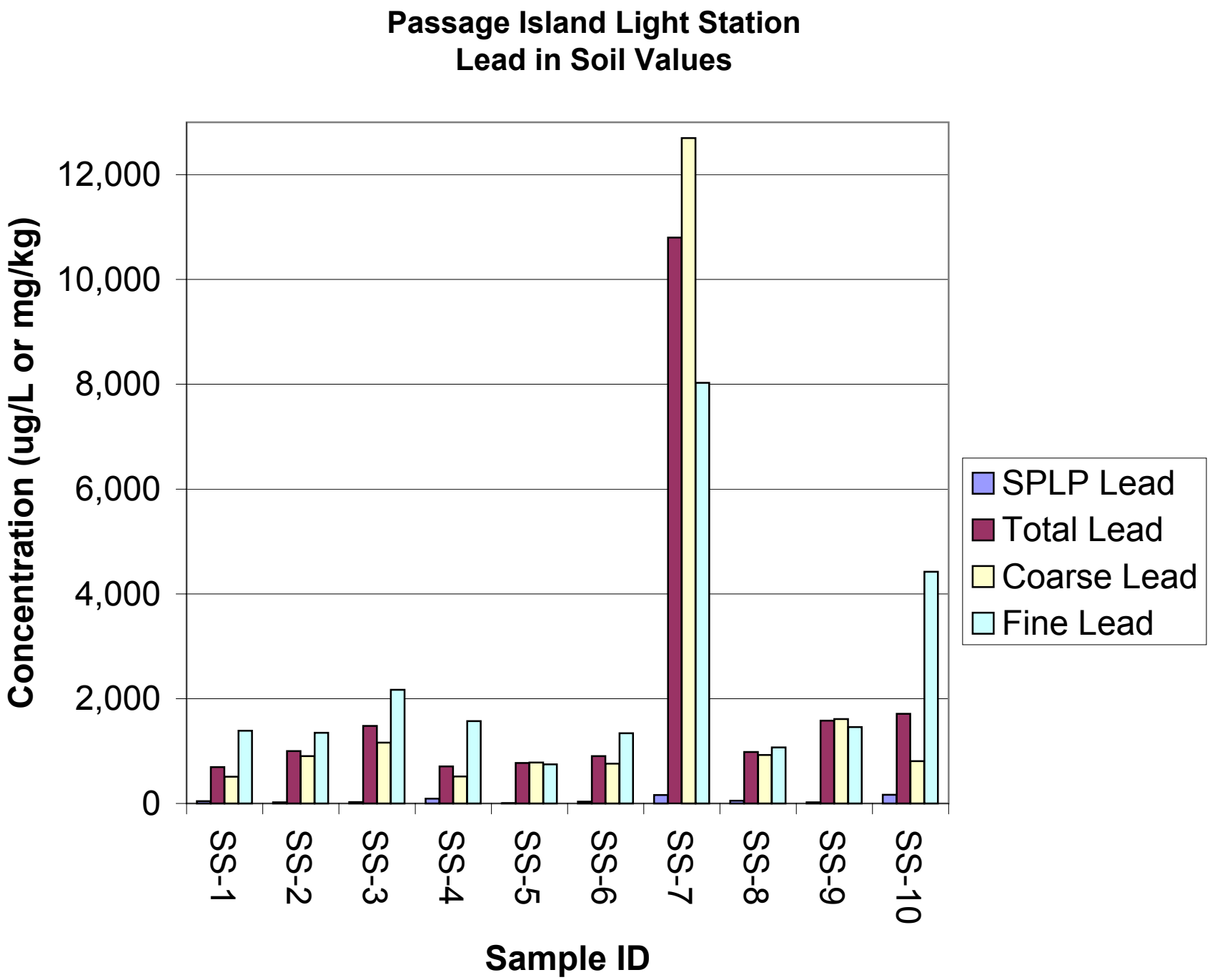
1994 Public Act 451, as amended, Residential Generic Cleanup Criteria and Screening Levels (December 10, 2004)

* Calculated Soil GSI Protection Critiera based on water hardness of Lake Superior

1. GSI: Groundwater Surface Water Interface Protection Criteria
2. Indoor Air: Soil Volatilization to Indoor Air Inhalation Criteria
3. Inhalation: Particulate Soil Inhalation Criteria
4. NLV: Criteria not available under MDEQ Part 201, hazardous substance is not lilkely to volatize under most conditions
5. GSI criteria is a calculated value, based on the hardness of the potential receiving surface water body.

ATTACHMENT C

PASSAGE ISLAND LIGHT STATION LEAD IN SOIL ANALYTICAL RESULTS GRAPH – JUNE 2005


Passage Island Light Station
Lead in Soil Values
Concentration (ug/L or mg/kg)
12,000
10,000
8,000
6,000
4,000
2,000
0
SS-1
SS-2
SS-3
SS-4
SS-5
SS-6
SS-7
SS-8
SS-9
SS-10
Sample ID
SPLP Lead
Total Lead
Coarse Lead
Fine Lead

ATTACHMENT D

LABORATORY ANALYTICAL RESULTS AND DATA VALIDATION REPORT

DATA VALIDATION REPORT

United States Coast Guard

Passage Island, Keweenaw County, Michigan

June 2005

Ten soil and associated quality control (QC) samples were collected from the United States Coast Guard (USCG) Passage Island Light Station in Keweenaw County, Michigan on June 9, 2005. The samples were analyzed by CT Laboratories, Baraboo, Wisconsin for: synthetic precipitation leaching procedure (SPLP) lead by United States Environmental Protection Agency (USEPA) Methods SW-846 1312/6010B; fine fraction/coarse fraction lead by Michigan Department of Environmental Quality (MDEQ) Standard Operating Procedure (SOP) #213 Rev. 2 and USEPA Method SW-846 6010B; and total lead by USEPA Method SW-846 6010B. The analytical data were reviewed based on the results of the data evaluation parameters and/or the QC sample results provided by the laboratory.

Sample Delivery Group (SDG) 47515

Based on the results of this data validation, all data are considered complete and valid as reported.

SDG 47957

Based on the results of this data validation, all data are considered complete and valid as reported.

AJP/KER

G:\General-main\Laboratory Information\Data Validation Reports and blurbs\Reports 2005\USCG Passage Island 6-05 sampling.doc

CT Laboratories

1

INORGANIC ANALYSIS DATA SHEET

Sample Description

SS-1

Lab Name:	CT Laboratories	Contract:	MONTGOMERY WATSON HARZA-PASSAGE I
Matrix (soil/water)	SPLP	SDG No.:	47515
% Solids:		Lab Sample ID:	321157
Analytical Method:	EPA 6010B	Date Received:	06/11/2005

Concentration Units (ug/L or mg/kg dry weight): mg/L

CAS No.	Analyte	Concentration	C	Q	M
7439-92-1	Lead	0.0415			P

CT Laboratories

1

INORGANIC ANALYSIS DATA SHEET

Sample Description

SS-2

Lab Name:	CT Laboratories	Contract:	MONTGOMERY WATSON HARZA-PASSAGE I
Matrix (soil/water)	SPLP	SDG No.:	47515
% Solids:		Lab Sample ID:	321158
Analytical Method:	EPA 6010B	Date Received:	06/11/2005

Concentration Units (ug/L or mg/kg dry weight): mg/L

CAS No.	Analyte	Concentration	C	Q	M
7439-92-1	Lead	0.0203			P

CT Laboratories

1

INORGANIC ANALYSIS DATA SHEET

Sample Description

SS-3

Lab Name:	CT Laboratories	Contract:	MONTGOMERY WATSON HARZA-PASSAGE I
Matrix (soil/water)	SPLP	SDG No.:	47515
% Solids:		Lab Sample ID:	321159
Analytical Method:	EPA 6010B	Date Received:	06/11/2005

Concentration Units (ug/L or mg/kg dry weight): mg/L

CAS No.	Analyte	Concentration	C	Q	M
7439-92-1	Lead	0.0247			P

CT Laboratories

1

INORGANIC ANALYSIS DATA SHEET

Sample Description

SS-4

Lab Name:	CT Laboratories	Contract:	MONTGOMERY WATSON HARZA-PASSAGE I
Matrix (soil/water)	SPLP	SDG No.:	47515
% Solids:		Lab Sample ID:	321160
Analytical Method:	EPA 6010B	Date Received:	06/11/2005

Concentration Units (ug/L or mg/kg dry weight): mg/L

CAS No.	Analyte	Concentration	C	Q	M
7439-92-1	Lead	0.0913			P

CT Laboratories

1

INORGANIC ANALYSIS DATA SHEET

Sample Description

SS-5

Lab Name:	CT Laboratories	Contract:	MONTGOMERY WATSON HARZA-PASSAGE I
Matrix (soil/water)	SPLP	SDG No.:	47515
% Solids:		Lab Sample ID:	321161
Analytical Method:	EPA 6010B	Date Received:	06/11/2005

Concentration Units (ug/L or mg/kg dry weight): mg/L

CAS No.	Analyte	Concentration	C	Q	M
7439-92-1	Lead	0.00527			P

CT Laboratories

1

INORGANIC ANALYSIS DATA SHEET

Sample Description

SS-6

Lab Name:	CT Laboratories	Contract:	MONTGOMERY WATSON HARZA-PASSAGE I
Matrix (soil/water)	SPLP	SDG No.:	47515
% Solids:		Lab Sample ID:	321162
Analytical Method:	EPA 6010B	Date Received:	06/11/2005

Concentration Units (ug/L or mg/kg dry weight): mg/L

CAS No.	Analyte	Concentration	C	Q	M
7439-92-1	Lead	0.0358			P

CT Laboratories

1

INORGANIC ANALYSIS DATA SHEET

Sample Description

SS-7

Lab Name:	CT Laboratories	Contract:	MONTGOMERY WATSON HARZA-PASSAGE I
Matrix (soil/water)	SPLP	SDG No.:	47515
% Solids:		Lab Sample ID:	321163
Analytical Method:	EPA 6010B	Date Received:	06/11/2005

Concentration Units (ug/L or mg/kg dry weight): mg/L

CAS No.	Analyte	Concentration	C	Q	M
7439-92-1	Lead	0.161			P

CT Laboratories

1

INORGANIC ANALYSIS DATA SHEET

Sample Description

SS-8

Lab Name:	CT Laboratories	Contract:	MONTGOMERY WATSON HARZA-PASSAGE I
Matrix (soil/water)	SPLP	SDG No.:	47515
% Solids:		Lab Sample ID:	321164
Analytical Method:	EPA 6010B	Date Received:	06/11/2005

Concentration Units (ug/L or mg/kg dry weight): mg/L

CAS No.	Analyte	Concentration	C	Q	M
7439-92-1	Lead	0.0505			P

CT Laboratories

1

INORGANIC ANALYSIS DATA SHEET

Sample Description

SS-9

Lab Name:	CT Laboratories	Contract:	MONTGOMERY WATSON HARZA-PASSAGE I
Matrix (soil/water)	SPLP	SDG No.:	47515
% Solids:		Lab Sample ID:	321165
Analytical Method:	EPA 6010B	Date Received:	06/11/2005

Concentration Units (ug/L or mg/kg dry weight): mg/L

CAS No.	Analyte	Concentration	C	Q	M
7439-92-1	Lead	0.0226			P

CT Laboratories

1

INORGANIC ANALYSIS DATA SHEET

Sample Description

SS-10

Lab Name:	CT Laboratories	Contract:	MONTGOMERY WATSON HARZA-PASSAGE I
Matrix (soil/water)	SPLP	SDG No.:	47515
% Solids:		Lab Sample ID:	321166
Analytical Method:	EPA 6010B	Date Received:	06/11/2005

Concentration Units (ug/L or mg/kg dry weight): mg/L

CAS No.	Analyte	Concentration	C	Q	M
7439-92-1	Lead	0.166			P

CT Laboratories

1

INORGANIC ANALYSIS DATA SHEET

Sample Description

DUP-1

Lab Name:	CT Laboratories	Contract:	MONTGOMERY WATSON HARZA-PASSAGE I
Matrix (soil/water)	SPLP	SDG No.:	47515
% Solids:		Lab Sample ID:	321167
Analytical Method:	EPA 6010B	Date Received:	06/11/2005

Concentration Units (ug/L or mg/kg dry weight): mg/L

CAS No.	Analyte	Concentration	C	Q	M
7439-92-1	Lead	0.0761			P

CTLaboratories

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Baraboo, WI 53913-3109
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www.ctlaboratories.com

ANALYTICAL REPORT

MONTGOMERY WATSON HARZA
ERICA GEASLER
41551 ELEVEN MILE RD
NOVI, MI 48375

Project Name: PASSAGE ISLAND
Contract #: 1937
Project #:
Folder #: 47957
Purchase Order #:
Arrival Temperature: See COC

Report Date: 7/8/2005
Date Received: 7/5/2005

Reprint Date:

CT Lab#: 325880 Sample Description: SS-1 Sampled: 6/9/2005 1330

Analyte	Result	Units	LOD	LOQ	Dilution	Qualifier	Prep Date	Analysis Date	Analyst	Method
Inorganic Results										
Solids, Percent	52.8	%	N/A	N/A	1.0	H		7/5/2005	KMB	EPA 5030A
Metals Results										
Lead	552	mg/kg	0.66	2.5	1.0		7/6/2005	7/7/2005	NAH	EPA 6010B
Lead, Coarse	511	mg/kg	0.400	1.50	1.0		7/22/2005	7/26/2005	NAH	EPA 6010B
Lead, Fine	1390	mg/kg	0.400	1.50	1.0		7/22/2005	7/26/2005	NAH	EPA 6010B
Lead, Total	693	mg/kg	N/A	N/A	1.0		7/22/2005	7/26/2005	NAH	EPA 6010B

CT Lab#: 325881 Sample Description: SS-2 Sampled: 6/9/2005 1335

Analyte	Result	Units	LOD	LOQ	Dilution	Qualifier	Prep Date	Analysis Date	Analyst	Method
Inorganic Results										
Solids, Percent	48.4	%	N/A	N/A	1.0	H		7/5/2005	KMB	EPA 5030A
Metals Results										
Lead	747	mg/kg	0.79	3.0	1.0		7/6/2005	7/7/2005	NAH	EPA 6010B
Lead, Coarse	902	mg/kg	0.400	1.50	1.0		7/22/2005	7/26/2005	NAH	EPA 6010B
Lead, Fine	1350	mg/kg	0.400	1.50	1.0		7/22/2005	7/26/2005	NAH	EPA 6010B
Lead, Total	998	mg/kg	N/A	N/A	1.0		7/22/2005	7/26/2005	NAH	EPA 6010B

CT Lab#: 325882 Sample Description: SS-3 Sampled: 6/9/2005 1340

Analyte	Result	Units	LOD	LOQ	Dilution	Qualifier	Prep Date	Analysis Date	Analyst	Method
Inorganic Results										

CT Lab#: 325882 Sample Description: SS-3 Sampled: 6/9/2005 1340

Analyte	Result	Units	LOD	LOQ	Dilution	Qualifier	Prep Date	Analysis Date	Analyst	Method
Solids, Percent	49.5	%	N/A	N/A	1.0	H		7/5/2005	KMB	EPA 5030A
Metals Results										
Lead	406	mg/kg	0.73	2.8	1.0		7/6/2005	7/7/2005	NAH	EPA 6010B
Lead, Coarse	1160	mg/kg	0.400	1.50	1.0		7/22/2005	7/26/2005	NAH	EPA 6010B
Lead, Total	1480	mg/kg	N/A	N/A	1.0		7/22/2005	7/26/2005	NAH	EPA 6010B
Lead, Fine	2170	mg/kg	0.400	1.50	1.0		7/22/2005	7/26/2005	NAH	EPA 6010B

CT Lab#: 325883 Sample Description: SS-4 Sampled: 6/9/2005 1345

Analyte	Result	Units	LOD	LOQ	Dilution	Qualifier	Prep Date	Analysis Date	Analyst	Method
Inorganic Results										
Solids, Percent	90.2	%	N/A	N/A	1.0	H		7/5/2005	KMB	EPA 5030A
Metals Results										
Lead	454	mg/kg	0.40	1.5	1.0		7/6/2005	7/7/2005	NAH	EPA 6010B
Lead, Coarse	517	mg/kg	0.400	1.50	1.0		7/22/2005	7/26/2005	NAH	EPA 6010B
Lead, Fine	1570	mg/kg	0.400	1.50	1.0		7/22/2005	7/26/2005	NAH	EPA 6010B
Lead, Total	709	mg/kg	N/A	N/A	1.0		7/22/2005	7/26/2005	NAH	EPA 6010B

CT Lab#: 325884 Sample Description: SS-5 Sampled: 6/9/2005 1350

Analyte	Result	Units	LOD	LOQ	Dilution	Qualifier	Prep Date	Analysis Date	Analyst	Method
Inorganic Results										
Solids, Percent	33.5	%	N/A	N/A	1.0	H		7/5/2005	KMB	EPA 5030A
Metals Results										
Lead	249	mg/kg	0.89	3.3	1.0		7/6/2005	7/7/2005	NAH	EPA 6010B
Lead, Coarse	781	mg/kg	0.400	1.50	1.0		7/22/2005	7/26/2005	NAH	EPA 6010B
Lead, Fine	746	mg/kg	0.400	1.50	1.0		7/22/2005	7/26/2005	NAH	EPA 6010B
Lead, Total	773	mg/kg	N/A	N/A	1.0		7/22/2005	7/26/2005	NAH	EPA 6010B

CT Lab#: 325885 Sample Description: SS-6 Sampled: 6/9/2005 1355

Analyte	Result	Units	LOD	LOQ	Dilution	Qualifier	Prep Date	Analysis Date	Analyst	Method
Inorganic Results										
Solids, Percent	56.4	%	N/A	N/A	1.0	H		7/5/2005	KMB	EPA 5030A

CT Lab#: 325885 Sample Description: SS-6 Sampled: 6/9/2005 1355

Analyte	Result	Units	LOD	LOQ	Dilution	Qualifier	Prep Date	Analysis Date	Analyst	Method
Metals Results										
Lead	417	mg/kg	0.62	2.3	1.0		7/6/2005	7/7/2005	NAH	EPA 6010B
Lead, Coarse	760	mg/kg	0.400	1.50	1.0		7/22/2005	7/26/2005	NAH	EPA 6010B
Lead, Total	903	mg/kg	N/A	N/A	1.0		7/22/2005	7/26/2005	NAH	EPA 6010B
Lead, Fine	1340	mg/kg	0.400	1.50	1.0		7/22/2005	7/26/2005	NAH	EPA 6010B

CT Lab#: 325886 Sample Description: SS-7 Sampled: 6/9/2005 1358

Analyte	Result	Units	LOD	LOQ	Dilution	Qualifier	Prep Date	Analysis Date	Analyst	Method
Inorganic Results										
Solids, Percent	44.1	%	N/A	N/A	1.0	H		7/5/2005	KMB	EPA 5030A
Metals Results										
Lead	2320	mg/kg	0.67	2.5	1.0		7/6/2005	7/7/2005	NAH	EPA 6010B
Lead, Coarse	12700	mg/kg	4.00	15.0	10.0		7/22/2005	7/26/2005	NAH	EPA 6010B
Lead, Fine	8030	mg/kg	0.400	1.50	1.0		7/22/2005	7/26/2005	NAH	EPA 6010B
Lead, Total	10800	mg/kg	N/A	N/A	1.0		7/22/2005	7/26/2005	NAH	EPA 6010B

CT Lab#: 325887 Sample Description: SS-8 Sampled: 6/9/2005 1400

Analyte	Result	Units	LOD	LOQ	Dilution	Qualifier	Prep Date	Analysis Date	Analyst	Method
Inorganic Results										
Solids, Percent	57.8	%	N/A	N/A	1.0	H		7/5/2005	KMB	EPA 5030A
Metals Results										
Lead	573	mg/kg	0.49	1.8	1.0		7/6/2005	7/7/2005	NAH	EPA 6010B
Lead, Coarse	924	mg/kg	0.400	1.50	1.0		7/22/2005	7/26/2005	NAH	EPA 6010B
Lead, Fine	1070	mg/kg	0.400	1.50	1.0		7/22/2005	7/26/2005	NAH	EPA 6010B
Lead, Total	981	mg/kg	N/A	N/A	1.0		7/22/2005	7/26/2005	NAH	EPA 6010B

CT Lab#: 325888 Sample Description: SS-9 Sampled: 6/9/2005 1405

Analyte	Result	Units	LOD	LOQ	Dilution	Qualifier	Prep Date	Analysis Date	Analyst	Method
Inorganic Results										
Solids, Percent	42.8	%	N/A	N/A	1.0	H		7/5/2005	KMB	EPA 5030A
Metals Results										
Lead	4290	mg/kg	0.77	2.9	1.0		7/6/2005	7/7/2005	NAH	EPA 6010B

CT Lab#: 325888 Sample Description: SS-9 Sampled: 6/9/2005 1405

Analyte	Result	Units	LOD	LOQ	Dilution	Qualifier	Prep Date	Analysis Date	Analyst	Method
Lead, Coarse	1610	mg/kg	0.400	1.50	1.0		7/22/2005	7/26/2005	NAH	EPA 6010B
Lead, Total	1580	mg/kg	N/A	N/A	1.0		7/22/2005	7/26/2005	NAH	EPA 6010B
Lead, Fine	1460	mg/kg	0.400	1.50	1.0		7/22/2005	7/26/2005	NAH	EPA 6010B

CT Lab#: 325889 Sample Description: SS-10 Sampled: 6/9/2005 1410

Analyte	Result	Units	LOD	LOQ	Dilution	Qualifier	Prep Date	Analysis Date	Analyst	Method
Inorganic Results										
Solids, Percent	75.7	%	N/A	N/A	1.0	H		7/5/2005	KMB	EPA 5030A
Metals Results										
Lead	2710	mg/kg	0.53	2.0	1.0		7/6/2005	7/7/2005	NAH	EPA 6010B
Lead, Coarse	809	mg/kg	0.400	1.50	1.0		7/22/2005	7/26/2005	NAH	EPA 6010B
Lead, Fine	4420	mg/kg	0.400	1.50	1.0		7/22/2005	7/26/2005	NAH	EPA 6010B
Lead, Total	1710	mg/kg	N/A	N/A	1.0		7/22/2005	7/26/2005	NAH	EPA 6010B

CT Lab#: 325890 Sample Description: DUP-1 Sampled: 6/9/2005 1400

Analyte	Result	Units	LOD	LOQ	Dilution	Qualifier	Prep Date	Analysis Date	Analyst	Method
Inorganic Results										
Solids, Percent	63.8	%	N/A	N/A	1.0	H		7/5/2005	KMB	EPA 5030A
Metals Results										
Lead	520	mg/kg	0.48	1.8	1.0		7/6/2005	7/7/2005	NAH	EPA 6010B
Lead, Coarse	5320	mg/kg	0.400	1.50	1.0		7/22/2005	7/26/2005	NAH	EPA 6010B
Lead, Fine	1010	mg/kg	0.400	1.50	1.0		7/22/2005	7/26/2005	NAH	EPA 6010B
Lead, Total	4730	mg/kg	N/A	N/A	1.0		7/22/2005	7/26/2005	NAH	EPA 6010B

Notes regarding entire Chain of Custody:

Notes: * Indicates Value in between LOD and LOQ.
All samples were received intact and properly preserved unless otherwise noted. The results reported relate only to the samples tested.
This report shall not be reproduced, except in full, without written approval of this laboratory. The Chain of Custody is attached.

This report satisfies the requirements of your project but has not been prepared to comply with NELAP reporting requirements.

Submitted by: PML

Pat M. Letterer
Project Manager
608-356-2760

QC Qualifiers

Code	Description
A	Analyte averaged calibration criteria within acceptable limits.
B	Analyte detected in associated Method Blank.
C	Toxicity present in BOD sample.
D	Diluted Out.
E	Safe, No Total Coliform detected.
F	Unsafe, Total Coliform detected, no E. Coli detected.
G	Unsafe, Total Coliform detected and E. Coli detected.
H	Holding time exceeded.
J	Estimated value.
L	Significant peaks were detected outside the chromatographic window.
M	Matrix spike and/or Matrix Spike Duplicate recovery outside acceptance limits.
N	Insufficient BOD oxygen depletion.
O	Complete BOD oxygen depletion.
P	Concentration of analyte differs more than 40% between primary and confirmation analysis.
Q	Laboratory Control Sample outside acceptance limits.
R	See Narrative at end of report.
S	Surrogate standard recovery outside acceptance limits due to apparent matrix effects.
T	Sample received with improper preservation or temperature.
V	Raised Quantitation or Reporting Limit due to limited sample amount or dilution for matrix background interference.
W	Sample amount received was below program minimum.
X	Analyte exceeded calibration range.
Y	Replicate/Duplicate precision outside acceptance limits.
Z	Calibration criteria exceeded.

Rev. 3/2003

Chain of Custody

Page 1 of 1

CTLaboratories

1230 Lange Court, Baraboo, WI 53913
608-356-2760 Tel. Fx 608-356-2766
www.ctlaboratories.com

Company Name: MWH
Project Contact: Art Peitsch
Telephone: 248-344-0205
Project Name: Passage Island
Project Number:
Project Location: Passage Island MI
Sampled By: JWR

Folder #: 47515
Company: MONTGOMERY WATS
Project: PASSAGE ISLAND
Logged By: JLW PM: PMI

Ice Present Yes No
Temperature 6.5°C
Initials GCC
Date 6-11-05 Time 1140
Cooler # 1027

Mail Report To: SAME
Company:
Address:
City/State/Zip:

Invoice To:
Company:
Address:
City/State/Zip:
PO No.
Contract No.

Regulatory Program:
UST RCRA SDWA NPDES
Solid Waste Other _____

Turnaround Time
Normal RUSH* Date Needed _____
*Notify Lab prior to sending in RUSH
Surcharges 24 hr 200% 2-3 days 100% 4-9 days 50%
Surcharges subject to change without notice.

Landfill License Number _____

Client Special Instructions:

Fill in Spaces with Bottles per Test

Collection Date	Collection Time	Field Screen	Field ID	Grab/ Comp	Sample ID Description	Filt'd Y/N	WDNR Well ID #	**Matrix:	4 SPLP ~~Total~~ LEAD	MS/MSD							Total No of Containers	Total No of Cont. Rec'd	Preservation*	Lab ID #
6/9/05	1330	N		G	SS-1	N		S	X								1			321157
	1335			G	SS-2	N		S	X								1			321158
	1340			G	SS-3	N		S	X								1			321159
	1345			G	SS-4	N		S	X	X							#2			321160
	1350			G	SS-5	N		S	X								1			321161
	1355			G	SS-6	N		S	X								1			321162
	1358			G	SS-7	N		S	X								1			321163
	1400			G	SS-8	N		S	X								1			321164
	1405			G	SS-9	N		S	X								1			321165
	1410			G	SS-10	N		S	X								1			321166
↓	1400	↓		G	DUP-1	N		S	X								1			321167

NEED 48 hr TAT

Relinquished By:	Date/Time	Relinquished By:	Date/Time
[signature]	12 noon 6/10/05		
Received by:	**Date/Time**	**Received by:**	**Date/Time**
		[signature]	08:14 6/13/05

**Matrix
S-Soil A-Air Slg-Sludge M-Misc Waste
GW-Groundwater SW-Surface Water
WW-Wastewater DW-Drinking Water

* Preservation Code
A=None B=HCL
C=H2SO4 D=HNO3
E=Encore F=Methanol
G=NaOH
O=Other _____

Appendix **E**

Risk Assessment/Exposure Pathway Evaluation

APPENDIX E

RISK ASSESSMENT / EXPOSURE PATHWAY EVALUATION

PASSAGE ISLAND REMOVAL ACTION OBJECTIVE CALCULATION

This technical memorandum presents a refined and revised removal action objective (RAO) for lead contaminated soil at the U.S. Coast Guard (USCG) Passage Island Light Station, Keweenaw County, Michigan. An initial range of potential RAOs and a final recommended value were presented in the Final Toxicological Review for Passage Island (MWH, 2005). Since the preparation of this document, the U.S. Environmental Protection Agency's (USEPA's) Adult Lead Model (ALM) has been updated (USEPA, 2009a). In addition, the range of potential model input parameters used in the calculation of RAOs in 2005 has been refined and reduced to one scenario per receptor.

Briefly, a USCG owned Light Station on Passage Island has been in operation since 1882. Passage Island is located approximately 3.5 miles off the northern tip of Isle Royale in Lake Superior and is part of the Isle Royale National Park; the Light Station and adjacent land are owned by the USCG. Soil adjacent to buildings is contaminated with lead believed to be the result of historic use of lead-based paint. Because the property on which the Light Station is situated is neither residential nor industrial, but rather is zoned recreational, the Michigan Department of Environmental Quality requested justification for a health-based, site-specific lead RAO. A range of preliminary RAOs were provided in 2005 (MWH, 2005); however, updates to the ALM necessitate reevaluation of the Site.

UPDATES TO THE ADULT LEAD MODEL

The ALM is used to calculate the blood-lead concentration in the fetus of an adult female exposed to lead contaminated soil, or to calculate the maximum allowable concentration of lead in soil that would result in no more than a 5% probability that fetal blood-lead concentration exceeds the USEPA's goal of 10 µg/dL (USEPA, 1994). The model assumes that any site-related lead exposure results in an increase in blood-lead beyond a baseline level, expressed as geometric mean baseline blood-lead concentration (PbB_0) in adult females, with an associated geometric standard deviation (GSD). The PbB_0 and GSD in the 2003 version of the ALM were derived from an analysis of blood-lead data for non-institutionalized U.S. women 17–45 years of age, from Phase 1 and 2 (1988 to 1994) of the Third National Health and Nutrition Examination Survey (NHANES III). The Centers for Disease Control (CDC) releases data from the continuous NHANES in two year increments, however, the CDC recommends use of four or more years of continuous data when updating parameter estimates. The 2009 version of the ALM contains updated PbB_0 and GSD estimates using NHANES surveys that were conducted from 1999-2004. In addition to updated PbB_0 and GSD values for all U.S. women, the 2009 ALM eliminates estimates of PbB_0 and GSD for regional or ethnic alternatives that were included in earlier versions of the model (USEPA, 2009b).

EXPOSURE ASSESSMENT FOR PASSAGE ISLAND LIGHT STATION

Potentially Exposed Human Health Receptors

Due to the remote location of the Passage Island Light Station, there is limited opportunity for the general public to become exposed to lead-contaminated soil. As described in MWH (2005), most of Passage Island is managed by the National Park Service (NPS) as a natural area, with no facilities for temporary or permanent human occupation. Overnight docking at the NPS dock and camping are not allowed, and the island is not open for general use by the public. The Light Station is automated, and therefore not occupied.

Potential activities on the island, as described by the NPS, include tours of the island provided to visitors by NPS staff, research activities, park maintenance activities, restoration activities at historic buildings associated with the Light Station, and occasional trespassing recreational boaters mooring their boat at the island. The potential for exposure to lead-contaminated soil associated with these activities is described in the Final Toxicological Review for Passage Island (MWH, 2005). It was determined that a NPS employee giving guided tours of the island and a NPS employee performing restoration work to maintain historic structures at the Light Station were the receptors with the highest potential for exposure to lead-contaminated soil.

The NPS offers a maximum of 12 tours per year on Mondays and Fridays from Mid-June through Labor Day. The tours include an approximately two-mile round trip guided hike from the NPS dock to the Light Station, with approximately an hour tour of the Light Station. During the tour of the Light Station, the tour guide is not expected to disturb or otherwise come into significant contact with lead-contaminated soil.

Periodic restoration activities to maintain the historic structures at the Passage Island Light Station occur every three to five years, as funds allow. Examples of recent restoration activities include roof repairs, painting the exteriors of structures, maintenance of drainpipes and drainage, and rehabilitation or rebuilding of outbuildings. The NPS estimates that restoration work might occur over as much as four to six consecutive weeks per season, depending on weather. Workers spend approximately six hours per day outside working on buildings at the Light Station; soil disturbance during most work activities is minimal. It should be noted that restoration work on the exteriors of buildings that produces lead-contaminated dust is not accounted for in the calculation RAOs for lead-contaminated soil described herein. Any restoration activities that are expected to produce lead-contaminated dust should be performed by workers wearing appropriate personal protective equipment (PPE).

Adult Lead Model Parameters

Parameters in the ALM include the 95% percentile blood-lead concentration in a fetus of an exposed female, fetal to maternal blood-lead ratio, biokinetic uptake slope factor, baseline maternal blood-lead concentration and associated standard deviation, soil ingestion rate, absorption fraction, exposure frequency, and averaging time. Default values are recommended for most of these parameter; however, the soil ingestion rate, exposure frequency, and averaging time should be based on site-specific information. The assumptions for these exposure parameters are shown in Table 1.

Table 1
Exposure Parameters for Receptors Exposed to Lead Contaminated Soil
Passage Island Light Station
Passage Island Light Station, Keweenaw County, Michigan

Adult Lead Model Exposure Paramenter	Units	Receptor	
		Park Tour Guide	Light Station Restoration Worker
Exposure Frequency	days / year	12	30
Averaging Time	days / year	90	150
Ingestion Rate	grams / day	0.050	0.050

The exposure frequency of 12 days per year for the tour guide is considered by the NPS to be the maximum number of tours to the site given over a season by a given tour guide. The tour guide was assumed to be exposed to soil at the Passage Island Light Station over an approximate three month period from mid-June through August, and was therefore given an averaging time of 90 days per year. The majority of the tour is on the trail between the dock and the Light Station, so tours do not bring the NPS tour guide in contact with soil at the Light Station for an appreciable time, and the employee does not perform any soil intensive work while at the Light Station. Thus, a soil ingestion rate of 0.050 grams per day is considered conservative.

The exposure frequency of 30 days per year for the restoration worker was based on the assumption that a restoration worker would spend a maximum of six weeks working at the Passage Island Light Station over a season. The restoration worker is also likely to be at the Light Station during the summer months of mid-June through August; however, it is possible that restoration work could occur outside of the tour season. Therefore, the potential for the restoration worker to be on site for the five-month period between May through September was included in the RAO calculation for this receptor. The EPA default soil ingestion rate of 0.050 grams per day was used for the restoration worker. This ingestion rate was derived with considerations for soil exposures outdoors, as well as exposure to soil-derived dust indoors. A 0.100 gram per day soil ingestion rate could be considered a reasonable central tendency estimate of soil ingestion by workers performing soil intensive activities such as digging, and may apply at the Light Station if soil intensive work such as foundation work is performed. In general, based on information from the NPS, activities at the site will not be soil intensive, so the 0.050 grams per day is the most applicable estimate.

REMOVAL ACTION OBJECTIVE

As shown in Table 2, RAOs for the Passage Island Light Station range from 6,700 mg/kg to 10,000 mg/kg.

Table 2
Preliminary Remediation Goals for Lead Contaminated Soil
Passage Island Light Station
Passage Island Light Station, Keweenaw County, Michigan

	Receptor	
	Park Tour Guide	**Light Station Restoration Worker**
Lead Concentration (milligrams per kilogram)	10,000	6,700

As described previously, these RAOs are based on conservative exposure assumptions. The Passage Island Light Station is very remote, and exposure to lead contaminated soil is expected to be minimal for all potential receptors, including NPS employees. However, there is always uncertainty associated with exposure estimates. In the case of the NPS tour guide, exposure estimates are expected to be highly conservative; in the case of the restoration worker, elevated exposure could occur in certain unlikely circumstances, such work on building foundations. Because of this uncertainty, a review of other recent RAO calculations was included in this assessment. A recent evaluation at another Michigan site, Thunder Bay, resulted in RAOs ranging from 4,800 mg/kg to 6,700 mg/kg (MWH, 2011). The upper end of the Thunder Bay RAO range was for a Site Worker, and therefore equivalent to the Passage Island RAO. The low end value which was accepted for use at the site was for a recreational user. Although recreational use of Passage Island is considered trespassing, it cannot be ruled out.

CONCLUSIONS

A soil-lead RAO of 4,800 mg/kg is recommended for the protection of human health associated with surficial soil exposure at the Passage Island Light Station. This value is more conservative than the site-specific RAO of 6,700 mg/kg calculated for a Light Station restoration worker, and thereby accounts for some of the uncertainty associated with exposure parameters used in the ALM, as well as the uncertainty associated with receptor selection.

ATTACHMENTS

Attachment 1 Removal Action Objective Calculation for Passage Island Light Station – NPS Tour Guide

Attachment 2 Removal Action Objective Calculation for Passage Island Light Station – NPS Restoration Worker

REFERENCES

MWH. 2005. Final Toxicological Review for Passage Island. November 2005.

MWH. 2011. Engineering Evaluation / Cost Analysis, Thunder Bay Island Light station, Alpena County, Michigan. June 2011.

United States Environmental Protection Agency [USEPA]. 1994. Memorandum from Elliot P. Laws to Regional Administrators I-X. Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities. OSWER Directive 9355.4-12. August 1994.

USEPA. 2009a. Adult Lead Model Spreadsheet. Online: http://www.epa.gov/superfund/lead/products/ALM_2009.xls.

USEPA. 2009b. Update of the Adult Lead Methodology's Default Baseline Blood Lead Concentration and Geometric Standard Deviation Parameters. OSWER 9200.2-82. June 2009.

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Attachment 1 - Remedial Action Objective Calculation for Passage Island Light Station - NPS Tour Guide

Calculations of Remedial Action Objective (RAO)
U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee
Version date 6/21/09

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
$PbB_{fetal, 0.95}$	95th percentile PbB in fetus	ug/dL	10
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	12
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	90
RAO		**ppm**	**10,078**

Attachment 2 - Remedial Action Objective Calculation for Calculation for Passage Island Light Station - Light Station Restoration Worker

Calculations of Remedial Action Objective (RAO)
U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee
Version date 6/21/09

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
$PbB_{fetal, 0.95}$	95th percentile PbB in fetus	ug/dL	10
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	30
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	150
RAO		**ppm**	**6,719**

Appendix **F**

Applicable or Relevant and Appropriate Requirements Analysis and Correspondence

U.S. Department of Homeland Security

United States Coast Guard

Commanding Officer
United States Coast Guard
Civil Engineering Unit Cleveland

1240 East Ninth Street
Room 2179
Cleveland Ohio 44199-2060
Staff Symbol:ER
Phone: (216) 902-6255
Fax: (216) 902-6277
Email: Frank.A.Blaha@uscg.mil

11000

MAY 25 2011

Michigan Department of Environmental Quality
Environmental Response Division
Mr. Bob Delaney
525 West Allegan
Constitution Hall, Third Floor SW
Lansing, Michigan 48909

Dear Mr. Delaney:

The purpose of this letter is to request the identification of specific requirements that are considered applicable or relevant and appropriate (ARAR) for the investigation and possible remediation of lead in soil at the United States Coast Guard (USCG) Passage Island Light Station, located on Passage Island, Keweenaw County, Michigan located within the Isle Royale National Park in northern Lake Superior. As provided in Executive Order 12580 and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), the USCG is acting as the lead agency for removal response actions planned at the USCG Passage Island Light Station. At this time, the USCG anticipates remediation could include localized removal of surface soils. The reasonably anticipated future use of the site will be recreational as a part of the Isle Royale National Park.

This request is made pursuant to 40 CFR Section 300.400 (g) (5) of the NCP. As provided in the NCP, we anticipate a response from you within 30 working days of the receipt of this letter. The ARARs provided will be addressed in an Engineering Evaluation and Cost Analysis (EE/CA) to be completed and made available for public review and comment prior to remediation. It is our current intention to complete remediation in summer 2011. Please let me know if there are questions. We appreciate your prompt attention to this matter.

Sincerely,

Frank A. Blaha
Chief, Environmental Compliance
By direction of the Commanding Officer

Copy: SILC EMD
Mr. Owen Thompson, USEPA Region V

Appendix **G**

Endangered Species Assessment and Correspondence

STATE OF MICHIGAN

DEPARTMENT OF NATURAL RESOURCES

LANSING

JENNIFER M. GRANHOLM
GOVERNOR

REBECCA A. HUMPHRIES
DIRECTOR

October 11, 2004

OPTIONAL FORM 99 (7-90)

FAX TRANSMITTAL # of pages ▶ 5

To ERICA GEASLER	From LYNN KELLER
Dept./Agency MNH	Phone # 216-902-6258
Fax # 248-344-0217	Fax # -6277

NSN 7540-01-317-7388 5099-101 GENERAL SERVICES ADMINISTRATION

BMC A. Martin
U.S. Coast Guard Station Portage
P.O. Box 350
Dollar Bay, MI 49922-0350

Dear BMC Martin,

Enclosed is Endangered Species Permit # 1615, issued in your name. This permit replaces the permit originally issued on August 31, 2004. I have made some modifications to the original permit according to the requests of Lynn M. Keller. Please destroy the original permit.

Sincerely,

Todd C. Hogrefe

Todd C. Hogrefe, Endangered Species Coordinator
Natural Heritage Program, Wildlife Division
517-373-1263
hogrefet@michigan.gov

TCH:meh
Enclosure

Cc: Lynn M. Keller

STANDARD PERMIT CONDITIONS

A. All specimens authorized for collection under this Permit shall be deposited in the collection of an approved public educational or research institution prior to Permit expiration.

B. None of the specimens collected shall become part of a private collection or private property.

C. This permit does not allow or grant the right of trespass. Projects shall not take place on any private or public lands without permission from the owner or administrator of such lands.

D. This permit does not provide authorization to circumvent any federal, state, or local laws and ordinances.

E. Additionally, federal permits may be required for activities affecting federally listed threatened or endangered species and/or migratory birds. Contact the U. S. Fish and Wildlife Service at 2651 Coolidge Road, East Lansing, MI 48823.

F. The activities covered under this Permit are not transferable to another person unless specifically authorized.

G. Unless otherwise noted, within 10 days of the expiration of this Permit, the holder is required to file a report detailing the locations of any threatened and endangered species encountered and the number and disposition of specimens handled. Annual reports for multi-year permits are due at the end of each calendar year.

H. A person conducting any activities authorized by this permit shall carry a copy of this permit and shall produce a copy of this permit upon request of a Department of Natural Resources employee or law enforcement officer.

USCG Passage Island Light Station
T/ES Permit # 1615

WILDLIFE DIVISION
DEPARTMENT OF NATURAL RESOURCES
PO BOX 30444
LANSING MICHIGAN 48909-7944

Permit Number: 1615

Date Issued: 08/31/2004

THREATENED/ENDANGERED SPECIES PERMIT

BY THE AUTHORITY OF PART 365, ENDANGERED SPECIES PROTECTION, OF THE NATURAL RESOURCE AND ENVIRONMENTAL PROTECTION ACT, 1994 PA 451, AND THE RULES AND REGULATIONS THEREUNDER, PERMISSION IS HEREBY GRANTED TO:

BMC A. Martin
U.S. Coast Guard Station Portage
P.O. Box 350
Dollar Bay, MI 49922-0350

To conduct the scientific activities listed under special conditions on the threatened/endangered species listed below. All activities are subject to the standard permit conditions on the back of this permit

SPECIES: prickly saxifrage (Saxifraga tricuspidata) and other state threatened or endangered plants within the

THIS PERMIT SHALL BE VALID ONLY ON THE FOLLOWING LANDS/LOCATIONS: areas of lead contamination around the former U.S. Coast Guard Passage Island Light Station, Keweenaw County
contamination area

SPECIAL CONDITIONS:

In addition to the standard requirements listed on the back of this permit:

1) For purposes of human safety, permitted is the collection and off-site disposal of state threatened or endangered plants occurring within the area of lead contamination.

2) Efforts should be made to minimize impacts to state-listed plants outside the area of lead contamination. State-listed plants outside the contamination area should be flagged or fenced to faciliate recognition and avoidance by project personnel. Foot traffic, equipment operation, and equipment staging should be minimized in areas where state-listed plants occur outside of the project footprint.

3) Equipment should be power-washed prior to transport to Passage Island to prevent introduction of exotic plant species.

4) This permit does not require the reporting outlined under standard permit condition G.

SUBPERMITTEES: U.S. Coast Guard (USCG) personnel under direction of BMC A.R. Martin; USCG Civil Engineering Unit Cleveland personnel; National Park Service personnel; employees of MWH Americas and other hired contractors

UNLESS REVOKED SOONER, THIS PERMIT EXPIRES ON: 07/31/2005

THE DIRECTOR OF NATURAL RESOURCES BY: Todd C Hogue
ENDANGERED SPECIES PROGRAM COORDINATOR

PR 2013-3 (Rev. 3/00)

State-Listed Species Within Footprint of USCG Lead-Contaminated Soil Removal Project at Passage Island

Rock Whitlow-grass *(Draba arabisans)* (Species of Concern)

An estimated 350 plants are located within and adjacent to the soil removal footprint, surrounding the lighthouse keeper's residence (within 15' of the residence on all sides.)

Approximately 10 plants are located along the walkway west of the lighthouse keeper's residence, near the antenna.

Prickly saxifrage *(Saxifraga tricuspidata)* (State Threatened)

An estimated 10 plants are located along the walkway and tramway ramp. Although this is outside the soil removal area, it is an area that is likely to be damaged as a result of foot traffic or staging because it is the major path to the lighthouse keeper's residence.

Note: No areas outside of the 400mg/kg lead impact footprint were intensively surveyed for state-listed plant species (except for the area near the tramway and walkways.) If other areas off the trail and outside of the removal footprint are proposed to be used, they will require surveys.

Recommendations:

Protective pads over *Saxifraga tricuspidata* near tram and walkways may reduce damage to the plants.

Flagging project footprint will reduce likelihood of damage to listed species beyond the work area.

Equipment should be power-washed prior to transport to Passage Island to prevent import of exotic seeds that could indirectly impact state listed species outside of work footprint if exotic species become established.

(Data on species and locations taken from "Inventory and Establishment of Monitoring Programs For Special Floristic Elements at Isle Royale National Park, Michigan.", Judziewicz, 2004, and from 2004 field surveys.)

Jean Battle
Natural Resource Specialist
Isle Royale National Park

Protection for Plants in Michigan

Numerous plants in Michigan are protected by state law. Plants may be protected because they're very rare or to prevent overharvest. Michigan legislation that protects plants includes Parts 365 (Endangered Species Protection) and 529 (Christmas Trees, Boughs, Plants, and Other Trees) of P.A. 451 of 1994, and the Michigan Ginseng Act (Act 184 of 1994).

Part 365 (Endangered Species Protection) of P.A. 451 of 1994 protects all plants listed as threatened and endangered in Michigan. A Species can be listed if it has become rare in Michigan due to habitat loss, if Michigan is along the edge of it's range, or simply by overharvest. Part 365 makes it unlawful to collect, pick, cut, dig up, or destroy any threatened or endangered plant in Michigan without a permit from the MDNR. While not protected by Part 365, species listed as "special concern" should be considered rare and be treated accordingly.

Part 529 (Christmas Trees, Boughs, Plants, and Other Trees) of P.A. 451 of 1994 makes it unlawful to possess or transport several species of trees, boughs, wildflowers, shrubs, and mosses without a bill of sale or some other evidence of title. While many of the species protected by Part 529 are not rare, this legislation is in place to prevent the overharvest or irresponsible take of these species.

The Michigan Ginseng Act was passed in 1994 to regulate the harvest, sale, and distribution of American Ginseng in Michigan. This act covers both cultivated and wild ginseng, and makes it unlawful to take American ginseng from the wild without a permit from the MDNR.

Related Co
>MNFI Rar Reference
>Michigan's (An Overv
>Michigan's Plants
>Michigan's List of Enc Threatene

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION ACT (EXCERPT)
Act 451 of 1994

324.36505 Prohibitions; exceptions.

Sec. 36505. (1) Except as otherwise provided in this part, a person shall not take, possess, transport, import, export, process, sell, offer for sale, buy, or offer to buy, and a common or contract carrier shall not transport or receive for shipment, any species of fish, plants, or wildlife appearing on the following lists:

(a) The list of fish, plants, and wildlife indigenous to the state determined to be endangered or threatened within the state pursuant to section 36503 or subsection (3).

(b) The United States list of endangered or threatened native fish and wildlife.

(c) The United States list of endangered or threatened plants.

(d) The United States list of endangered or threatened foreign fish and wildlife.

(2) A species of fish, plant, or wildlife appearing on any of the lists delineated in subsection (1) which enters the state from another state or from a point outside the territorial limits of the United States may enter, be transported, possessed, and sold in accordance with the terms of a federal permit issued pursuant to section 10 of the endangered species act of 1973, 16 USC 1539, or an applicable permit issued under the laws of another state.

(3) The department may, by rule, treat any species as an endangered species or threatened species even though it is not listed pursuant to section 36503, if it finds any of the following:

(a) The species so closely resembles in appearance, at the point in question, a species which is listed pursuant to section 36503 that enforcement personnel would have substantial difficulty in attempting to differentiate between the listed and unlisted species.

(b) The effect of the substantial difficulty in differentiating between a listed and an unlisted species is an additional threat to an endangered or threatened species.

(c) The treatment of an unlisted species will substantially facilitate the enforcement and further the intent of this part.

(4) The department may permit the taking, possession, purchase, sale, transportation, exportation, or shipment of species of fish, plants, or wildlife which appear on the state list of endangered or threatened species compiled pursuant to section 36503 and subsection (3) for scientific, zoological, or educational purposes, for propagation in captivity of such fish, plants, or wildlife to ensure their survival.

(5) Upon good cause shown and where necessary to alleviate damage to property or to protect human health, endangered or threatened species found on the state list compiled pursuant to section 36503 and subsection (3) may be removed, captured, or destroyed, but only as authorized by a permit issued by the department pursuant to part 13. Carnivorous animals found on the state list may be removed, captured, or destroyed by any person in emergency situations involving an immediate threat to human life, but the removal, capture, or destruction shall be reported to the department within 24 hours of the act. *

(6) This section does not prohibit any of the following:

(a) The importation of a trophy under a permit issued pursuant to section 10 of the endangered species act of 1973, 16 USC 1539, which is not for resale and which was lawfully taken in a manner permitted by the laws of the state, territory, or country where the trophy was caught, taken, or killed.

(b) The taking of a threatened species when the department has determined that the abundance of the species in the state justifies a controlled harvest not in violation of federal law.

(c) Subject to any permits that may be required by the department, the possession, transfer, transportation, importation, or exportation or the transport or receipt for shipment by a common or contract carrier of a raptor or the captive-bred progeny of a raptor, a raptor egg, or raptor semen acquired in accordance with applicable state and federal laws and regulations which allow raptors, raptor eggs, or raptor semen to be used in falconry or in the captive propagation of raptors for use in falconry.

(d) Subject to any permits that may be required by the department, the selling, offering for sale, buying, or offering to buy a raptor that was captive-bred or semen from a raptor that was captive-bred in accordance with applicable state and federal laws and regulations which allow raptors or raptor semen to be used in falconry or in captive propagation of raptors for use in falconry.

History: Add. 1995, Act 59, Imd. Eff. May 24, 1995;—Am. 1998, Act 470, Imd. Eff. Jan. 4, 1999;—Am. 2004, Act 325, Imd. Eff. Sept. 10, 2004.

Popular name: Act 451

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Appendix **H**

Cost Estimate

Cost Estimate for Soil Removal
USCG Passage Island Light Station
Keweenaw County, Michigan

Site Name: Passage Island Light Station Proj. Name: CERCLA Removal Action *TASK*	*TASK DESCRIPTION*	*Subtotal All Costs*	*G&A*	*Profit*	*Total Task Price*
5	Removal Action Work Plan (RAWP)	$11,586.97	$2,027.72	$1,361.47	$14,976.16
5A	Draft RAWP				
5B	RTCs on Draft RAWP				
5C	Draft Final RAWP				
5D	RTCs on Draft Final RAWP				
5E	Final RAWP				
6	Removal Action	$663,530.52	$116,117.84	$77,964.84	$857,613.19
6A	MWH Mob/Demob				
6B	Soil Removal and Disposal				
7	Removal Action Completion Report (RACR)	$10,387.48	$1,817.81	$1,220.53	$13,425.81
7A	Draft RACR				
7B	RTCs on Draft RACR				
7C	Draft Final RACR				
7D	RTCs on Draft Final RACR				
7E	Final RACR				
8	Adminstrative Record (AR)	$4,773.16	$835.30	$560.85	$6,169.31
8A	AR compilation				
9	Project Management	$41,332.46	$7,233.18	$4,856.56	$53,422.20
9A	Kickoff Meeting				
9B	Monthly Progress Reports				
9C	Status Meetings - 24 monthly meetings				
9D	Project Schedule				
9E	Invoicing				
9F	Closeout				
10	Contingency	$54,000.00	$9,450.00	$6,345.00	$69,795.00
10A	Contingency				
	TOTALS:	$782,042.96	$136,857.52	$91,890.05	$1,010,790.53

Cost Estimate for Soil Removal
USCG Passage Island Light Station
Keweenaw County, Michigan

Site Name: Passage Island Light Station Proj. Name: CERCLA Removal Action		Labor 2011							
TASK	*TASK DESCRIPTION*	*Program Mgr* $62.16	*Project Mgr* $46.95	*Sr. Technical Specialist* $68.34	*Staff Engineer* $37.59	*Risk Assessor* $41.35	*CAD Drafter* $38.45	*Procurement Specialist* $35.45	*Clerical* $20.08
5	Removal Action Work Plan (RAWP)								
5A	Draft RAWP								
5B	RTCs on Draft RAWP								
5C	Draft Final RAWP								
5D	RTCs on Draft Final RAWP								
5E	Final RAWP								
6	Removal Action								
6A	MWH Mob/Demob								
6B	Soil Removal and Disposal								
7	Removal Action Completion Report (RACR)								
7A	Draft RACR								
7B	RTCs on Draft RACR								
7C	Draft Final RACR								
7D	RTCs on Draft Final RACR								
7E	Final RACR								
8	Adminstrative Record (AR)								
8A	AR compilation								
9	Project Management	2	41		74				12
9A	Kickoff Meeting	1	1		2				
9B	Monthly Progress Reports		16		28				
9C	Status Meetings - 24 monthly meetings		16		28				
9D	Project Schedule	1	2		4				
9E	Invoicing		6		12				12
9F	Closeout								
10	Contingency								
10A	Contingency								
	TOTALS:	2	41		74				12

Cost Estimate for Soil Removal
USCG Passage Island Light Station
Keweenaw County, Michigan

Site Name: Passage Island Light Station Proj. Name: CERCLA Removal Action		Labor 2012									Total Labor Hours	Total Unburdened Labor Price	Total Burdened Labor Price
TASK	TASK DESCRIPTION	Program Mgr $64.27	Project Mgr $48.54	Sr. Technical Specialist $70.67	Staff Engineer $38.87	Health & Safety Specialist $52.98	CAD Drafter $39.76	Procurement Specialist $36.66	Contract Administrator $28.76	Clerical $20.77			
5	Removal Action Work Plan (RAWP)	1	12	11	54	5	22			6	111.00	$4,787.34	$10,105.79
5A	Draft RAWP	1	4	10	32	4	16			2			
5B	RTCs on Draft RAWP		2	1	6								
5C	Draft Final RAWP		4		8	1	4						
5D	RTCs on Draft Final RAWP		1		4								
5E	Final RAWP		1		4		2			4			
6	Removal Action		48		224			32	44		348.00	$13,475.36	$28,445.68
6A	MWH Mob/Demob				72								
6B	Soil Removal and Disposal		48		152			32	44				
7	Removal Action Completion Report (RACR)	1	12	5	58		22			6	104.00	$4,253.90	$8,979.73
7A	Draft RACR	1	4	4	32		16			2			
7B	RTCs on Draft RACR		2	1	6								
7C	Draft Final RACR		4		12		4						
7D	RTCs on Draft Final RACR		1		4								
7E	Final RACR		1		4		2			4			
8	Adminstrative Record (AR)	1	8		32					12	53.00	$1,945.67	$4,107.19
8A	AR compilation	1	8		32					12			
9	Project Management	3	83		126			28	34	34	437.00	$16,901.64	$35,678.35
9A	Kickoff Meeting												
9B	Monthly Progress Reports		30		46								
9C	Status Meetings - 24 monthly meetings		30		46								
9D	Project Schedule	2	6		12								
9E	Invoicing		11		22					22			
9F	Closeout	1	6					28	34	12			
10	Contingency												
10A	Contingency												
	TOTALS:	6	163	16	494	5	44	60	78	58	1,053	$41,363.91	$87,316.73

Cost Estimate for Soil Removal
USCG Passage Island Light Station
Keweenaw County, Michigan

Site Name: Passage Island Light Station Proj. Name: CERCLA Removal Action		*Subcontracted Services*			*Total Subcont. Price*
TASK	*TASK DESCRIPTION*	*Soil Removal*	*Analytical*	*Surveyor*	
5	Removal Action Work Plan (RAWP)				
5A	Draft RAWP				
5B	RTCs on Draft RAWP				
5C	Draft Final RAWP				
5D	RTCs on Draft Final RAWP				
5E	Final RAWP				
6	Removal Action	$592,452.00	$23,360.00	$2,775.00	$618,587.00
6A	MWH Mob/Demob				
6B	Soil Removal and Disposal	$592,452.00	$23,360.00	$2,775.00	
7	Removal Action Completion Report (RACR)				
7A	Draft RACR				
7B	RTCs on Draft RACR				
7C	Draft Final RACR				
7D	RTCs on Draft Final RACR				
7E	Final RACR				
8	Adminstrative Record (AR)				
8A	AR compilation				
9	Project Management				
9A	Kickoff Meeting				
9B	Monthly Progress Reports				
9C	Status Meetings - 24 monthly meetings				
9D	Project Schedule				
9E	Invoicing				
9F	Closeout				
10	Contingency	$54,000.00			$54,000.00
10A	Contingency	$54,000.00			
	TOTALS:	$592,452.00	$23,360.00	$2,775.00	$618,587.00

Cost Estimate for Soil Removal
USCG Passage Island Light Station
Keweenaw County, Michigan

Site Name: Passage Island Light Station Proj. Name: CERCLA Removal Action		*Travel Costs*											*Total Travel Price*
		Water Taxi		Lodging (ISRO)		Lodging		Per Diem			Field Vehicle		
TASK	*TASK DESCRIPTION*	Trips	Cost/Trip $550.00	Days	Cost/Day $250.00	Days	Cost/Day $84.00	Days	Cost/Day $46.00	Airfare $600.00	Days	Cost/Day *$75.00*	
5	Removal Action Work Plan (RAWP)												
5A	Draft RAWP												
5B	RTCs on Draft RAWP												
5C	Draft Final RAWP												
5D	RTCs on Draft Final RAWP												
5E	Final RAWP												
6	Removal Action	1	$550.00	14	$3,500.00	4	$336.00	18	$828.00	$600.00	18	$1,350.00	$7,164.00
6A	MWH Mob/Demob	1		4		2		8		$600.00	8		
6B	Soil Removal and Disposal			10		2		10			10		
7	Removal Action Completion Report (RACR)												
7A	Draft RACR												
7B	RTCs on Draft RACR												
7C	Draft Final RACR												
7D	RTCs on Draft Final RACR												
7E	Final RACR												
8	Adminstrative Record (AR)												
8A	AR compilation												
9	Project Management												
9A	Kickoff Meeting												
9B	Monthly Progress Reports												
9C	Status Meetings - 24 monthly meetings												
9D	Project Schedule												
9E	Invoicing												
9F	Closeout												
10	Contingency												
10A	Contingency												
	TOTALS:	1	$550.00	14	$3,500.00	4	$336.00	18	$828.00	$600.00	18	$1,350.00	$7,164.00

Cost Estimate for Soil Removal
USCG Passage Island Light Station
Keweenaw County, Michigan

Site Name: Passage Island Light Station Proj. Name: CERCLA Removal Action		*Other Direct Costs (ODCs)*							*Total Total ODC Price*
		Color Copies		*Associated*	*Federal*	*Sample*	*CADD*	*Equipment*	
TASK	*TASK DESCRIPTION*	# of Copies	Cost Per Copy $5.00	*Project Costs*	*Express* Boxes of Documents	*Shipment*	*Operation*	*Cost*	
5	Removal Action Work Plan (RAWP)	7	$35.00	$1,111.94	$50.00		$284.24		$1,481.18
5A	Draft RAWP			$723.81			$206.72		
5B	RTCs on Draft RAWP			$94.41					
5C	Draft Final RAWP			$178.33			$51.68		
5D	RTCs on Draft Final RAWP								
5E	Final RAWP	7		$115.39	$50.00		$25.84		
6	Removal Action			$4,363.84		$300.00		$4,670.00	$9,333.84
6A	MWH Mob/Demob			$1,007.04					
6B	Soil Removal and Disposal			$3,356.80		$300.00		$4,670.00	
7	Removal Action Completion Report (RACR)	7	$35.00	$1,038.51	$50.00		$284.24		$1,407.75
7A	Draft RACR			$618.91			$206.72		
7B	RTCs on Draft RACR			$94.41					
7C	Draft Final RACR			$209.80			$51.68		
7D	RTCs on Draft Final RACR								
7E	Final RACR	7		$115.39	$50.00		$25.84		
8	Adminstrative Record (AR)	7	$35.00	$555.97	$75.00				$665.97
8A	AR compilation	7		$555.97	$75.00				
9	Project Management			$5,654.11					$5,654.11
9A	Kickoff Meeting			$41.96					
9B	Monthly Progress Reports			$1,594.48					
9C	Status Meetings - 24 monthly meetings			$1,594.48					
9D	Project Schedule			$419.60					
9E	Invoicing			$1,153.90					
9F	Closeout			$849.69					
10	Contingency								
10A	Contingency								
	TOTALS:	21	105	$12,724.37	$175.00	$300.00	$568.48	$4,670.00	$18,542.85