Draft

DRAFT
Hamilton Reservoir
Dredge Feasibility Report

Holland, Massachusetts

November 30, 2018

MILONE & MACBROOM®

Engineering | Planning | Landscape Architecture | Environmental Science

Draft

DRAFT
Hamilton Reservoir
Dredge Feasibility Report

Holland, Massachusetts
November 30, 2018

Prepared for:
Town of Holland
27 Sturbridge Road
Holland, Massachusetts 01521

MMI #6291-01-07

Prepared by:
MILONE & MACBROOM, INC.
99 Realty Drive
Cheshire, Connecticut 06410
(203) 271-1773
www.mminc.com

Copyright 2018 Milone & MacBroom, Inc.

TABLE OF CONTENTS

1.0 INTRODUCTION 1
1.1 Background 1
1.2 Historical Context 5
1.3 Definition of Project Goals 5
1.4 Overview of Work Scope 6
1.5 Review of Existing Data, Mapping, and Reports 6
1.6 Identification of Existing Water Quality Issues 7
1.7 Previous Watershed and Reservoir Study Recommendations 7
2.0 BATHYMETRIC SURVEY 9
2.1 Bathymetric Survey Methods 9
2.2 Survey Results 9
2.2.1 Survey Observations 9
2.2.2 Other Benthic Features 10
2.2.3 Bedrock 10
3.0 SEDIMENT SAMPLING AND ANALYSIS 11
3.1 Sediment Sampling 11
3.2 Sediment Analysis 13
3.2.1 Physical Characterization and Results 13
3.2.2 Chemical Analysis and Results 15
4.0 ASSESSMENT OF DREDGING FEASIBILITY 17
4.1 Preliminary Sediment Removal Volumes 17
4.2 Identification and Assessment of Potential Dredging Methods 18
4.2.1 Conventional Dry Dredging 18
4.2.2 Clamshell Dredging 20
4.2.3 Dragline Dredging 20
4.2.4 Hydraulic Dredging 21
4.3 Evaluation of Water Handling, Control, and Drawdown Capabilities 22
4.4 Causeway Culvert 22
4.5 Recommendation 23
4.6 Dredge Sediment Quality and Potential Use, Reuse and Disposal Options 23
4.7 Dredging and Restoration Concept Plans 24

Draft

5.0 RESTORATION OPPORTUNITIES 25
5.1 Submerged and Floating Aquatic Vegetation 25
5.2 Fishery Habitat Restoration 26
5.3 Informational and Educational Opportunities 26
6.0 COSTS, FUNDING, AND PERMITTING REQUIREMENTS 27
6.1 Preliminary Construction Cost Opinions 27
6.2 Project Funding Mechanisms and Sources 27
6.3 Permit Requirements and Project Scheduling 27
6.3.1 Permit Needs 27
6.3.2 Project Scheduling 28

LIST OF FIGURES

Figure 1-1 USGS Location Map 2
Figure 1-2 Tributary Map 4
Figure 1-3 Watershed Map 5
Figure 3-1 12

LIST OF TABLES

Table 3-1 Summary of Estimated Sediment Depths by Sample Location 11
Table 3-2 Summary of Sediment Samples by Location 13
Table 4-1 Sediment Removal Volume Estimates to Deepen Parts of Hamilton Reservoir to 8, 10, and/or 12 feet 18
Table 4-2 Total Nitrogen, Phosphorous, and Carbon Results Summary 24
Table 6-1 List of Potentially Required Permits 28

APPENDICES

Historical Mapping ..... Appendix A
Previous Data, Maps, and Reports References ..... Appendix B
Side Scan Sonar Maps ..... Appendix C
Interpretive Bedrock Geology and Surficial Geology Maps ..... Appendix D
Sediment Core Logs ..... Appendix E
Sediment Lab Results ..... Appendix F
Concept Dredge Plans ..... Appendix G
Preliminary Engineer's Opinion of Probable Construction Costs ..... Appendix H

Draft

1.0 INTRODUCTION

The town has retained Milone & MacBroom, Inc. (MMI) to complete a dredging feasibility study for Hamilton Reservoir located in Holland, Massachusetts. The Town of Holland (the town) would like to increase the flood capacity, recreational uses, and ecological health of Hamilton Reservoir. Restoration of the reservoir is important to the health of the aquatic community and the town's community identity and financial stability. This feasibility study has been prepared in conjunction with the following stakeholders including the Town of Holland, town Board of Selectmen, Lake Oversight Committee (LOC), and the Friends of Hamilton Reservoir Association, Inc.

1.1 Background

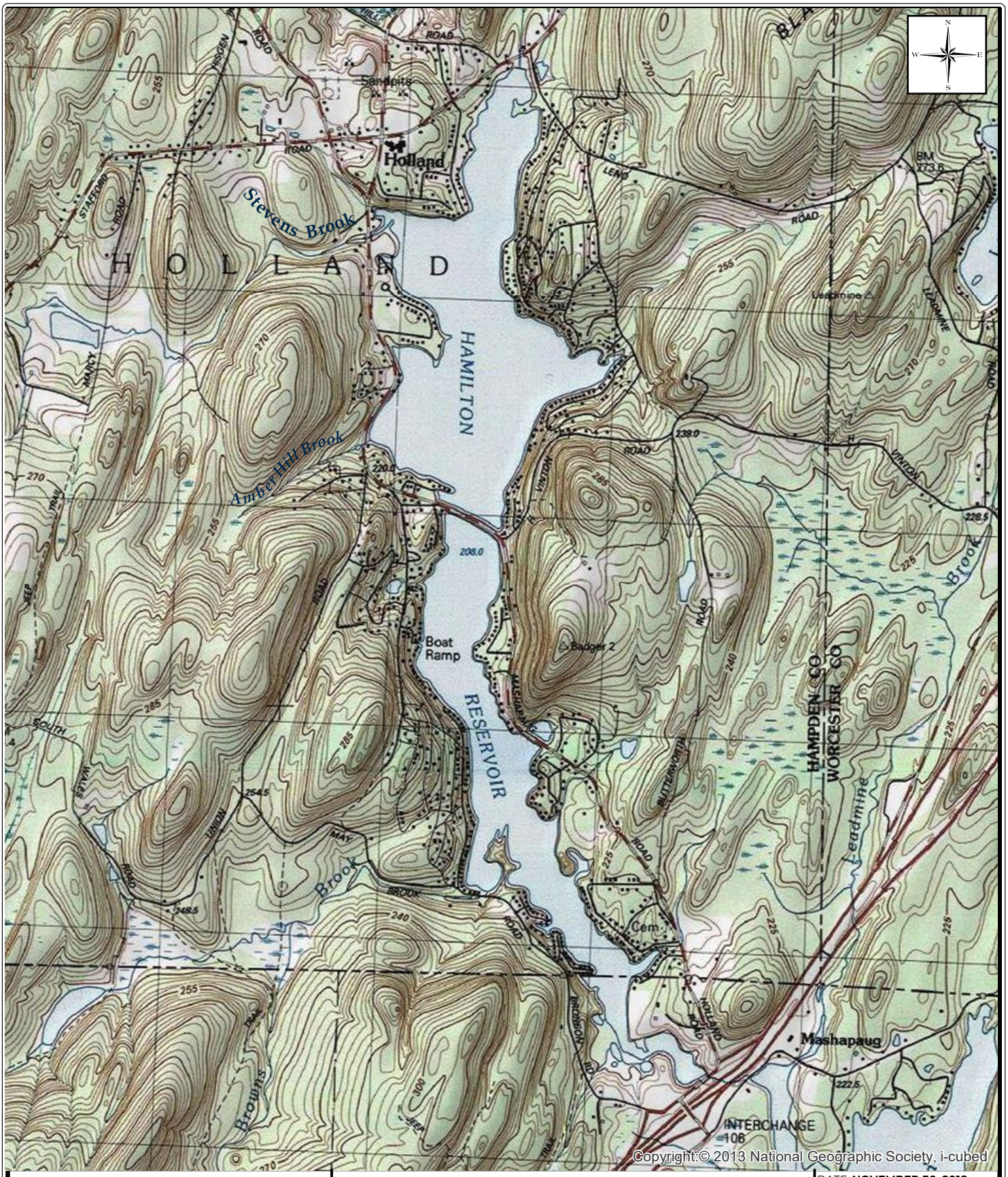
Hamilton Reservoir is a 413-acre recreational impoundment located principally in Holland, Massachusetts. Holland is located in south-central Massachusetts at the intersection of the Massachusetts Turnpike and Interstate 84. A portion of the reservoir extends over the state border into Union, Connecticut (see Figure 1-1). The reservoir is an impoundment on the Quinebaug River, which flows through the reservoir and later combines with the French and Middle Rivers to form the Thames River, which flows southward through Connecticut into Long Island Sound.

Hamilton Reservoir is formed via a combined earthen fill embankment and concrete spillway. The dam spillway is an ogee weir structure that is approximately 150 linear feet long and is approximately 11 feet high. The dam discharges water to the Quinebaug River via the spillway and two 12-inch-square low-level outlet control structures located along the western end of the dam. In addition, the dam has a 4-foot-high by 2-foot-wide sluice gate that is manually controlled. MMI did not complete a formal dam inspection as part of this study; however, based on previous dam inspections by others, the dam is in good condition. Water discharges under Sturbridge Road via three 36-inch-diameter metal pipes and a 17-foot-wide concrete box culvert.

Existing earthen dam with concrete ogee weir spillway located at north end of reservoir

Draft

MXD: Y:\6291-01\Maps\Figure 1-1 - Hamilton Reservoir_USGS.mxd



MILONE & MACBROOM
1350 Main Street, Suite 1012
Springfield,Massachusetts
(413) 241-6920
www.mminc.com

USGS LOCATION MAP

HAMILTON RESERVOIR DREDGING FEASIBILITY STUDY

HOLLAND, MA

SOURCE: MASS DEP, USGS, CT DEEP

DATE: **NOVEMBER 30, 2018**
SCALE: **1"=2000'**
PROJ. NO.: **6291-01**

DESIGNED	DRAWN	CHECKED
HLP	**HLP**	**MJS**

DRAWING NAME:

FIG. 1-1

Copyright Milone & MacBroom, Inc - 2018

The reservoir has varying water depths ranging from a few feet near the shore to approximately 20 feet deep in the former location of Mud Pond. Most of the reservoir has water depths ranging between 4 to 10 feet deep. The reservoir is divided into north and south basins by a man-made causeway. A 9-foot by 11.5-foot corrugated metal pipe arch located under the causeway hydrologically connects the north and south basins. The causeway spans the width of the reservoir. The size of the causeway culvert is restricting flow between the north and south basins. This restriction causes the south basin to act as a sediment catch for the north basin.

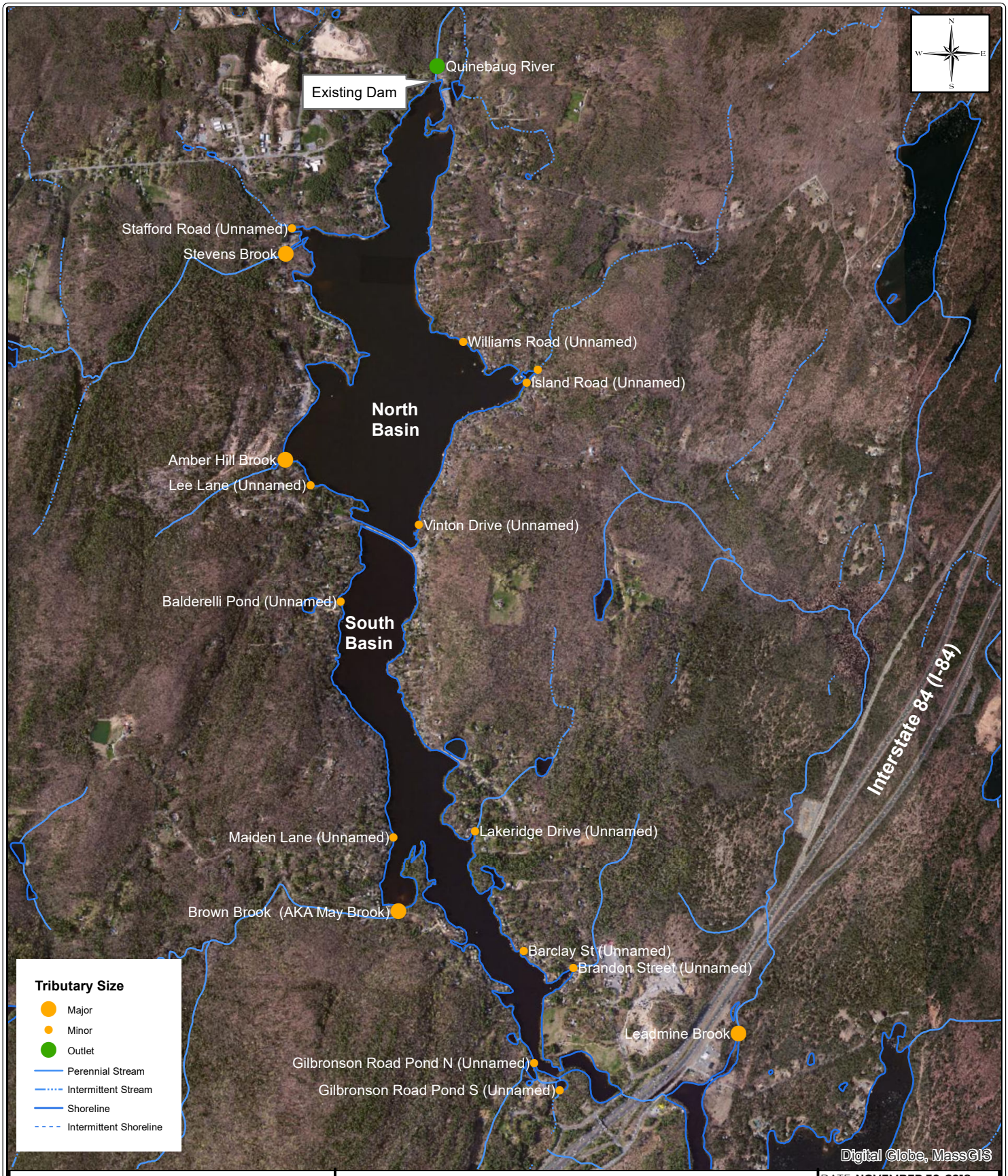
Hamilton Reservoir has four named brooks flowing into it (see Figure 1-2). Leadmine Brook, the largest of the tributaries, is located along the south shoreline of the south basin reservoir and discharges into the reservoir through Mashapaug Pond. Other named tributaries located along the western shoreline include Brown's Brook (also known as May Brook), which flows into the south basin, and Stevens Brook, which flows into the north basin. Amber Hill Brook, the smallest named tributary, flows from the west shoreline into the north basin.

The reservoir is an important natural resource and popular recreational area used extensively for recreation during the summer months. It is surrounded by seasonal and permanent lake residences and small pockets of undeveloped land along the shoreline. The reservoir provides many critical functions to the Holland community including flood flow storage and protection, aesthetic value, warm-water fishery habitat, wildlife habitat, boating, swimming, water skiing, summer and winter fishing, community value, and economic support in the form of taxes and tourism. According to the Natural Heritage and Endangered Species Program mapping, the reservoir is not located within an estimated or priority habitat for rare, threatened, and/or endangered species.

The approximately 17-square-mile watershed (Subregional Basin No. 3701-01) of Hamilton Reservoir is lightly developed (see Figure 1-3) with a network of both public and privately owned roads surrounding the reservoir. Many of the roads consist of dirt (i.e., sand), which has contributed to the sedimentation that has caused the reservoir to gradually fill in, impairing water quality and recreational uses. Open water areas are becoming increasingly shallower, and use in some areas is dwindling, which can in turn facilitate proliferation of invasive aquatic plant species. Sedimentation of the reservoir poses a threat to the health of the aquatic community and the town's community identity and financial stability.

Draft

MXD: Y:\6291-01\Maps\Figure 1-2 - Hamilton Reservoir_Tributaries_.mxd



MILONE & MACBROOM

1350 Main Street, Suite 1012
Springfield,Massachusetts
(413) 241-6920
www.mminc.com

TRIBUTARY MAP

HAMILTON RESERVOIR DREDGING FEASIBILITY STUDY

HOLLAND, MA

SOURCE: 2004 AERIAL PHOTO, CTDEEP, 2006

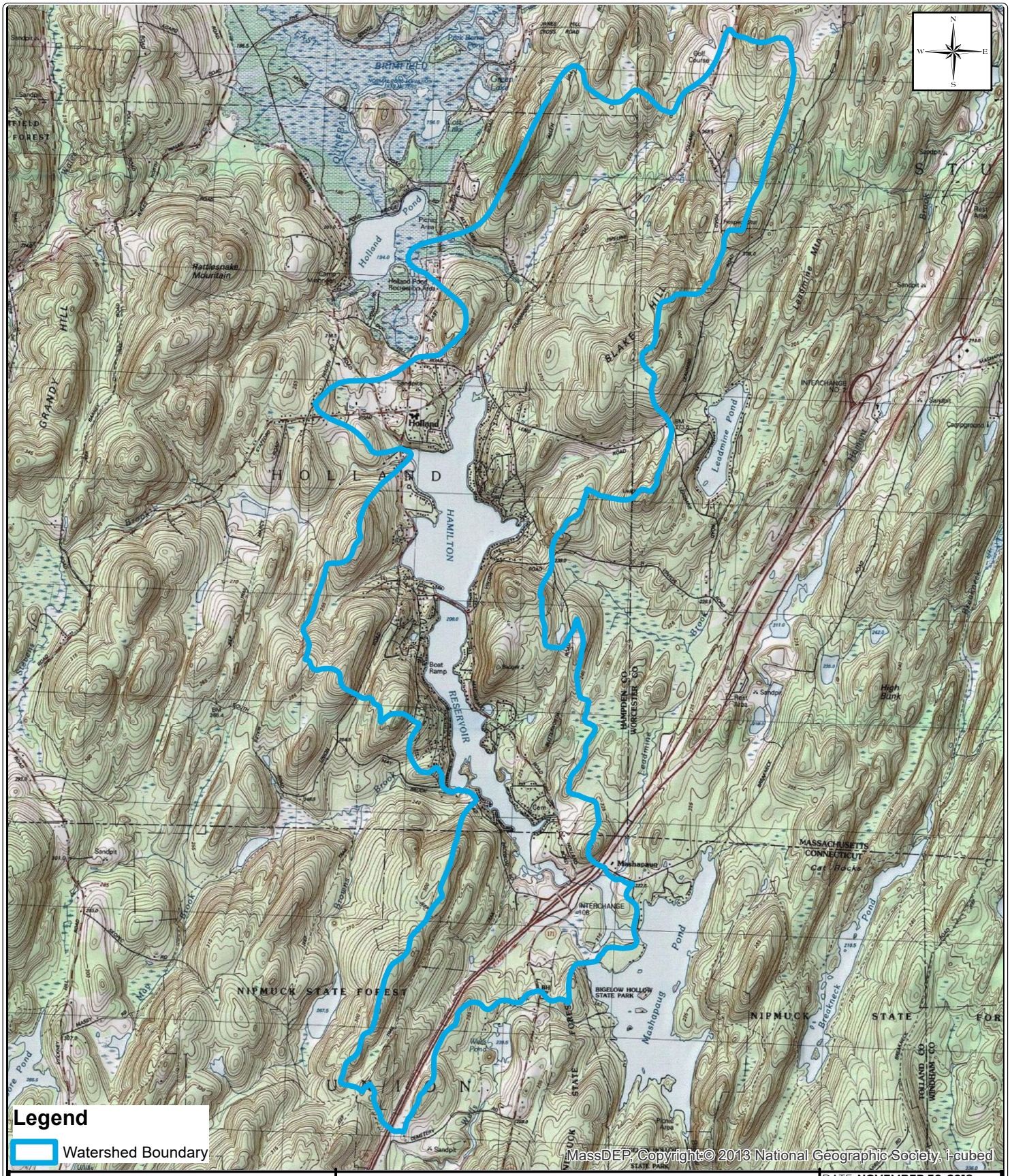
DATE: **NOVEMBER 30, 2018**		
SCALE: **1"=2000'**		
PROJ. NO.: **6291-01**		
DESIGNED **HLP**	DRAWN **HLP**	CHECKED **MJS**

DRAWING NAME:

FIG. 1-2

Copyright Milone & MacBroom, Inc - 2018

MXD: Y:\6291-01\Maps\Hamilton Reservoir_Drainage Basins.mxd



MILONE & MACBROOM

1350 Main Street, Suite 1012
Springfield,Massachusetts
(413) 241-6920
www.mminc.com

DRAINAGE BASIN MAP

HAMILTON RESERVOIR DREDGIN FEASIBILITY STUDY

HOLLAND, MA

SOURCE: 2013, NATIONAL GEOGRAPHIC SOCIETY

DATE: **NOVEMBER 30, 2018**			
SCALE: **1"=4,000'**			
PROJ. NO.: **6291-01**			
DESIGNED **HLP**	DRAWN **HLP**	CHECKED **MJS**	

DRAWING NAME:

FIG. 1-3

Copyright Milone & MacBroom, Inc - 2018

1.2 Historical Context

MMI found historical maps of the Town of Holland dating back to 1855. These maps show land formations and the original Quinebaug River and associated floodplain wetland systems that are now submerged under the Hamilton Reservoir. Based on anecdotal information, historically, the wetlands were used for pastureland and hay production and were known as Beaver Dam Meadow. The existing Mud Pond and Beaver Dam Meadow, shown in the pre-impoundment map from 1855 in Figure 1-3, became part of the impoundment. The Mud Pond represents the deepest part of the reservoir and was likely formed through the glaciation processes. The average depth (i.e., approximately 22 feet) and bathymetric shape (i.e., conical) of Mud Pond most closely resembles a former kettle hole. Historical mapping is provided in Appendix A.

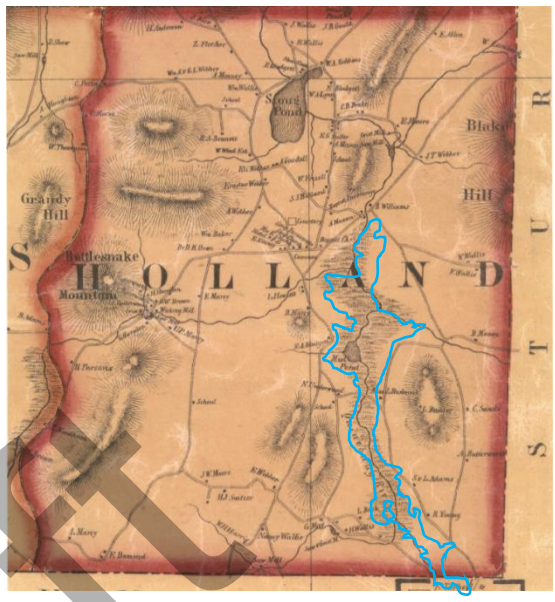


Figure 1-3: Map of Holland and the Quinebaug River from 1855, before the impoundment of the reservoir. Current reservoir location indicated by blue outline.

The reservoir was created in 1862 by the Hamilton Woolen Company to augment its power generation requirements during low flow periods. The earliest maps depicting the reservoir date back to 1893 and illustrate a reservoir that is smaller in size (approximately 390 acres) than today's impoundment (approximately 413 acres). Sometime between the late 1890s and early 1900s, the cut stone dam either washed out or was reconstructed, creating a larger impoundment. The Hamilton Woolen Company reportedly commenced fish stocking within the reservoir in 1926. During the August 1955 flood, the spillway constructed by the Hamilton Woolen Company was destroyed, and the dam was breached. In 1960, the dam, gatehouse, and spillway were replaced.

Sedimentation and nuisance aquatic vegetation growth had been an ongoing issue within the reservoir since the 1960s. Previous dredging efforts have been either nonexistent and/or limited within this reservoir. There is some anecdotal information that limited dredging was performed along several private properties along the western shoreline of the north basin back in the 1970s; however, no formal dredge plans and/or other dredging-related documentation has been found.

1.3 Definition of Project Goals

The town and the LOC have established specific project goals for Hamilton Reservoir, which include the following:

1) Improve long-term water quality within the reservoir.
2) Provide diverse sustainable fishery resources within the reservoir.
3) Minimize and/or eliminate nuisance aquatic vegetation growth within the reservoir.
4) Improve recreational opportunities within the reservoir.

Draft

There are several pieces that the town will need to implement over the next several years to achieve the goals identified above. Most importantly, these goals are attainable but require a multifaceted approach to both watershed and reservoir management. Watershed-based management principles and recommendations have been developed by regional planning agencies and educational institutions for the Hamilton Reservoir watershed. These recommendations relate to residential septic system repairs, stormwater management, road surface management, and lakefront residential property management in and around the reservoir. The town should continue to implement these recommendations. From a reservoir management perspective, significant improvements to water quality, fishery resources, and recreational opportunities can be achieved through removal of organic-enriched sediments and nuisance aquatic species by implementing a sound dredging program.

1.4 Overview of Work Scope

This report provides an assessment of the reservoir's biological conditions, bathymetry, sediment characterization and quality, potential dredging methods, sediment removal volumes and reuse or disposal options, aquatic habitat restoration opportunities, and likely costs, funding options, and permitting requirements.

Tasks that were completed as part of the study include the following:

- Data Gathering and Assessment
  - Completion of a bathymetric survey
  - Sediment probing, sampling, and laboratory analysis
- Conceptual Dredging Plan
  - Development of preliminary sediment removal volumes
  - Identification and assessment of potential dredging methods
  - Evaluation of water handling, control, and drawdown capabilities
  - Identification of dredge sediment reuse and disposal options
  - Development of dredging and restoration concept plans
- Restoration Opportunities
  - Aquatic species habitat enhancement
  - Management of nuisance aquatic vegetation
- Costs, Funding, and Permitting Requirements
  - Development of preliminary construction cost opinions
  - Identification of project funding mechanisms and sources
  - Identification of likely federal, state, and local permits

The above analysis is summarized in this feasibility report and is the basis for developing a long-term reservoir management plan.

1.5 Review of Existing Data, Mapping, and Reports

As part of the feasibility study, the town provided MMI with several studies and reports that had been completed by others on Hamilton Reservoir. This reservoir has been studied over the past 35 years. The reports vary in subject matter and include land use planning, watershed studies, aquatic vegetation management, and water quality improvement recommendations. The planning materials related to land use, water supply, water quality, and grant applications for improvement of environmental quality

Draft

were consulted to gain an understanding of the historical context of the present condition of the reservoir. Appendix B of this report lists several studies, reports, and other sources that have provided support for the preparation of the Dredge Feasibility Study for Hamilton Reservoir.

1.6 Identification of Existing Water Quality Issues

Water quality has been studied within the reservoir for the past few decades. The existing water quality issues are related to a variety of issues within the reservoir and its associated watershed. The following water quality issues have been previously identified within the reservoir:

- Turbidity levels during stormwater runoff events are typically high.
- Turbidity levels at the reservoir substrate/water column interface are high due to wave action from boating.
- Water temperatures fluctuate seasonally, but warm temperatures in the summer drives the system to only support warm-water fishery resources.
- Warm water temperatures lead to low dissolved oxygen levels within the impoundment thus stressing fishery and aquatic fishery resources.
- Seasonal algal blooms impact water quality.
- Submerged aquatic vegetation (nonnative invasive variable water milfoil) impacts water quality.

1.7 Previous Watershed and Reservoir Study Recommendations

Several studies have been completed on both the watershed and reservoir to help identify key issues that contribute to ongoing water quality issues.

The first comprehensive study of the reservoir was completed in 1983 and was titled "Diagnostic/Feasibility Study for Hamilton Reservoir" prepared by Cullinan Engineering Company as part of the Clean Lakes Program initiative. The study identified the reservoir's baseline conditions for water and sediment quality, fishery resource, trophic condition, and aquatic macrophyte populations. The following key findings of that study support the basis of the need for reservoir dredging:

- Substantial potential for suspended solids and/or turbidity levels adverse to the ambient fishery upon recreational disturbance of shallow sediments
- Dissolved oxygen (DO) levels and water temperatures within the reservoir are more suited for warm-water fishery resources than cold-water fishery resources. The shallow water depths and sediment accumulation help contribute to the low DO levels and high temperature issues.
- Hydrogen sulfide gas generation from reduced sediments may have the possible adverse impacts to more sensitive fish. Recreational disturbance of apparent iron and sulfide complexed metals in reduced sediments can create oxidation and consequent toxic metals release.
- Substantial in-lake iron retention occurs in the sediments. Phosphate inactivation within the sediments is already occurring.
- There is an apparent nitrogen influx from the sediments in early summer. Existing organic rich sediments are influencing the water quality.

Many of the key findings related to the sediment and water column interactions identified in 1983 are still ongoing today due to even shallower water depths and ongoing sediment accumulation.

Draft

As part of the 1983 study, alternatives for water quality and recreational improvements were identified. Eight primary water quality improvement alternatives were evaluated, with aquatic herbicide application and dredging being identified as prudent and feasible alternatives for addressing water quality issues with the reservoir. The study identified several water quality improvement measures that could be implemented within the watershed and reservoir. Some of the measures included identification and repair of failing septic systems, paving of private and public roads to reduce sediment source inputs, implementation of stormwater management measures, and dredging of the reservoir.

The studies related to watershed management tend to focus on stormwater management practices along both town-owned and privately owned roadways. Recommendations for enhancing stormwater management practices in and around the reservoir have been clearly documented within the Section 319 Grant Application prepared in 2007, a Section 604B Grant Application prepared in 2006 through 2007, and the Conway Watershed Study prepared in 2000. The June 2000 *Hamilton Reservoir Watershed Study* prepared by the Conway School of Landscape Design identified development in the surrounding watershed, dirt roadways, improperly designed stormwater systems, and private boat ramp and driveway erosion as major contributors of sediment to the reservoir and discussed the role and management of nuisance aquatic weed vegetation. In addition to stormwater runoff from roadways, the studies provided recommendations for managing fertilizer runoff from lawns located adjacent to the reservoir, increased shoreline plantings for both thermal and wildlife habitat, and continued monitoring and repair of subsurface septic systems.

The town has been actively implementing the recommendations from the grant studies. There is a continued need to further implement road management recommendations to reduce stormwater runoff-related impacts including reduction in total suspended solids and turbidity entering the reservoir.

Draft

2.0 BATHYMETRIC SURVEY

2.1 Bathymetric Survey Methods

On May 12 and 17, 2018, the MMI project team completed bathymetric mapping of Hamilton Reservoir. e4 Sciences assisted with the mapping and used a state-of-the-art single-beam echo sounder with 500-foot-wide spacing between flow breaklines to measure the bathymetry of the reservoir. The echo sounder was a Teledyne-Odom Echotrach CVM paired with a 200 MHz 3® transducer. An onboard Trimble RTK-GNSS was used to constrain the navigation and vessel altitude.

Survey boat rigged with multibeam echo sounder, inertial motion unit, antennae, and single beam transducer

As part of the bathymetric mapping control, the team utilized four measurements for establishing bottom elevations. These are: (1) velocity of sound in water, (2) travel time of acoustic wave from source to first break, (3) depth of instrument below the water surface, and (4) water level (tide stage). The team used a Digibar Pro to measure the velocity of sound in water. The depth of the transducer in the water was calibrated by physical measurements of the rigid mount. The local water level measurements were recorded using Real Time Kinetic (RTK) Virtual Reference Station (VRS) GNSS-aided GPS. The team set up a temporary water level staff gauge for the duration of survey activities. Horizontal accuracy of the single beam bathymetry is approximately ±3 feet. Vertical accuracy is approximately ±0.2 feet. The survey was completed in North American Datum of 1983 and North American Vertical Datum of 1988. The bathymetric data was then postprocessed and exported into *AutoCAD* to generate an existing conditions bathymetric map to depict elevation depths. One-foot contour intervals were created for the bathymetric mapping. Results of this survey are shown on the conceptual design plans entitled "Existing Conditions – Hamilton Reservoir."

2.2 Survey Results

2.2.1 Survey Observations

North Basin

In general, the bathymetric survey indicates that the north basin depth ranges from elevation 663 feet to 683 feet. The deeper depths of the basin are located within the southwestern portion of the basin, located within the former Mud Pond. Mud Pond has water depths of approximately 20 feet. The coves within the north basin generally have less than 5 feet of water depth. The central portions of the north basin have varying water depths that range between 9 to 10 feet.

Draft

South Basin
Elevations within the south basin vary between 673 to 683 feet with shallow water depths found within the Maybrook Road/Sandy Beach Road cove and Fenton Street/Brandon Street cove. The central portions of the south basin have varying water depths that range between 4 to 10 feet. Water depths deepen from south to north.

2.2.2 Other Benthic Features

As part of the bathymetric survey, e4 Sciences completed side-scan sonar mapping, which provides a deeper two-dimensional mapping system for evaluating the reservoir bottom. The side-scan sonar maps are provided in Appendix C.

North Basin
A few key features were observed on the side-scan sonar mapping including the sinuous Quinebaug River channel, submerged stone walls, shoals, sand waves, boulder ridges, and boat keel scars located along the eastern shoreline. The stone walls occur between Vinton Way and Waterfront Way and properties located at the end of Williams Road. Sand waves and boat keel scars where observed south of the public boat launch located on Leno Road, and additional boat keel scars were observed along the west shoreline located along Lakefront Drive properties. A narrow sand and boulder ridge is located within the Sunset Lane and Island Drive cove.

South Basin
In the south basin, the side-scan sonar identified the former Quinebaug River channel, submerged trees, a sunken boat, boat keel scars, and a boulder and sand ridge near the confluence with Brown's Brook.

2.2.3 Bedrock

Hamilton Reservoir is underlain by metamorphic rock with inclusions of intrusive igneous rocks. Both segments of the reservoir are on a mixture of primarily gneiss and schist. The Rock Meadows Fault cuts diagonally northeast across the northern reservoir.

Bedrock is generally not exposed in the reservoir area, but on the eastern bank of the northern basin, there is a large bedrock outcropping that extends into the reservoir, forming two exposed rock islands. In the south basin, bedrock outcroppings are mapped in some surrounding hillslopes but do not extend into the reservoir itself.

Bedrock, surficial geology, bedrock well data, and interpretative lake floor mapping of Hamilton Reservoir are found in Appendix D. Estimates of total sediment above bedrock based on sediment sample locations and estimates of top of rock from nearby wells are roughly 50 to 140 feet in most of the northern basin and 5 to 20 feet in the southern basin.

Depth to bedrock is typically a limiting factor for dredging. High bedrock elevations would limit potential dredging depths. Removal of bedrock is financially expensive for dredging projects. Based on current geology mapping, groundwater well logs the estimated depth to bedrock is not anticipated to be a limiting factor in dredging Hamilton Reservoir. While it is possible that bedrock outcroppings (i.e., islands) or shallow bedrock could be encountered during dredging operations, its presence is not expected to be widespread.

Draft

3.0 SEDIMENT SAMPLING AND ANALYSIS

3.1 Sediment Sampling

The bathymetric survey, side-scan sonar/seismic mapping, and physical sediment probing were used to develop a sediment sampling plan. To define sediment thickness, the project team used Edgetech piezoelectric sources to complete seismic surveys of the reservoir bottom. Based on the surveys, our project team selected sample locations primarily located within coves within the north and south basins. Because of the size of the sample fields in some of the coves, our team collected additional samples that were then composited to provide to the laboratory for physical and chemical analysis. A total of 16 push-core samples were collected from 12 locations, six locations in the north basin and six in the south basin. Sample locations are presented on Figures 3-1 and 3-2. The intent of the sampling program was to define the location, depth, and physical characteristics of reservoir sediment deposits. The cores were preserved, imaged, and described in detail. Seismic sounding was also used to estimate the depth of accumulated sediment from prereservoir conditions to the present and total sediment above rock. Table 3-1 presents a summary of the estimated sediment depths around the reservoir. Please note that Sediment Logs are included in Appendix E.

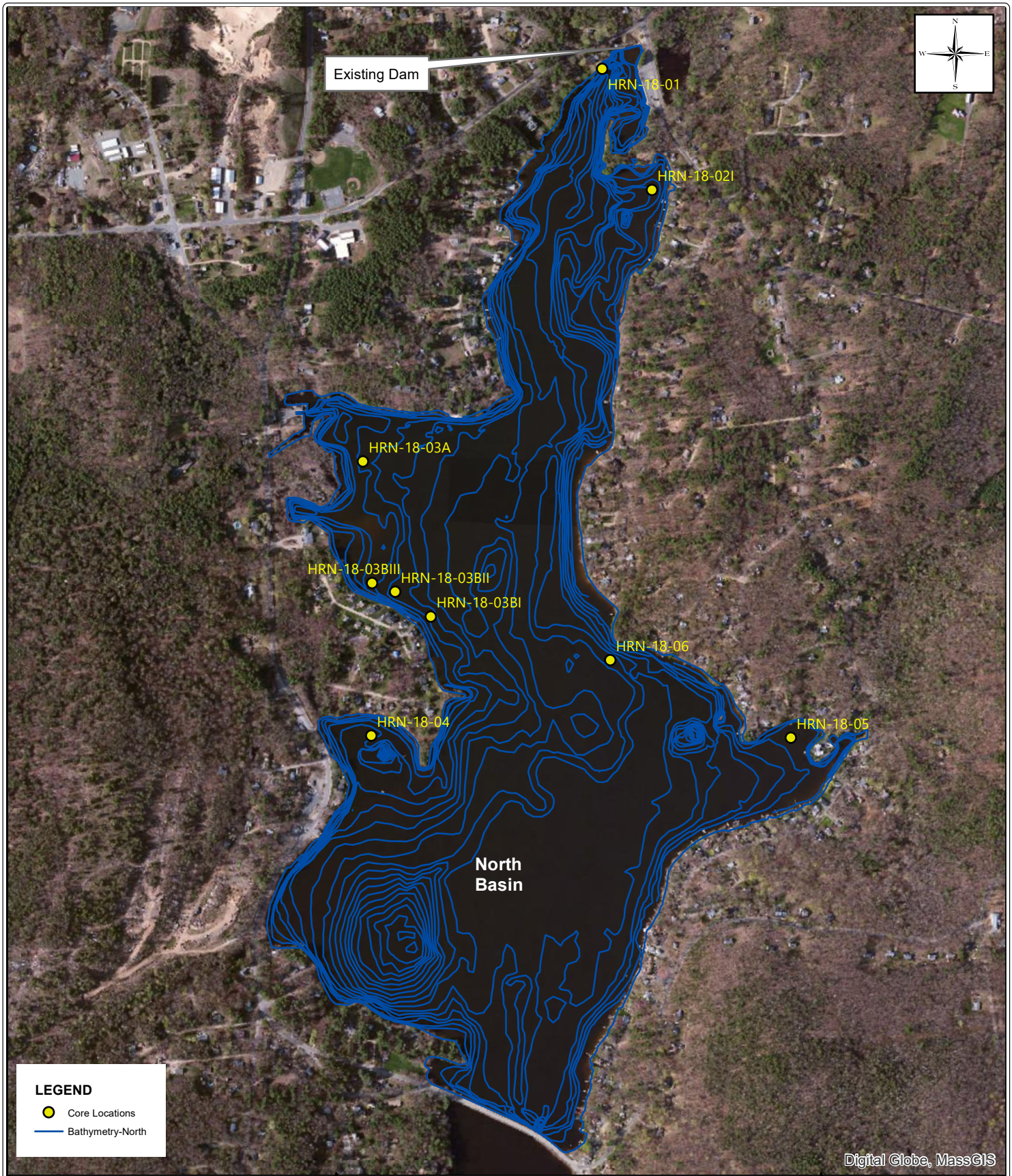
Draft

TABLE 3-1
Summary of Estimated Sediment Depths by Sample Location

Location	Sediment Core	Depth of Accumulated Sediment (ft)*	Estimated Total Depth of Historical Wetland/Upland Soil/Sediment (ft)**	Water Depth (ft)***
North Basin				
1	HRN-18-01	>10	71	3.5
2	HRN-18-02	2.3	49	5.3
3	HRN-18-03a	8.1	48 to 138	5.4
	HRN-18-03bi	4.1	98	6.1
	HRN-18-03bii	4.0	118	5.9
	HRN-18-03biii	4.4	97 to 124	4.4
4	HRN-18-04	8.7	113	5.4
5	HRN-18-05	5.0	5 to 30	4.3
6	HRN-18-06	4.6	15 to 20	11.1
South Basin				
7	HRS-18-01a	5.7	6 to 20	5.3
	HRS-18-01b	5.9	6 to 20	3.4
8	HRS-18-02	4.0	17	4.7
9	HRS-18-03	12.0	18	5.2
10	HRS-18-04	5.8	10 to 20	3.7
11	HRS-18-05	9.6	*unknown*	4.6
12	HRS-18-06	2.0	20	8.0

* Estimated depth of accumulated sediment from prereservoir soil surface conditions to the present
** Estimated total sediment thickness above bedrock
*** Water depth measured from elevation 683.3 feet to top of reservoir sediment

MXD: Y:\6291-01\Maps\Figure 3-1 - Sediment Core Locations North Basin.mxd



MILONE & MACBROOM

1350 Main Street, Suite 1012
Springfield,Massachusetts
(413) 241-6920
www.mminc.com

SEDIMENT CORE LOCATIONS - NORTH BASIN

HAMILTON RESERVOIR DREDGING FEASIBILITY STUDY

HOLLAND, MA

SOURCE: 2004 AERIAL PHOTO, CTDEEP, 2006

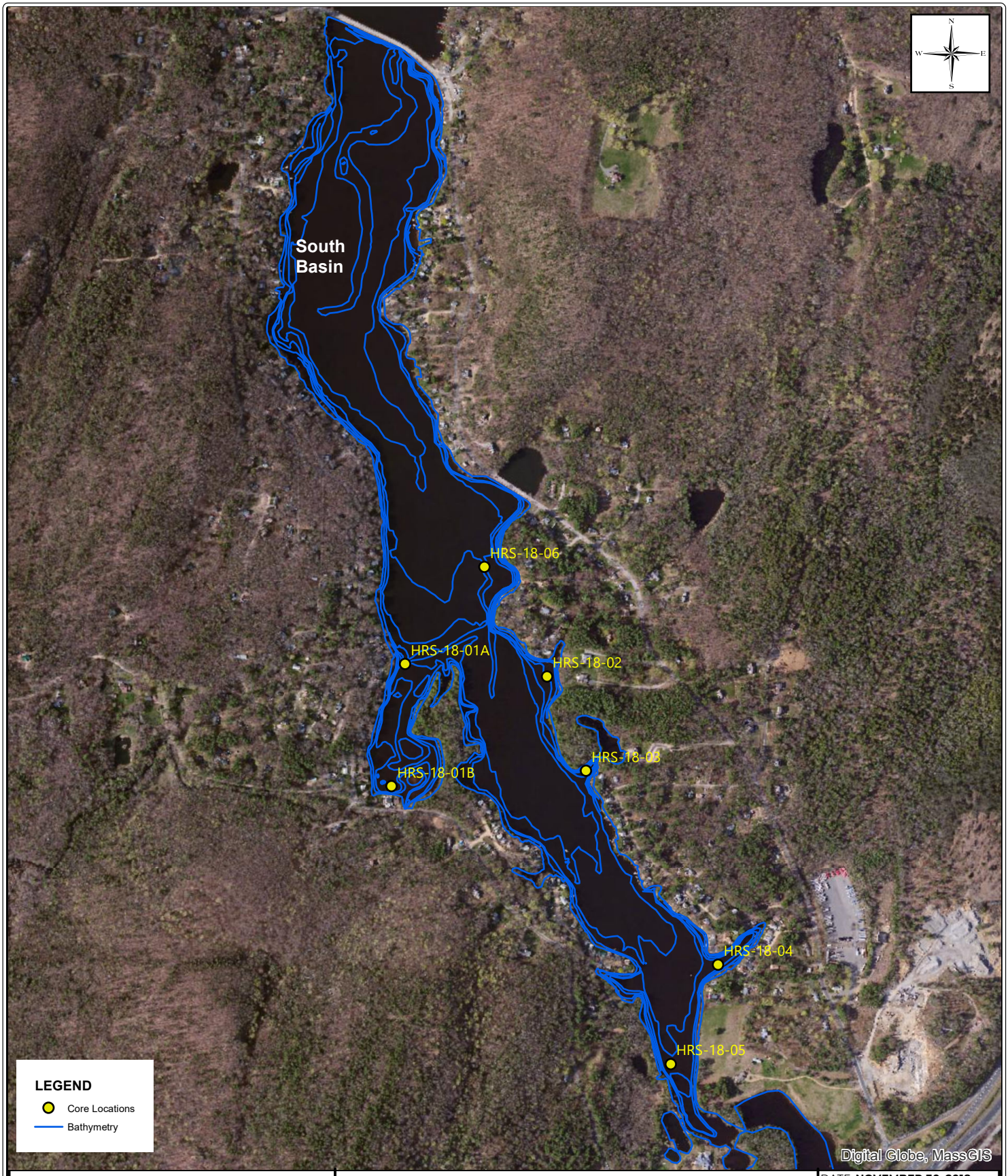
DATE: **NOVEMBER 30, 2018**		
SCALE: **1"=850'**		
PROJ. NO.: **6291-01**		
DESIGNED **MJS**	DRAWN **KFK**	CHECKED **MJS**

DRAWING NAME:

FIG. 3-1

Copyright Milone & MacBroom, Inc - 2018

MXD: Y:\6291-01\Maps\Figure 3-2 - Sediment Core Locations South Basin.mxd



MILONE & MACBROOM
1350 Main Street, Suite 1012
Springfield,Massachusetts
(413) 241-6920
www.mminc.com

SEDIMENT CORE LOCATIONS - SOUTH BASIN

HAMILTON RESERVOIR DREDGING FEASIBILITY STUDY

HOLLAND, MA

SOURCE: 2004 AERIAL PHOTO, CTDEEP, 2006

DATE: **NOVEMBER 30, 2018**		
SCALE: **1"=975'**		
PROJ. NO.: **6291-01**		
DESIGNED **MJS**	DRAWN **KFK**	CHECKED **MJS**

DRAWING NAME:

FIG. 3-2

Copyright Milone & MacBroom, Inc - 2018

Table 3-1 shows that the north basin has considerably deeper sediment depths to bedrock as compared to the south basin. In many instances, bedrock is more than 45 feet below the existing sediments in the north basin. Thick glacial stratified drift deposits are found in the north basin. Shallower deposits were documented within the south basin.

3.2 Sediment Analysis

3.2.1 Physical Characterization and Results

Sampling was completed using push-core technology to determine the stratigraphy, sediment depths, and to collect samples for testing. The push-core sampling focused on the recent sediments (i.e. soft sediments). Recent sediments are those materials that have been deposited over the last 150 years. The reservoir bottom was sampled with hand driven cores that measure 2 5/8 inches in diameter and approximately 2 to 4 feet long.

In locations such as shallow areas and embayment where the movement of water is restricted, flushing volumes are low, meaning that organic materials that enter the reservoir accumulate. Over time, this can form thick mats of leaves and debris, leading to loss of depth. In addition to characterization of sampled sediments, seismic tools were used to estimate the thickness of the uppermost soft organic sediment at the sampling locations. These results are described in Table 3-2

Draft

TABLE 3-2
Summary of Sediment Samples by Location

Location	Sediment Core Nomenclature	Water Depth (ft)	Length of Core Recovered (ft)	Thickness of Uppermost Soft Organic Sediment* (ft)	Sediment type	Description
North Basin						
1	HRN-18-01	~3.5	1.42	0.0	Sand with organics	Medium sand (trace coarse sand) with organics (plant matter including small twigs and leaves). Two live mussels in top 3 in.
2	HRN-18-02	5.3	1.30	1.2	Peat over silty sand	0.75 ft organic peat with little silt; 0.36 ft fine sand, silt, and organics; 0.19 ft sandy clay
3	HRN-18-03a	5.4	2.00	2.2	Silty sand over silty peat	1.13 ft dark gray brown silt and very fine sand; 0.87 ft silty peat, trace fine sand
3	HRN-18-03bi	6.1	1.25	0.9	Peaty silt	0.9 ft organic peat with little silt
3	HRN-18-03bii	5.9	1.88	0.7	Peaty silt	0.9 ft organic peat with little silt
3	HRN-18-03biii	4.4	1.45	1.0	Peat over sand	0.66 ft dark brown organic peaty silt; 0.40 ft dark yellow brown organic silt and sand; 0.22 ft yellow brown silt and fine sand; 0.17 ft yellow brown medium sand with clay layers
4	HRN-18-04	5.4	1.38	1.9	Peat	0.53 ft brown organic peat, trace silt; 0.85 ft brown peat,

						trace to little silt. Pieces of wood up to 7.0x4.0x2.5 cm.
5	HRN-18-05	4.3	1.00	0.1	Organic silt	Dark gray brown organic silt, thin clay layer
6	HRN-18-06	11.1	1.10	0.6	Silt with organics	Silt with organics
South Basin						
7	HRS-18-01a	5.3	1.20	1.0	Silt with organics	0.55 ft brown silt with organics; 0.65 ft dark gray brown silt with organics
7	HRS-18-01b	3.4	0.95	1.3	Silt with organics	0.55 ft plant matter (leaves); 0.40 ft medium sand
8	HRS-18-02	4.7	1.50	1.5	Silt with organics	0.41 ft organics with silt; 0.30 ft silt with organics; 0.79 ft organics sandy silt
9	HRS-18-03	5.2	1.40	2.2	Silt with organics	0.82 ft dark gray brown silt with organics (fine roots); brown silty peat (roots, wood/stick fragments)
10	HRS-18-04	3.7	1.05	1.6	Silty over peat over sand	0.33 ft dark brown silt with organics; 0.65 ft dark brown silty peat; brown medium to coarse sand, trace organics
11	HRS-18-05	4.6	1.10	1.3	Peat to silty peat	0.33 ft silty peat; 0.97 ft dark brown peat and silt
12	HRS-18-06	8.0	1.12	1.0	Silt with organics	Silt with organics

Please see the Interpretative Lake Floor Geology Mapping in Appendix D for additional information. Overall, the sediment analysis indicates that the reservoir sediments can be grouped into one of four categories. These include peat, peat and silt, organic silt, and sand.

Peat is an accumulation of partially decayed vegetation or organic matter. This material is typically soft in nature and has high water content. In Hamilton Reservoir, the peat consists of decaying hardwood leaves, woody debris, and decomposing submerged aquatic vegetation. These peat areas are concentrated in low-flow condition areas including north of the public boat ramp on the north basin, the Lakeshore Drive and Mashapaug Road cove in the North Basin, and Brown's Brook (also known as May Brook) in the south basin.

Peat and Silt consists of an equal combination of partially decayed organic matter and silt. Silt is a granular material of a size between sand and clay, whose mineral origin is quartz and feldspar. Silt adds cohesiveness and firmness properties to the sediment. However, this sediment type is still very soft in nature given the amount of peat. These sediments are primarily found along the immediate shorelines and small cove areas along both the north and south basins. In addition, this particular sediment type is found at the bottom of the former Mud Pond.

Organic Silt sediments consist primarily of silt materials but have some partially decomposed organic matter present. These soils are much firmer in nature as compared to peat. These sediments are the dominant form found within both the north and south basins.

Draft

Sand dominated sediments consist of small, often rounded grains or particles of disintegrated rock and are larger than particles of silt. Sands are typically firm bottom sediments, and within this reservoir, they are found along the shoreline of both basins.

The sediment types found within Hamilton Reservoir are typical of the surficial geology of the watershed. These sediments are not unusual and can be removed from the reservoir in a variety of ways that will be discussed in detail later on in this report.

3.2.2 Chemical Analysis and Results

The sediment core samples were separated into 10 discrete composite samples for chemical analysis. These samples were placed on ice and submitted to a certified laboratory. The 10 samples were analyzed for the suite of tests required by the 401 Water Quality Certification regulations of 314 CMR 9.00. The minimum number of samples required for dredging projects requiring a 401 Water Quality Certification is typically two although generally Massachusetts Department of Environmental Protection requires one sample for every 1,000 cubic yards of material intended to be removed. The sediment samples were analyzed for the following parameters in accordance with 314 CMR 9.07:

- Total Nitrate
- Total Nitrite
- Total Kjehdal Nitrogen
- Total Nitrogen "organic"
- Total Phosphorous
- Total Organic Carbon
- Total Arsenic
- Total Cadmium
- Total Chromium
- Total Copper
- Total Lead
- Total Mercury
- Total Nickel
- Total Zinc
- Total Vanadium
- Polycyclic Aromatic Hydrocarbons (PAHs)
- Polychlorinated Biphenyls (PCBs)
- Extractable Petroleum Hydrocarbons
- Volatile Organic Compounds (VOC)
- Percent Water
- Grain Size Distribution

A copy of the laboratory analytical results and summary Table 3-2 are included as Appendix F.

The laboratory analytical results have been compared to the Massachusetts Department of Environmental Protection (MA DEP) COMM 97-001 Reuse Levels for Lined & Unlined Landfills, in addition to the applicable MA DEP Massachusetts Contingency Plan (MCP) Numerical Standards (i.e., 310 CMR 40.0975). Based on the laboratory analytical results, no analyzed constituents were detected above the minimum laboratory detection limit except for low-level detections of select heavy metals.

Draft

These detections are consistent with generally accepted background concentrations naturally occurring in sediments and soils. It is apparent that all of the sampled material may be suitable for reuse either on site or off site, including at both lined or unlined landfills. However, it is important to note that select landfills may require additional sampling and/or analysis, depending on the specific details of their permit.

Should it be decided that the sediments will be reused elsewhere (i.e., other than a permitted landfill facility), the MA DEP Similar Soils Provision should be adhered to. Such disposal should also be done in accordance with any municipal, state, and federal permitting requirements or land use laws.

The sediment samples were assessed and reviewed by a Licensed Site Professional (LSP), and the results of sediment analysis indicate that the sediment material has been minimally impacted by chemical constituents. Screening level sediment quality data suggests that the soft sediments in the reservoir would be considered "clean fill" upon their removal. The sediment has potential for reuse including landfill cap material, potential blending to make topsoil, and/or general fill. Please note that additional sediment testing may be required to fulfill regulatory requirements as dredging plans and volumes advance to regulatory and/or final design levels.

Draft

4.0 ASSESSMENT OF DREDGING FEASIBILITY

Hamilton Reservoir has accumulated a significant amount of organic enriched sediments. Ideally, Hamilton Reservoir should have average water depths that consistently range between 8 to 12 feet. As has been described within this report, the deeper water depths will help reduce floating and/or submerged aquatic plant growth opportunities, provide enhanced fishing habitat, higher sustained dissolved oxygen levels, less fluctuation in water temperatures within the reservoir, and remove excess phosphorous and nitrogen from the system. The following section describes the volume of sediment to be removed and the various means and methods for removing the sediments.

4.1 Preliminary Sediment Removal Volumes

Target dredge areas have been developed around the reservoir based on results of sediment accumulation analysis, known recreational activity hazard areas, impacted aquatic species habitats, and known aquatic vegetation management areas. Within the north basin, five areas have been targeted for improvements. These areas are referred to as Area 1, Area 2, Area 3, Area 4, and Area 5A. Areas 1 through 4 are located within existing coves within the north basin, while Area 5A is located at the downstream end of the causeway cross culvert. For the South Basin three areas have been selected for sediment removal and aquatic fauna habitat improvements. These areas are referenced as Area 5B, Area 6, and Area 7. Area 5B is associated within the upstream end of the causeway culvert while Areas 6 and 7 are found within cove areas.

Target dredge depths are often predicated on thickness of accumulated sediment, type of refusal layer (i.e., bedrock, compacted till, etc.), and project restoration goals. For Hamilton Reservoir, it is recommended to dredge to an approximate depth of 12 feet within the targeted areas. This dredge target depth would remove both soft sediments (postreservoir accumulation) and some prereservoir sediments. This depth would remove the organic-enriched sediments from the coves and provide deeper depths that would discourage aquatic vegetation growth (low-light penetration below 9 feet). In addition, this would allow for some of the sediments that will remain in the central portions of the lake to be redistributed via wave action into the coves without significantly shallowing the coves again.

As part of this study, MMI also established lesser dredge target depths for the reservoir because of potential project implementation costs. In the target areas, our team developed dredge depth alternatives and volumes for deepening these areas to either 8 or 10 feet, respectively. Using the preferred alternative of a 12-foot dredge depth, the dredging operation would disturb approximately 160 acres of the existing reservoir bottom. This would result in approximately 39 percent of the reservoir being dredged.

The following table summarizes the potential sediment removal depths and volumes for both the north and south basins.

Draft

TABLE 4-1
Sediment Removal Volume Estimates
To Deepen Parts of Hamilton Reservoir to 8, 10, and/or 12 Feet

Location	Approximate Dredge Area (Acres)	Approximate Dredge Depth (feet)	Total Sediment Removal (cubic yards)	Total Sediment Removal (tons)
North Basin	105	8	344,500	516,750
		10	607,500	911,250
		12	855,500	1,283,250
South Basin	55	8	233,500	350,250
		10	357,500	536,250
		12	481,500	722,250

4.2 Identification and Assessment of Potential Dredging Methods

Dredging can be accomplished using several different methods, depending upon sediment type, water depth, access, and available land area near the impoundment to be dredged. Available methods include conventional earth moving equipment, dragline dredging, clamshell dredging, and hydraulic dredging. A description of each method and the feasibility of implementing each method for removal of sediments within Hamilton Reservoir are evaluated below.

4.2.1 Conventional Dry Dredging

Conventional dry dredging is the most common form of dredging used in inland freshwater ponds, lakes, and reservoirs within the Northeast. Use of conventional earthmoving equipment such as excavators, bulldozers, and front-end loaders to excavate and remove sediment from ponds, lakes, and reservoirs is only practical where the water can be removed and a firm bottom exists, or the area can be allowed to dry to a firm bottom. For Hamilton Reservoir, this method of dredging would require an initial drawdown as well as ongoing water control of groundwater and surface water tributaries for the duration of the project.

Example of conventional dry dredging on large reservoir

Conventional earth excavation equipment such as long-boom backhoes can work in a wet or soft sediment environment if they are supported on firm pads (i.e., timber matting) or temporary haul roads. In smaller impoundments, the excavated sediments can be reached from the banks and pulled to shore or in larger impoundments can be moved to shore by using conventional or articulated dump trucks on temporary haul roads or timber mats. Ultra-low load-

Draft

bearing equipment is available for use on soft, low strength sediments and soils. This type of equipment has broad tracks and lightweight frames to reduce the pressure on the sediment and/or soil. This technique requires dewatering but not fully dry sediments and/or soils. A significant limitation is that the light load-bearing bulldozers cannot push dense sediments, soils, and/or heavy rock.

In drier and firmer sediment/soil areas, a low-weight bulldozer can be used to move sediments. This procedure uses conventional excavation equipment that can dig both soft, wet sediments as well as the underlying gravel or till soils. The rate of excavation and ability to achieve uniform grades are enhanced by dewatering, but the sediments and/or soils do not need to be fully dry.

Sediments can be stockpiled within the reservoir and allowed to sufficiently dewater before being hauled off site. Stacking of wet sediments can be challenging dependent upon the percentage of organic content within the sediment. Sediments with high organic content (i.e., mucky sediments) are not as easily stackable as compared to sediment that consist mostly of gravel, sands, and silts. On sites that have sediments with low to moderate levels of organics, the contractor will typically stockpile the material and use gravity and the sediment weight to squeeze out the water from the sediments. In mucky sediments, the contractor will likely have smaller stacked stockpiles that are enclosed with earthen berms or concrete blocks and may require broader stockpile areas. Typically, high organic-enriched sediments will require longer dewatering time. Hauling of wet sediments can be accomplished through the use of rubber-lined dump trucks; however, construction costs rise considerably when the material consists of both water and sediment. In most cases, a contractor establishes a per ton haul rate, so hauling wet material is not advisable.

Example of conventional dry dredging and dewatering stockpiles

Once sediments have been sufficiently dewatered, they are then loaded into dump trucks that transport the material away from the site using temporary haul roads.

Dry dredging methods such as conventional dredging have the advantage of minimizing the amount of land area that is required for dewatering stockpiles since material is dewatered within the impoundment prior to excavation and transport. However, conventional dry dredging has the distinct disadvantage of requiring the impoundment to be dewatered. In order for conventional sediment excavation to be feasible, the reservoir or segments of it would have to be fully dewatered such as by use of a cofferdam. Water from the Quinebaug River and multiple smaller tributaries would have to be actively managed for the duration of the project. Maintaining a fully dewatered work area will be costly.

Draft

4.2.2 Clamshell Dredging

Clamshell dredging entails the use of a clamshell bucket that is extended into the water body from a large crane and removes material by closing the bucket and pulling it through the water column. Because of the size of the impoundment, the necessary cranes would not be able to reach the entire proposed dredge area from the shoreline. Therefore, pontoons or barges would be necessary to support the dredge equipment, and the equipment would need to "swing" to the shoreline or a barge to stockpile material for dewatering. Alternatively, short berms or pads could be used to provide ramps into the impoundment for crane equipment. After construction, the berms would be removed. This option may require that the reservoir be partially dewatered.

Clamshell excavation is suitable for both soft sediments and for granular soils such as sand and gravel. It is less effective on glacial till soils and rocky soils due to the limited cutting force that can be applied. Hamilton Reservoir is underlain by glacial till soils that are intermixed with boulders.

Staging of the crane and/or barge and the associated sediment dewatering area or sediment settling area will require a large open area on the shoreline with direct access to the reservoir. Land area outside of the reservoir is limited for dewatering of sediments.

4.2.3 Dragline Dredging

Dragline dredging may be a viable option for select areas where heavy machinery utilized in other dredging methodologies cannot be supported by softer accumulated sediments. With this methodology, a dragline excavator is staged alongside the shore or on competent material (i.e., berm or pad) within the reservoir. Dewatering of the impoundment would likely be required if berms or pads are used. Alternatively, the dragline excavator may be staged on a barge vessel, and dredged material could be loaded onto additional pontoons or barges and off loaded to an upland area for sediment dewatering. From this position, a dragline bucket is hoisted along a boom and cast waterward to collect accumulated sediments. In this manner, sediments are then drawn back to the dragline excavator and stockpiled on a nearby barge or shoreline.

Draft

4.2.4 Hydraulic Dredging

Hydraulic dredge operations often involve a barge-mounted suction unit that can range in size from a large oceangoing vessel to a small barge that is assembled at the site. These vessels use a suction hose with a powered cutterhead to loosen the sediment and then pump the sediment and water slurry through a floating pipe to the shore or a barge. Hydraulic dredging is most effective when used to remove softer, fine-grained sediments. Rocks, stumps, and dense soils cannot be removed by this method.

Example of hydraulic dredging an impoundment

Because of the high water content of the sediment slurry, the total volume of removed material is higher than with clamshell dredging. A dewatering basin, designated sediment settling area, or geotube is necessary to allow the solids to settle and separate from the water prior to transport and final disposal or reuse of the sediment. Dewatering basins or geotubes require a large, flat area (typically that have grades less than 0.5%) and have the potential to cause extensive surface disturbance during work. Much of the land area surrounding Hamilton Reservoir is divided into small residential properties, and large, flat parcels are limited. Sediment slurry can be pumped uphill to a flat site; however, the costs associated with running pumps throughout the duration of the project can raise construction costs considerably.

Example of dewatering sediment using geotubes

Because hydraulic dredging occurs under inundated conditions, this method has a greater potential to cause turbidity when compared to other potential dredge methods. This will require diligent monitoring of water turbidity levels to avoid the impacts resulting from suspended sediments.

Draft

4.3 Evaluation of Water Handling, Control, and Drawdown Capabilities

Water elevations within Hamilton Reservoir are controlled by a dam that has a crest elevation of 683.0 feet. Water handling is important for dredging projects that require drier conditions. Conversely, dredging that can be completed in the wet such as hydraulic dredging and/or clamshell/dragline barges typically do not require water control within the impoundment.

Example of water control using bypass channel and surface water pumps

The town has the ability to lower the water surface elevation of the reservoir via a low level sluiceway that has an approximate invert elevation of 674.0 feet. This sluiceway would drop the reservoir by approximately 9 feet. Dropping the elevation to 674 does not entirely drain the impoundment. In fact, the north basin will still have a large pool of water within the southern portion of this basin. This pool of water would be located in the former Mud Pond area. This area would have a water depth of approximately 11 feet during drawdown. This pool could be used as an aquatic fauna containment area in that the fish and other aquatic species that live within the impoundment can seek refuge during the construction. Supplemental aeration devices may be required during construction to help increase dissolved oxygen levels within the pool to keep fish and other aquatic species alive. Relocation of fish, reptiles, and/or amphibians to the aquatic fauna containment area may be required during construction.

In addition to using low-level outlets for drawdown, a dredging project requiring drier conditions may be required to use a combination of cofferdams, earthen swales, surface water pumps, and groundwater well points to control water during construction.

4.4 Causeway Culvert

The existing causeway culvert that hydrologically connects the north and south basins is resulting in an increased accumulation of sediment within the south basin. The restricted-size culvert and causeway act as a dam during higher storm flow events, allowing water to rise on the upstream side of the culvert, which allows suspended silts in the surface water to settle out in the south basin as opposed to being discharged over the spillway located in the north basin. This causes additional accumulation of organic silts to occur in the south basin than in the north basin and is shallowing the south basin. Replacing the existing causeway culvert with a larger causeway opening would help reduce but not eliminate this condition. This could be done by installing a bridge and/or a series of concrete box culverts, corrugated metals pipes, or smooth-lined corrugated plastic pipes. For the conceptual design phases of the project, MMI has specified widening this causeway culvert by installing new twin concrete box culverts. These culverts would provide a greater opening that will help with flushing and transport of sediment to the spillway located in the North Basin.

Draft

4.5 Recommendation

Based on a review of available dredging methodologies, use of conventional dry dredging is recommended for restoring Hamilton Reservoir. This method will restrict the majority of disturbance to the coves of the reservoir, will provide for aquatic fauna containment areas within the north basin, and will allow for construction access for forebay and causeway culvert installation, smooth contouring, removal of submerged aquatic plant roots/rhizomes, harvesting of habitat boulders, installation of fish habitat structures, and can be completed over multiple years if needed. Hydraulic dredging is not feasible at this reservoir given the limited land area for dewatering of sediments through geotubes or basins.

4.6 Dredge Sediment Quality and Potential Use, Reuse and Disposal Options

Riverine, lake, and harbor sediments are often reflective of materials previously discharged or spilled in their watersheds. Screening level sediment quality data suggests that the soft sediments in the reservoir would be considered "clean fill" upon their removal. The sediment has potential for reuse.

Sampling of sediments within Hamilton Reservoir included testing of the levels of the nutrients carbon (C), phosphorous (P), and nitrogen (N). This nutrient-rich sediment has potential for beneficial reuse in agricultural or pasture settings where it can provide alternative nutrient sources for forage or agricultural production. Lake-dredged materials can cut fertilizer costs in pasture-based animal agriculture if they are high in nutrients, be applied to farmland to elevate the soil surface and improve drainage, be incorporated into marginal soils to enhance their physical and chemical characteristics, or be used in the compost creation process.

Total Nitrogen, Phosphorous, and Carbon

Nutrient analyses were completed to determine if dredge materials may be suitable for off-site use as compost or fertilizer. Determining whether dredge materials will be suitable for use as compost is directly affected by the ratio of carbon to nitrogen in the compost material. Nitrogen is measured as Total Nitrogen (TN), total Kjeldahl (organic) nitrogen [TKN], plus nitrogen in the form of nitrate. Optimum ratios of carbon to nitrogen are 30 parts carbon to 1 part nitrogen by weight. Ratios in the range of 25:1 to 40:1 are generally considered to promote good compost. Blending of compost materials with native soils is often completed to achieve and maintain the proper carbon to nitrogen ratios.

Ten samples, five from the north basin (HRN-02, HRN-03A, HRN-03B, HRN-04, and HRN-05) and five from the south basin (HRS-01A, HRS-02, HRS-03, HRS-04, and HRS-05) were analyzed for carbon, nitrogen, and phosphorous. Results of these analyses are included in Table 4-2.

Draft

TABLE 4-2
Total Nitrogen, Phosphorous, and Carbon Results Summary

	Sample									
	HRN-02	HRN-03A	HRN-03B	HRN-04	HRN-05	HRS-01A	HRS-02	HRS-03	HRS-04	HRS-05
Weight (mg/kg)										
Total Organic Carbon	84000	103000	48000	848000	74000	109000	72000	319000	146000	260000
Total Nitrogen	300	640	370	1200	270	800	660	1400	770	1300
Total Phosphorus	290	320	310	230	290	440	520	520	380	400
Percent by Weight										
Percent C	8.40%	10.30%	4.80%	84.80%	7.40%	10.90%	7.20%	31.90%	14.60%	26.00%
Percent N	0.03%	0.06%	0.04%	0.12%	0.03%	0.08%	0.07%	0.14%	0.08%	0.13%
Percent P	0.03%	0.03%	0.03%	0.02%	0.03%	0.04%	0.05%	0.05%	0.04%	0.04%
Ratio by Weight										
C:N Ratio	**280:1**	**161:1**	**130:1**	**706:1**	**274:1**	**136:1**	**109:1**	**228:1**	**190:1**	**200:1**

The carbon-to-nitrogen ratio of the sediment samples ranged from 109:1 in the silt and organic material sediments at HRS-02 to 706:1 in the highly organic sediments at HRN-04, with an average ratio among measured samples of 241:1. Ultimately, the proposed type of reuse or the disposal location of the dredge material will determine specific criteria to be met. Additional discussions with potential end users are recommended to more precisely determine their needs and ultimate suitability of the material for subsequent use.

4.7 Dredging and Restoration Concept Plans

MMI has developed a set of conceptual dredging plans that depict the targeted dredge locations, sediment removal volumes, potential construction access routes, stockpile locations, in-line sediment forebays, sediment and erosion control details, and fish habitat restoration measures. The project plan set is located in Appendix G and includes the following plan sheets:

- Title Sheet
- Existing Conditions – North Basin
- Existing Conditions – South Basin
- Grading Plan – North Basin Area 1
- Grading Plan – North Basin Area 2
- Grading Plan – North Basin Area 3
- Grading Plan – North Basin Area 4
- Grading Plan – Culvert Area 5
- Grading Plan – South Basin Area 6
- Grading Plan – South Basin Area 7
- Construction Plan – North Basin
- Construction Plan – South Basin
- Details

Draft

5.0 RESTORATION OPPORTUNITIES

5.1 Submerged and Floating Aquatic Vegetation

Hamilton Reservoir has had an active submerged aquatic vegetation (SAV) management program for the past 10 or so years. Focus for SAV management has centered on variable watermilfoil (*Myriophyllum heterophyllum)* and most recently single fanwort (*Cabomba caroliniana)*. Dominant native species include slender naiad (*Najas flexilis*), common bladderwort (*Utricularia macrorhiza*), yellow and white waterlily (*Nymphaea sp*.), and watershield (*Brasenia schreberi*) as well as several pondweed (*Potamogeton*) species. Some SAV and floating aquatic vegetation is beneficial to open water systems because it can provide refuge for fingerling fish species, landing and reproducing sites for invertebrates, and food sources for a variety of aquatic wildlife species. The goal is to maintain a system that is free of nonnative invasive aquatic species, which is how the LOC has been actively managing the reservoir.

The LOC has retained an outside vendor to monitor and manage the nuisance SAV populations within the reservoir through a variety of means including hand pulling/raking and herbicide treatment. Watermilfoil is currently being controlled by a single annual treatment of the herbicide known as Reward (active ingredient: diquat) within each basin. A patch of fanwort (*Cabomba caroliniana)* was observed and removed by hand in August 2017 but had regrown by October 2017. Herbicide will be applied to the fanwort. In addition, the town does an annual drawdown of the reservoir in the fall to allow killing frosts to help control SAV.

Seasonal control of nuisance SAV has been achieved through ongoing management, but reducing rates of regrowth and making conditions less favorable for these plants requires a change in the resources available to them. Nuisance submerged and floating aquatic vegetation depends on access to substrate, light, and nutrients to thrive. Roots and the seedbank rely on nutrient-rich substrate to allow the plants to grow and reproduce. Aquatic and submerged vegetation also cannot grow without access to light. In shallow water, light is readily available while deeper water attenuates the penetration of light, making it more difficult or impossible for plants to grow. Nutrients entering the water body subsidize the growth of aquatic vegetation, many species of which are well adapted to readily absorbing nutrients.

Dredging for Aquatic Vegetation Control
Dredging presents the greatest opportunity to reduce the abundance of aquatic vegetation within the reservoir in four ways as follows:

1) **Physical removal.** The act of dredging sediments physically removes the sediment and associated roots/rhizomes, reproductive structures, and seedbank seeds of aquatic plants.
2) **Less light availability.** Dredging deepens the water, making less light available to plants attempting to grow up from the substrate thereby suppressing growth.
3) **Reduction in habitat**. Dredging reduces the area where nuisance plants can grow, making management easier.
4) **Removal of nutrients**. Dredging removes nutrient-rich sediments on the surface of the lake bottom that act somewhat like fertilizer. Removing these sediments reduces the availability of nutrients to nuisance vegetation.

Draft

5.2 Fishery Habitat Restoration

The reservoir provides an active warm-water fishery resource to the community and has the potential to provide a more diverse and healthier fishery resource through dredging and installation of fish habitat structures. Deepening of the reservoir will provide more available in-water habitat to a variety of fish including largemouth bass, blue gill, pumpkinseed, black crappie, chain pickerel, yellow perch, brown bullhead, and others. Removal of the sediments will reduce the level of turbidity at the sediment/water column interface, providing better habitat conditions for finfish species. Installation of fish habitat rock piles and large woody debris structures will provide additional cover and refuge areas.

5.3 Informational and Educational Opportunities

Dredging of Hamilton Reservoir certainly provides informational and educational opportunities for the local and regional community. Showcasing the public benefits through interpretive signage at the public boat launch, publishing articles in the local paper and/or posting project updates on the town website or Facebook pages, and providing presentations at the televised Board of Selectmen and/or LOC meetings can be used as important tools for disseminating information to the community.

Draft

6.0 COSTS, FUNDING, AND PERMITTING REQUIREMENTS

6.1 Preliminary Construction Cost Opinions

Preliminary engineer's opinion of probable construction costs were developed based on the dredging concept plans, sediment removal volume and disposal, potential construction access, water handling and control, and sediment and erosion control requirements. These costs for each of the targeted dredge areas are found in Appendix H. Please note that the construction costs do not include advancement of engineering to both regulatory and/or final design, preparation of regulatory permit applications, and/or construction inspection, administration, and compliance services. Costs are subject to change based on economic factors at the time of bid solicitation. Based on the limited sediment sampling completed in the reservoir, the sediments are considered minimally impacted, so disposal costs reflect this condition (i.e., meaning lower market excavation and disposal costs). Typical dry excavation dredging and disposal of clean sediments can range from $20 to $40 per cubic yard. If additional sediment testing is required per the Massachusetts Department of Environmental Protection and the results indicate a greater level of contaminants within the reservoir sediments, then the costs for disposal will rise. Costs associated with excavation, hauling, and tipping fees for lined landfill disposal could drive the costs up to $75 to $100 per cubic yard.

6.2 Project Funding Mechanisms and Sources

At this time state- and/or federal-level grants are somewhat limited for freshwater impoundment dredging projects. Many of the funding source opportunities for dredging-related projects are geared toward coastal and navigable waterway projects. In addition, there are some federal and state funding opportunities for impoundments and/or rivers that have contaminated sediments that result in impaired surface water. Unfortunately, given the location, type of impoundment, and existing conditions within Hamilton Reservoir, a dredging project for this reservoir would be very limited in the current grant and/or funding opportunities. However, the town should continue to seek additional funding for watershed management improvements on both private and public roadways through the Massachusetts Section 319 Nonpoint Source Competitive Grants Program.

6.3 Permit Requirements and Project Scheduling

6.3.1 Permit Needs

Regulatory permitting is predicated on the type of natural resources that are found and delineated within the project site and the proposed impacts to such resources. When the town decides to advance the project, the resource areas will need to be delineated in the field. For purposes of this feasibility study, the following resource areas could be impacted by dredging:

- Bordering Vegetated Wetlands (rather limited around the impoundment)
- Bank
- Bordering Land Subject to Flooding
- Land Under Water Bodies and Waterways

Draft

The following table presents a list of potential federal and state permits that would be required to complete the dredging at Hamilton Reservoir.

TABLE 6-1
List of Potentially Required Permits

Permit / Approval	Reviewing Authority	Typical Permit Processing Schedule
Environmental Impact Report	Massachusetts Environmental Policy Act Office	3-6 months
Section 404 Individual Permit	United States Army Corps of Engineers	6-9 months
Natural Heritage and Endangered Species Program Preliminary Determination	Massachusetts Division of Fish and Wildlife	3 months
401 Water Quality Certificate	Massachusetts Department of Environmental Protection	6-9 months
Chapter 91 Waterways Permit	Massachusetts Department of Environmental Protection	6-9 months
Notice of Intent and Order of Conditions	Holland Conservation Commission	3 months

6.3.2 Project Scheduling

The project schedule will be predicated on the size of the dredging project, available funds, regulatory permit stipulations, and community coordination. The town may elect to complete the dredging projects in phases, which would likely result in a multiple-year project. It is important that the dredging work occur during the nonrecreational season on the reservoir. We understand that winter ice fishing does occur on the reservoir and that this recreational activity would likely be impacted by the preferred dredging season. For this reservoir, the ideal time to complete dredging activities would be from September through early April. The contractor would be able to dewater the reservoir over a 2-week period and allow sediments to begin to dry out. Excavation of sediments would ideally begin in mid to late October.

Draft

APPENDIX A

HISTORICAL MAPPING

Draft

HAMPDEN COUNTY

MASSACHUSETTS,

Based upon the Trigonometrical Survey of the State,
The Details from Original Surveys, under the direction of

Henry F. Walling,

Superintendent of the State Map.

BOSTON.

1855.

ASSISTANT ENGINEERS.

T.W. Baker.
T.B. Mann.
S.D. Kendall.
A.S. Mowry.
Wm. Short.
J. Howe.

0 1 2 3 4 Miles

Scale $\frac{1}{47520}$ or One Inch to 240 Rods.

Entered according to act of Congress in the year 1855 by Henry F. Walling, in the Clerks office of the District Court of Massachusetts

H. A. HALEY
PUBLISHER
106 Washington St.
BOSTON.

199

1855.

0 1 2 3 4 Miles

Scale $\frac{1}{47520}$ or One Inch to 240 Rods.

HOLLAND

Grandy Hill

Rattlesnake Mountain

Hill

Blake

Shoe Shop Pond

Mud Pond

Gould Pond

Quinebaug River

H. Anderson
J. Rice
J. Wallis
J. B. Gould
H. Wallis
E. Allen
D. Shaw
Saw Mill
Z. Fletcher
E. Blodgett
W. A. Robbins
Wm. A. & G. L. Webber
A. Mooney
C. Potter
Wm. Wallis
E. Blodgett
W. A. Lynn
School
A. Houghton
C. Morse
C. B. Drake
E. Moore
R. A. Bennett
E. G. Fuller
Grist Mill
A. Mason Saw Mill
W. Thompson
W. Wood Est.
J. T. Webber
A. Goodell
School
Eli Webber
W. Frizell
Erastus Webber
S. J. Ballard
Baptist Parsonage
R. Williams
A. Webber
Cemetery
A. Mason
Cong. Parsonage
Cong. Church
Mrs. E. Hall's Hotel & P. O.
E. Kinney
Baptist Ch.
Wm. Baker
Dr. D. B. Dean
Common
W. Wallis
F. Wallis
N. Butterworth
H. Harrington
E. Marcy
L. Howlett
H. W. Brown
Wicking Mill
Grist M.
Saw Mill
D. Marcy
B. Adams
G. Harsdon
Up. Marcy
R. A. Blodgett
D. Mason
B. Parsons
N. Underwood
Miss L. Rosbrook
School
School
J. Badger
C. Sands
B. Needham
A. Butterworth
J. W. Moore
E. Webber
S. & L. Adams
H. J. Switzer
L. Back
R. Young
W. H. Harris
Nancy Wallis
G. May
H. Wallis
Saw & Grist M.
I. Marcy
F. Damond
Saw Mill
E. Tarbell

Holland Pond

Holland

Blake Hill

Lead Mine Mountain

Lead Mine Brook

Lead Mine Pond

Leadmine

Hamilton Reservoir

Hammond Brook

Breakneck Brook

Hatchet Brook

Hatchet Hill

MASSACHUSETTS
CONNECTICUT
BOUNDARY
LINE

Mashapaug

Mashapaug Pond

Hatchet Pond

Breakneck Pond

L L A N D

N O I O N

10'

(Woodstock)

5'

Scale 1/62,500

0 1/2 1 2 3 4 5 Miles

Contour Interval 20 feet

1893

Datum is mean Sea level

APPENDIX B

PREVIOUS DATA, MAPS, AND REPORTS REFERENCES

Draft

Appendix B

List of Previous Town provided Hamilton Reservoir Reports and Studies

Clean Lakes Program Section 314 "Diagnostic/Feasibility Study for Hamilton Reservoir – Holland, MA – Final Report, prepared by Cullinan Engineering Co. Inc. dated March 1983.

Hamilton Reservoir Watershed Study Prepared by the Conway School of Landscape Design dated June 2000.

Hamilton Reservoir FY07 Section 319 Grant Application Prepared by Pioneer Valley Planning Commission dated May 30, 2007.

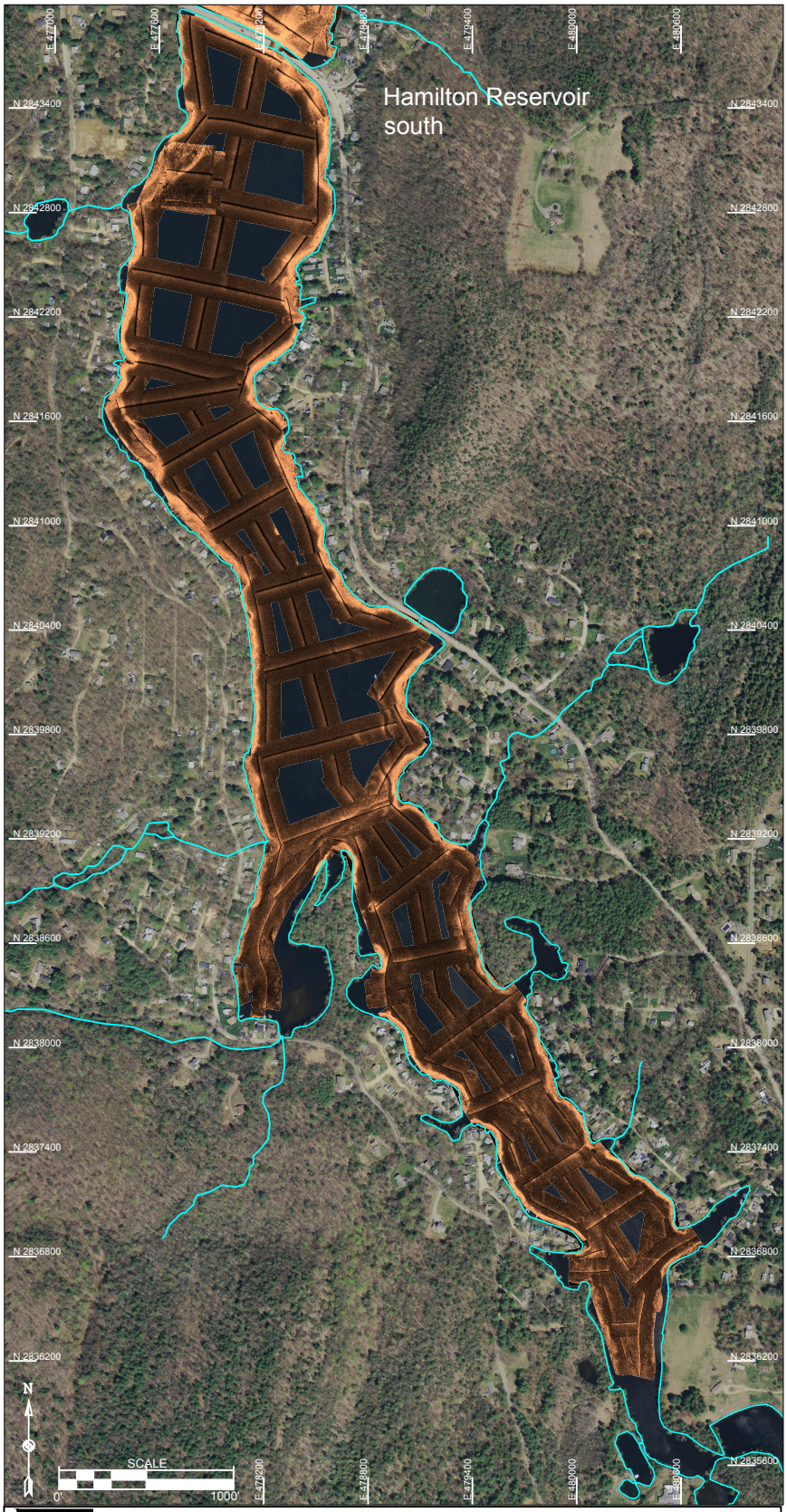
604B Grant Report Hamilton Reservoir Watershed Prepared by Pioneer Valley Planning Commission dated August 2007

Hamilton Reservoir Watershed Assessment Prepared by Pioneer Valley Planning Commission dated December 2007

APPENDIX C

SIDE-SCAN SONAR MAPS

Draft



Shoreline taken from 2014 aerial and tributaries obtained from Mass.gov

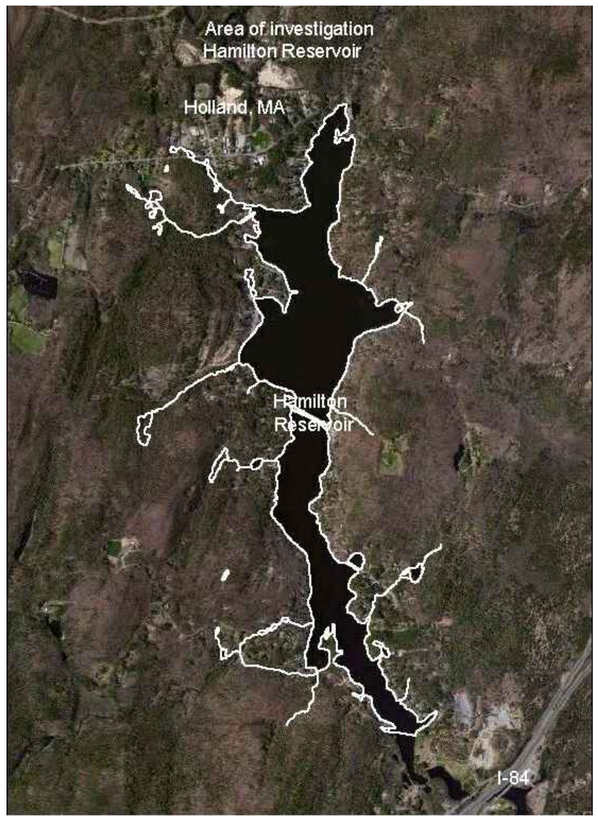
Massachusetts Mainland Plane Feet Coordinate System — Vertical datum NAVD88

North American Datum of 1983 (NAD83) — 2014 aerial photograph

e4sciences

Plate 1 Sidescan sonar map

eophysical investigation of Hamilton Reservoir Holland Massachusetts



DRAFT

Shoreline and etland outline obtained from Mass.gov

N

Massachusetts Mainland Plane Feet Coordinate System
North American Datum of 1983 (NAD83)
Vertical datum NAVD88

SCALE
0' 300'

Dra n y Beckett Boyd
Approved y
Date une 5 2018

APPENDIX D

INTERPRETIVE BEDROCK GEOLOGY AND SURFICIAL GEOLOGY MAPS

Draft

e4sciences

Surficial geology

Hamilton Reservoir, Holland, MA

MA well data

~690 Sand and gravel

~602 Bedrock: "shale"

~690 Clay

~650 Sand

~555 Bedrock: schist Clay (yellow brown)

~690 Cobbles

~645 Clay (gray)

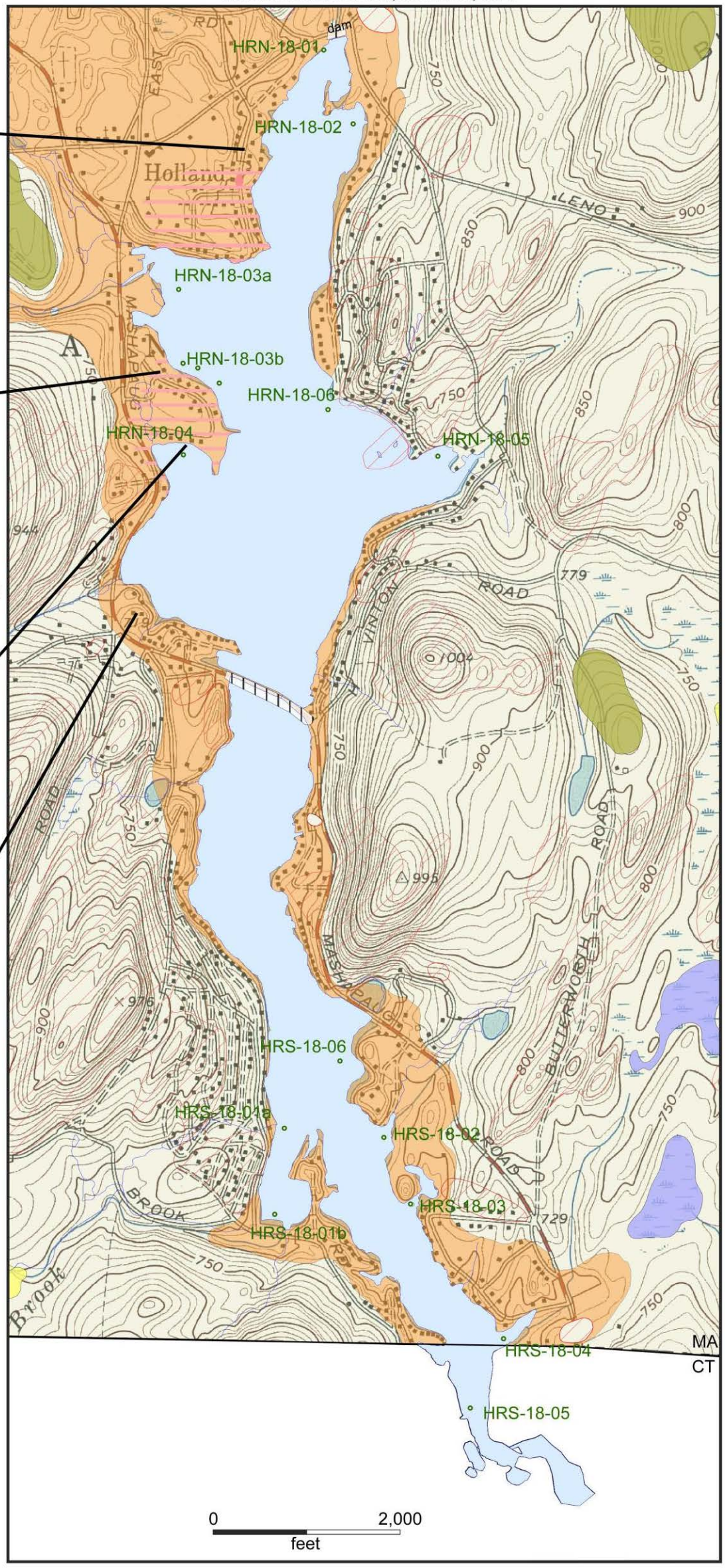
~565 Till

~555 Bedrock: "granite"

~710 Sand and gravel

~680 Gravel

~642 Bedrock: "red rock"



Fill

Man-made fill

Post-glacial sediments

Marsh deposits

Fluvial sands

Glacial sediments

Stratified fine sediments

Shallow buried stratified fine sediments

Stratified coarse sediments

Glacial till thin deposits

Glacial till thick deposits

Bedrock

Abundant bedrock outcrops and/or shallow bedrock

Bedrock outcrop

Figure 5e. Water well boring data, 2018 sediment core locations and surficial geeology in the vicinity of Hamilton Reservoir overlain on USGS topographic map for Wales, CT, quadrangle. Water well boring data is from the *Massachusetts Energy and Enviornmental Affairs data* portal. The surficialgeology map is modified from the digital file of the USGS Open-File Report 2006–1260–I *Surficial Geologic Map of the Mount Grace-Ashburnham-Monson-Webster 24-Quadrangle Area in Central Massachusetts.*

e4sciences

Bathymetry

Hamilton Reservoir, Holland, MA

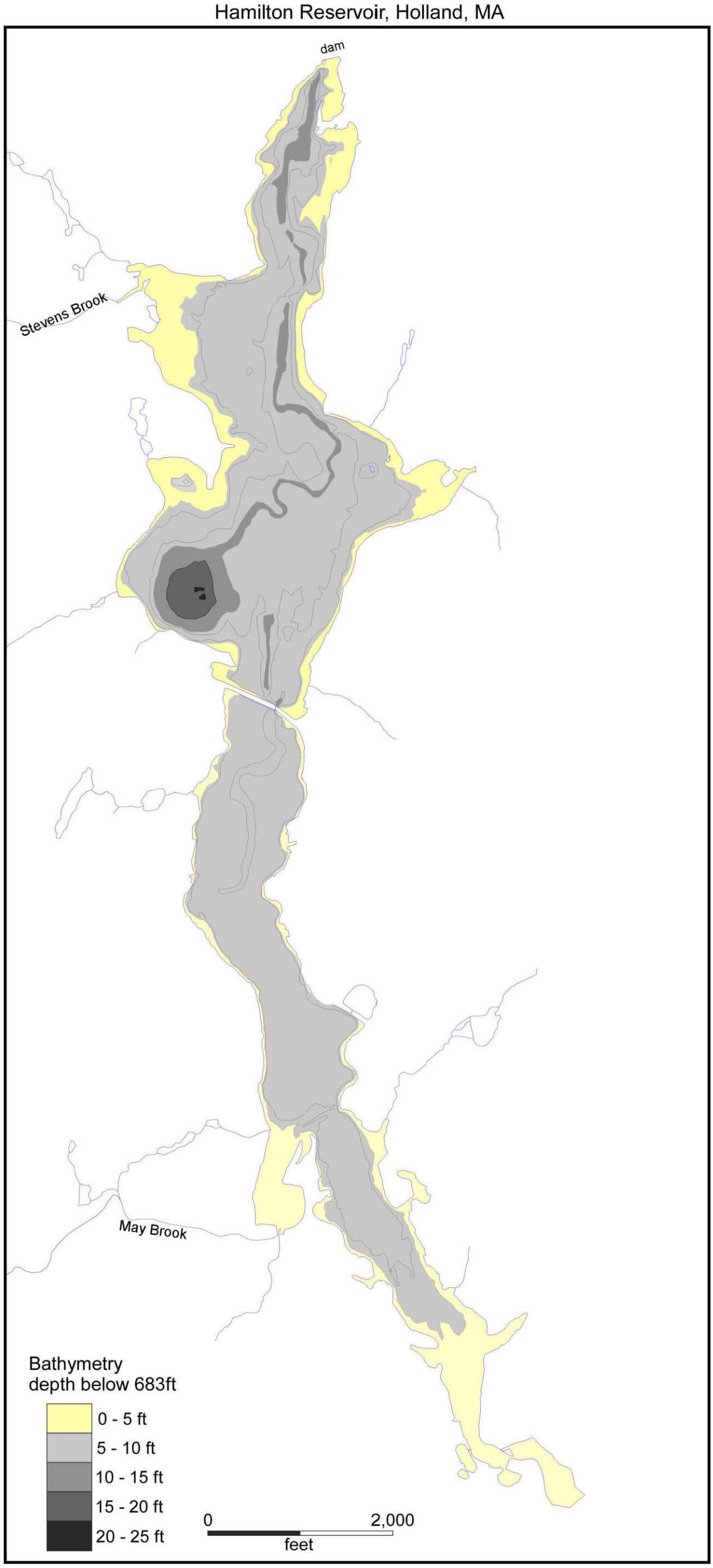


Figure 1b. Depth of Hamilton Reservoir based on 2018 bathymetry. Contours shown are at 674 and 677ftNVD88.Depth is below 683ft NAVD88. The top of the spillway is 683.8ft.

Bathymetry and sediment cores

Hamilton Reservoir, Holland, MA

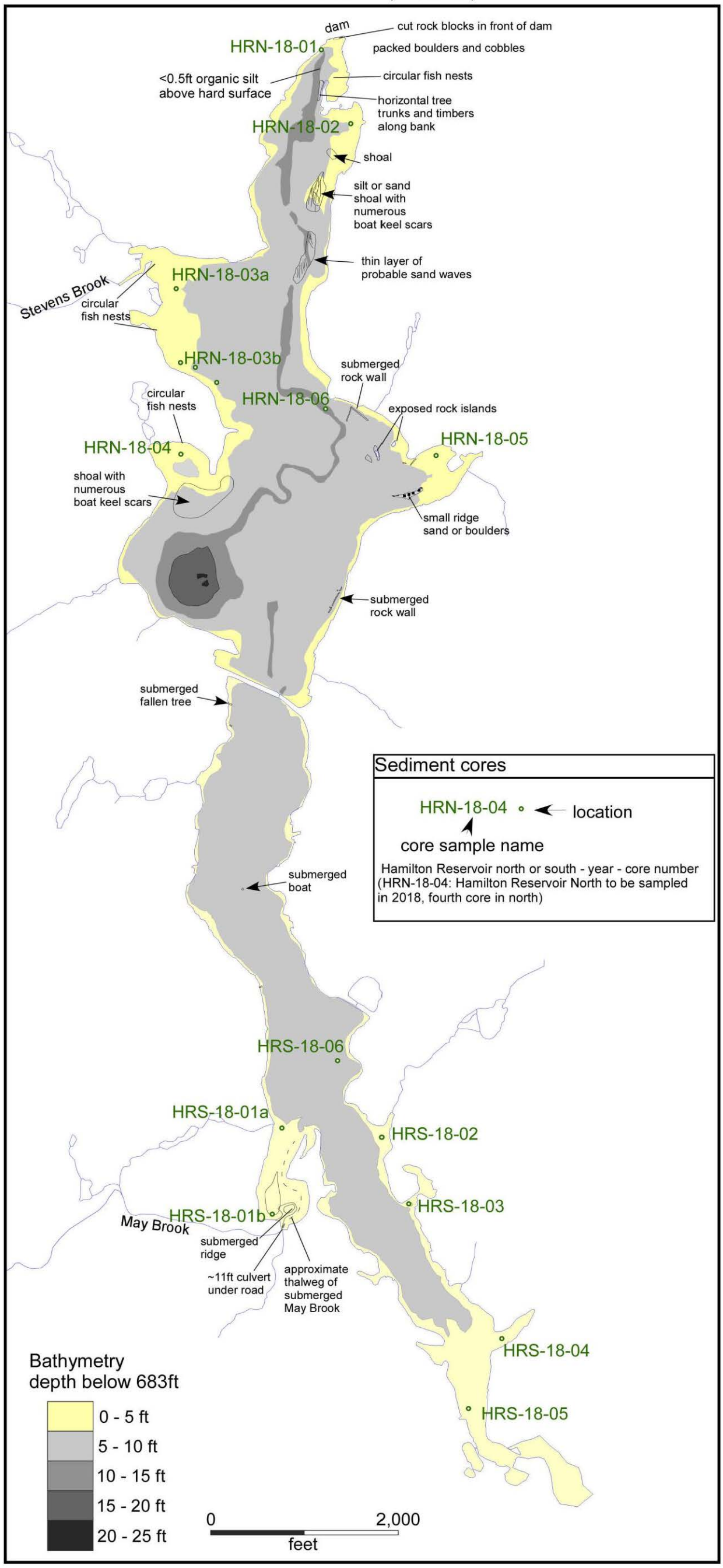


Figure 1d. Lake floor features of Hamiltion Reservoir. Sediment cores were collected in June, 2018. Depth of Hamilton Reservoir based on 2018 bathymetry. Depth is below 683ft NAVD88. The top of the spillway is 683.8ft.

Interpretive lake floor geology

Hamilton Reservoir, Holland, MA

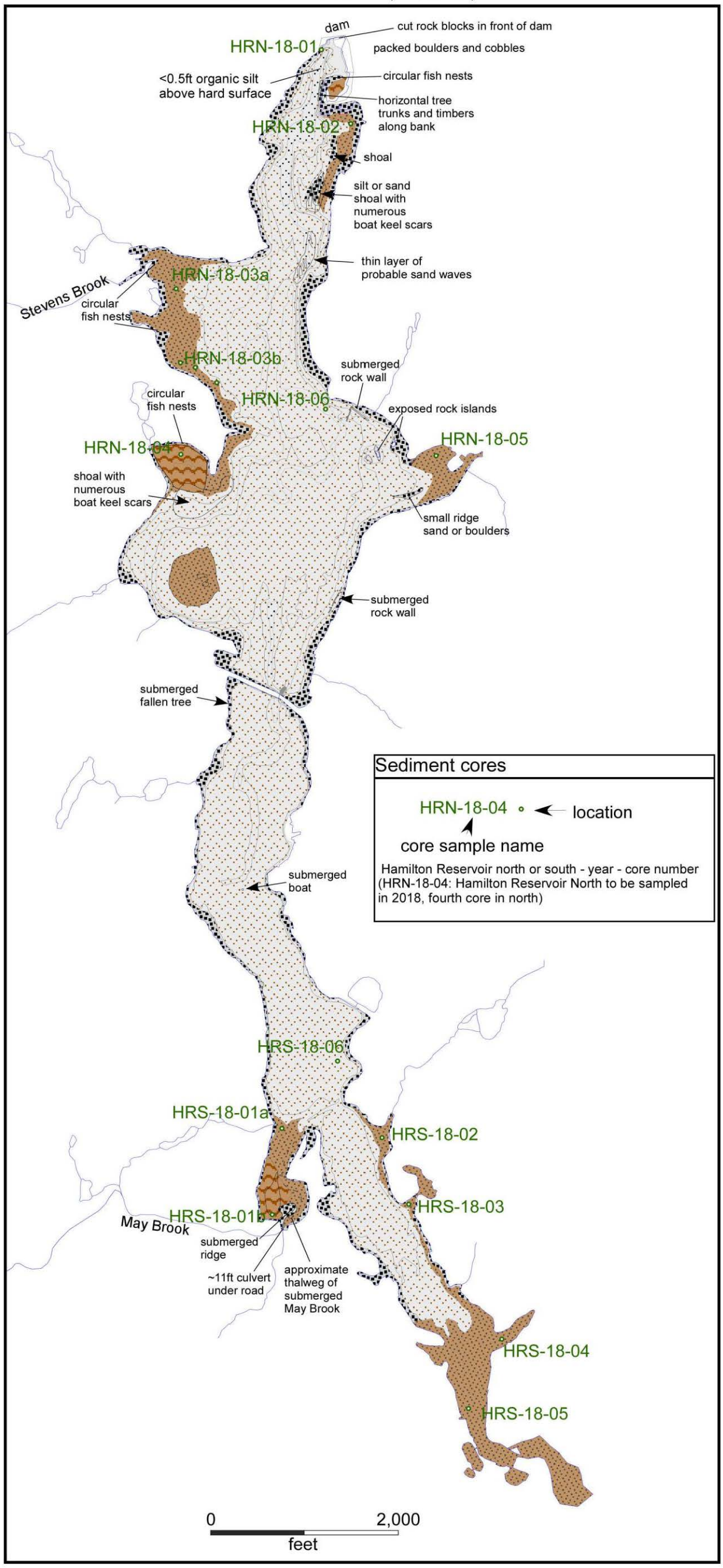


Figure 3a. Lake floor sediments and features of Hamilton Reservoir. Based on 2018 data including sediment cores, orthosonographs (sonar images of lake floor), and field observations.

Interpretive lake floor geology and surficial geology

Hamilton Reservoir, Holland, MA

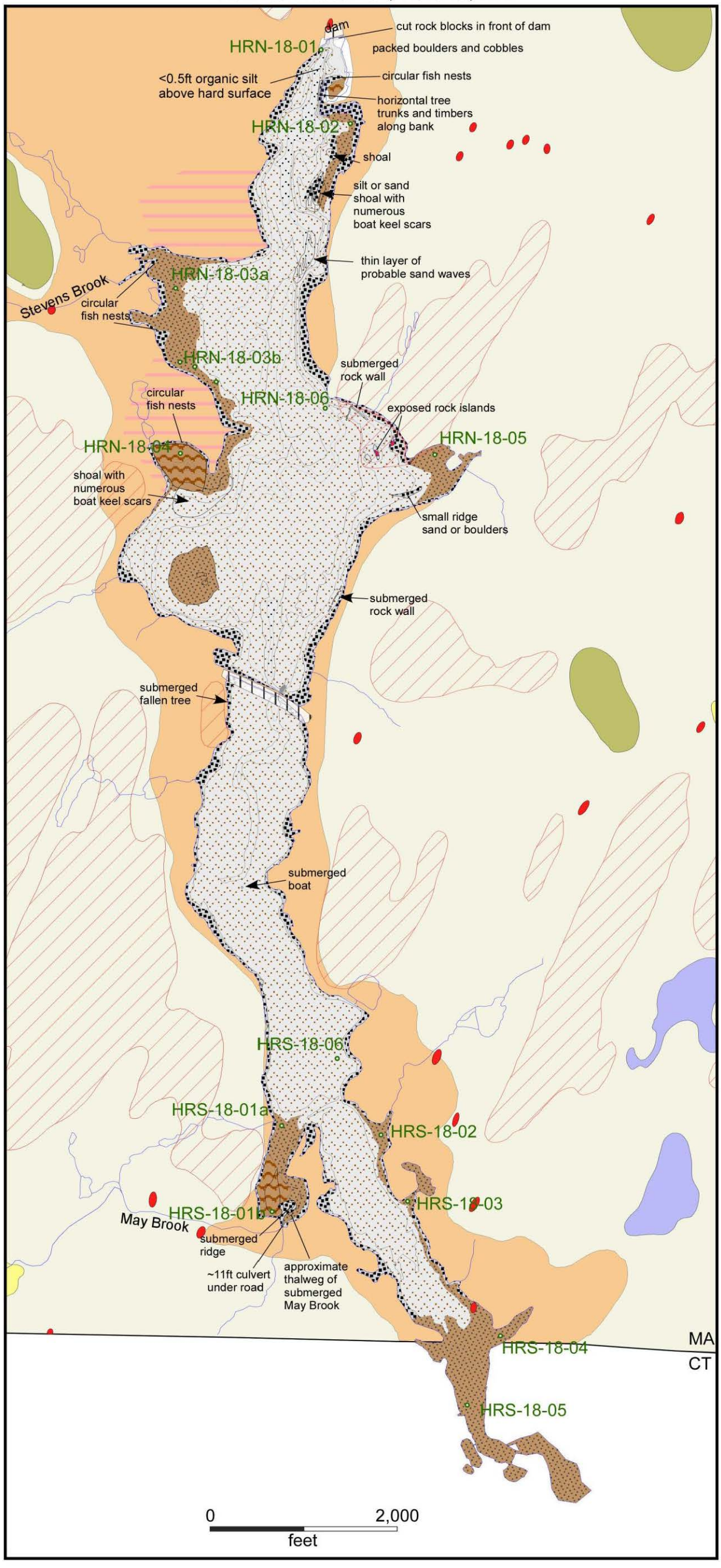


Figure 3b. Surficial geology and lake floor sediments and features of Hamilton. Based on 2018 data including sediment cores, orthosonographs (sonar images of lake floor), and field observations. Surficial geology map is modified from the digital file of the USGS Open-File Report 2006–1260–I *Surficial Geologic Map of the Mount Grace-Ashburnham-Monson-Webster 24-Quadrangle Area in Central Massachusetts.*

e4sciences

Surficial bedrock

Hamilton Reservoir, Holland, MA

MA well data

~690
Sand and gravel
~602
Bedrock: "shale"

~690
Clay
~650
Sand
~555
Bedrock: schist
Clay (yellow brown)

~690
Cobbles
~645
Clay (gray)
~565
Till
~555
Bedrock: "granite"

~710
Sand and gravel
~680
Gravel
~642
Bedrock: "red rock"

dam

MA
CT

0 2,000
feet

Fill
- Man-made fill

Post-glacial sediments
- Marsh deposits
- Fluvial sands

Glacial sediments
- Stratified fine sediments
- Shallow buried stratified fine sediments
- Stratified coarse sediments
- Glacial till thin deposits
- Glacial till thick deposits

Bedrock
- Abundant bedrock outcrops and/or shallow bedrock
- Bedrock outcrop

Figure 4a. Depth to bedrock and bedrock outcrops in the vicinity of Hamilton Reservoir. Depth to bedrock outside the reservoir is from wells from the *Massachusetts* Energy and Enviornmental Affairs data portal. Depth of bedrock inside the reservoir is from 2018 seimic data. The bedrock outcrop map is modified from the digital file of the USGS Open-File Report 2006–1260–I *Surficial Geologic Map of the Mount Grace-Ashburnham-Monson-Webster 24-Quadrangle Area in Central Massachusetts.*

e4sciences

Surficial geology and bedrock

Hamilton Reservoir, Holland, MA

MA well data

~690
Sand and gravel
~602
Bedrock: "shale"

~690
Clay
~650
Sand
~555
Bedrock: schist
Clay (yellow brown)

~690
Cobbles
~645
Clay (gray)
~565
Till
~555
Bedrock: "granite"

~710
Sand and gravel
~680
Gravel
~642
Bedrock: "red rock"

dam

MA
CT

0 2,000
feet

Fill
Man-made fill

Post-glacial sediments
Marsh deposits
Fluvial sands

Glacial sediments
Stratified fine sediments
Shallow buried stratified fine sediments
Stratified coarse sediments
Glacial till thin deposits
Glacial till thick deposits

Bedrock
Abundant bedrock outcrops and/or shallow bedrock
Bedrock outcrop

Figure 4b. Depth to bedrock and surficial geology in the vicinity of Hamilton Reservoir. Depth to bedrock outside the reservoir is from wells from the *Massachusetts* Energy and Enviornmental Affairs data portal. Depth of bedrock inside the reservoir is from 2018 seimic data. The surficialgeology map is modified from the digital file of the USGS Open-File Report 2006–1260–I *Surficial Geologic Map of the Mount Grace-Ashburnham-Monson-Webster 24-Quadrangle Area in Central Massachusetts.*

e4sciences

Surficial geology

Hamilton Reservoir, Holland, MA

MA well data

~690 Sand and gravel
~602 Bedrock: "shale"

~690 Clay
~650 Sand
~555 Bedrock: schist
Clay (yellow brown)

~690 Cobbles
~645 Clay (gray)
~565 Till
~555 Bedrock: "granite"

~710 Sand and gravel
~680 Gravel
~642 Bedrock: "red rock"

HRN-18-01
dam
HRN-18-02
HRN-18-03a
HRN-18-03b
HRN-18-06
HRN-18-04
HRN-18-05
HRS-18-06
HRS-18-01a
HRS-18-02
HRS-18-03
HRS-18-01b
HRS-18-04
HRS-18-05
MA
CT
0
2,000
feet

Fill
Man-made fill

Post-glacial sediments
Marsh deposits
Fluvial sands

Glacial sediments
Stratified fine sediments
Shallow buried stratified fine sediments
Stratified coarse sediments
Glacial till thin deposits
Glacial till thick deposits

Bedrock
Abundant bedrock outcrops and/or shallow bedrock
Bedrock outcrop

Figure 5b. Water well boring data, 2018 sediment core locations and the suricial geeology in the vicinity of Hamilton Reservoir. Water well boring data is from the *Massachusetts Energy and Enviornmental Affairs data* portal. The surficialgeology map is modified from the digital file of the USGS Open-File Report 2006–1260–I *Surficial Geologic Map of the Mount Grace-Ashburnham-Monson-Webster 24-Quadrangle Area in Central Massachusetts.*

APPENDIX E

SEDIMENT CORE LOGS

Draft

e4sciences 20180719
Hamilton Reservoir

North Reservoir

Sediment Core	Date	Easting	Northing	Elevation of lake bottom	Recovery	Sampling notes	Used for testing	Water depth below 683.8ft NAVD88	Sediment type	Description
		MAMSP NAD83 ft	MAMSP NAD83 ft	ft NAVD88	feet			ft		
HRN-18-01	2018.06.20	478720.8	2850658.4	680.8	1.42	2 attempts		~3.0	sand w organics	medium Sand (trace coarse sand) with organics (plant matter including small twigs and leaves)
HRN-18-02	2018.06.20	479041.1	2849872.7	678.5	1.30	2 attempts		5.3	peat over silty sand	0.75ft organic peat with little silt; 0.36ft fine sand, silt and organics; 0.19ft sandy clay
HRN-18-03a	2018.06.20	477167.6	2848109.7	678.4	2.00			5.4	silty sand over silty peat	1.13ft dark gray brown silt and very fine sand; 0.87ft silty peat, trace fine sand
HRN-18-03bi	2018.06.20	477607.0	2847103.0	677.7	1.25			6.1	peaty silt	
HRN-18-03bii	2018.06.20	477377.5	2847262.0	677.8	1.88	2 attempts		5.9	peaty silt	
HRN-18-03biii	2018.06.20	477227.3	2847320.0	679.4	1.45			4.4	peat over sand	0.66 dark brown organic peaty silt; 0.402ft dark yellow brown organic silt and sand; 0.22 yellow brown silt and fine sand; 0.17 yellow brown medium sand with clay layers
HRN-18-04	2018.06.20	477222.0	2846333.0	678.4	1.38	multiple attempts; penetration 8ft		5.4	peat	0.53ft brown organic peat ("coffee grounds" soup), trace silt; 0.85ft brown peat , trace to little silt
HRN-18-05	2018.06.20	479942.3	2846325.8	679.5	1.00	2 attempts		4.3	organic silt	dark gray brown organic silt, thin clay layer
HRN-18-06	2018.06.20	478772.4	2846818.3	672.7	1.10	in thalweg of submerged stream		11.1	silt w organics	silt w organics

South Reservoir

Sediment Core	Date	Easting	Northing	Elevation of lake bottom	Recovery	Sampling notes	Used for testing	Water depth below 683.8ft NAVD88	Sediment type	Description
		MAMSP NAD83 ft	MAMSP NAD83 ft	ft NAVD88	feet			ft		
HRS-18-01a	2018.06.20	478303.4	2839135.3	678.4	1.20			5.3	silt with organics	0.55ft brown sit with organics, 0.65ft dark gray brown silt with organics
HRS-18-01b	2018.06.20	478201.5	2838220.5	680.4	0.95	2 attempts		3.4		0.55ft plant matter (leaves); 0.40ft medium sand
HRS-18-02	2018.06.20	479368.0	2839038.0	679.1	1.50			4.7		0.41ft organics with silt; 0.30ft silt with organics; 0.79ft organics sandy silt
HRS-18-03	2018.06.20	479654.0	2838336.0	678.7	1.40			5.2		0.82 dark gray brown silt with organics (fine roots); brown silty peat (roots, wood/stick fragments)
HRS-18-04	2018.06.20	480642.2	2836886.0	680.0	1.05	(in seismic deeper soft sed)		3.8	silty over peat over sand	0.33 dark brown silt with organics; 0.65ft dark brown silty peat; brown medium to coarse sand, trace organics
HRS-18-05	2018.06.20	480290.0	2836147.0	679.4	1.10	(and 2nd tube)		4.6	peat to silty peat	0.33 silty peat (trace sheen); 0.97ft dark brown peat and silt
HRS-18-06	2018.06.20	478896.0	2839860.0	675.8	1.12	in thalweg of submerged stream		8.0	silt w organics	silt w organics

notes
2 live mussels in top 3in
pieces of wood up to 7.0x4.0x2.5cm

notes
very slight organic oily sheen

APPENDIX F

SEDIMENT LAB RESULTS

Draft

Table 3-3
Summary of Laboratory Analytical Results
Hamilton Reservoir
Holland, Massachusetts
MMI #6291-01

			Lab Number	8060766-01	8060766-02	8060766-03	8060766-04	8060766-05	8060766-06	8060766-07	8060766-08	8060766-09	8060766-10
			Sample ID	HRN-02	HRN-03A	HRN-03B	HRN-04	HRN-05	HRS-01A	HRS-02	HRS-03	HRS-04	HRS-05
			Sample Date	6/20/2018	6/20/2018	6/20/2018	6/20/2018	6/20/2018	6/20/2018	6/20/2018	6/20/2018	6/20/2018	6/20/2018
	MA DEP COMM-97-01												
	Lined Landfill	Unlined Landfill	MCP S-1/GW-1										
Calculated Analyte (mg/kg)													
Total Nitrogen	NE	NE	NE	300	640	370	1200	270	800	660	1400	770	1300
EPA 300.0 (mg/kg)													
Nitrate as N	NE	NE	NE	<0.28	<0.18	<0.19	<0.48	<0.20	<0.27	<0.27	<0.48	<0.27	6
EPA 351.2 (mg/kg)													
Total Kjeldahl Nitrogen (TKN)	NE	NE	NE	300	640	370	1200	270	800	660	1400	770	1300
EPA 365.2 (mg/kg)													
Phosophorus, Total	NE	NE	NE	290	320	310	230	290	440	520	520	380	400
EPA 6010C (mg/kg)													
Arsenic	40	40	20	<2.7	<1.5	3.1	<4.9	<2.0	<2.4	<2.5	<4.7	<2.6	<4.3
Barium	NE	NE	1,000	90	53	44	72	98	96	96	73	78	49
Cadmium	80	30	70	<1.3	<0.75	<0.77	<2.4	<1.0	<1.2	<1.2	<2.4	<1.3	<2.2
Copper	NE	NE	NE	13	9.6	12	15	16	18	17	19	14	11
Lead	2,000	1,000	200	24	9.2	12	31	20	14	20	36	12	16
Nickel	NE	NE	600	16	10	8.4	11	17	20	26	14	13	11
Selenium	NE	NE	400	3.5	1.9	<1.5	5.7	<2.0	2.6	3.2	8.2	2.9	7.7
Silver	NE	NE	100	<5.3	<3.0	<3.1	<9.8	<4.0	<4.9	<4.9	<9.5	<5.3	<8.7
Zinc	NE	NE	1,000	64	38	31	69	83	83	82	92	66	98
Chromium	1,000	1,000	100	45	24	22	<9.8	33	36	33	20	25	17
EPA 7471B (mg/kg)													
Mercury	10	10	20	<0.34	<0.23	<0.22	<0.57	<0.25	<0.34	<0.32	<0.61	<0.33	<0.55
EPA 8082A (mg/kg)													
Total PCBs	<2	<2	1	<0.28	<0.18	<0.19	<0.48	<0.20	<0.27	<0.27	<0.48	<0.27	<0.44
EPA 8260C (ug/Kg)													
Total VOCs	10	4	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
EPA 8270D (ug/Kg)													
Total SVOCs	100	100	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
EPA 9060A (mg/kg)													
Total Organic Carbon	NE	NE	NE	84000	103000	48000	848000	74000	109000	72000	319000	146000	260000
Mass DEP (mg/kg)													
C11-C22 Aromatic Hydrocarbons	NE	NE	NE	<54	<35	<37	<94	<39	<53	<54	<96	<53	<86
C19-C36 Aliphatic Hydrocarbons	NE	NE	NE	<54	<35	<37	<94	<39	<53	<54	<96	<53	<86
C9-C18 Aliphatic Hydrocarbons	NE	NE	NE	<54	<35	<37	<94	<39	<53	<54	<96	<53	<86
MA-VPH (mg/kg)													
Benzene	NE	NE	NE	<0.045	<0.066	<0.044	<0.24	<0.051	<0.11	<0.064	<0.15	<0.072	<0.22
Ethylbenzene	NE	NE	NE	<0.091	<0.13	<0.089	<0.47	<0.1	<0.22	<0.13	<0.3	<0.14	<0.45
m+p Xylenes	NE	NE	NE	<0.091	<0.13	<0.089	<0.47	<0.1	<0.22	<0.13	<0.3	<0.14	<0.45
Methyl-t-Butyl Ether (MTBE)	NE	NE	NE	<0.091	<0.13	<0.089	<0.47	<0.1	<0.22	<0.13	<0.3	<0.14	<0.45
Naphthalene	NE	NE	NE	<0.45	<0.66	<0.44	<2.4	<0.51	<1.1	<0.64	<1.5	<0.72	<2.2
o-Xylene	NE	NE	NE	<0.091	<0.13	<0.089	<0.47	<0.1	<0.22	<0.13	<0.3	<0.14	<0.45
Toluene	NE	NE	NE	<0.091	<0.13	<0.089	<0.47	<0.1	<0.22	<0.13	<0.3	<0.14	<0.45
C5-C8 Aliphatic	NE	NE	NE	<9	<13	<8.8	<47	<10	<22	<13	<30	<14	<45
C9-C10 Aromatic	NE	NE	NE	<9	<13	<8.8	<47	<10	<22	<13	<30	<14	<45
C9-C12 Aliphatic	NE	NE	NE	<9	<13	<8.8	<47	<10	<22	<13	<30	<14	<45

Notes:

Grey highlighted cell indicates a detection above the laboratory minimum detection limit.

NE=Criterion not established

ND=Not detected above the laboratory minimum detection limit.

All comparitive criteria in ppm.

80 Lupes Drive
Stratford, CT 06615

Tel: (203) 377-9984
Fax: (203) 377-9952
e-mail: cet1@cetlabs.com

Client: Mr. Matt Sanford
Milone + MacBroom Inc
99 Realty Drive
Cheshire, CT 06410

Analytical Report

CET# 8060766

Report Date:July 11, 2018
Project: Hamilton Reservior, Mass
Project Number: 6291-01

Connecticut Laboratory Certificate: PH 0116
Massachusetts Laboratory Certificate: M-CT903
Rhode Island Laboratory Certificate: 199

New York NELAP Accreditation: 11982
Pennsylvania Laboratory Certificate: 68-02927

SAMPLE SUMMARY

The sample(s) were received at 6.5°C.

This report contains analytical data associated with following samples only.

Sample ID	Laboratory ID	Matrix	Collection Date/Time	Receipt Date
HRN-02	8060766-01	Soil	6/20/2018 9:00	06/21/2018
HRN-03A	8060766-02	Soil	6/20/2018 10:00	06/21/2018
HRN-03B	8060766-03	Soil	6/20/2018 11:00	06/21/2018
HRN-04	8060766-04	Soil	6/20/2018 12:00	06/21/2018
HRN-05	8060766-05	Soil	6/20/2018 13:00	06/21/2018
HRS-01A	8060766-06	Soil	6/20/2018 14:00	06/21/2018
HRS-02	8060766-07	Soil	6/20/2018 15:00	06/21/2018
HRS-03	8060766-08	Soil	6/20/2018 16:00	06/21/2018
HRS-04	8060766-09	Soil	6/20/2018 17:00	06/21/2018
HRS-05	8060766-10	Soil	6/20/2018 18:00	06/21/2018

Analyte: Percent Solids [SM 2540 G]

Analyst: AMA

Matrix: Soil

Laboratory ID	Client Sample ID	Result	RL	Units	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
8060766-01	HRN-02	**36**	1.0	%	1	B8F2606	06/26/2018	06/28/2018 00:00	
8060766-02	HRN-03A	**55**	1.0	%	1	B8F2606	06/26/2018	06/28/2018 00:00	
8060766-03	HRN-03B	**53**	1.0	%	1	B8F2606	06/26/2018	06/28/2018 00:00	
8060766-04	HRN-04	**21**	1.0	%	1	B8F2606	06/26/2018	06/28/2018 00:00	
8060766-05	HRN-05	**50**	1.0	%	1	B8F2606	06/26/2018	06/28/2018 00:00	
8060766-06	HRS-01A	**37**	1.0	%	1	B8F2606	06/26/2018	06/28/2018 00:00	
8060766-07	HRS-02	**37**	1.0	%	1	B8F2630	06/26/2018	06/27/2018 10:20	
8060766-08	HRS-03	**21**	1.0	%	1	B8F2630	06/26/2018	06/27/2018 10:20	
8060766-09	HRS-04	**37**	1.0	%	1	B8F2630	06/26/2018	06/27/2018 10:20	
8060766-10	HRS-05	**23**	1.0	%	1	B8F2630	06/26/2018	06/27/2018 10:20	

Analyte: Percent Moisture [SM 2540 G]

Analyst: AMA

Matrix: Soil

Laboratory ID	Client Sample ID	Result	RL	Units	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
8060766-01	HRN-02	**64**	1.0	%	1	B8F2606	06/26/2018	06/28/2018 00:00	
8060766-02	HRN-03A	**45**	1.0	%	1	B8F2606	06/26/2018	06/28/2018 00:00	
8060766-03	HRN-03B	**47**	1.0	%	1	B8F2606	06/26/2018	06/28/2018 00:00	
8060766-04	HRN-04	**79**	1.0	%	1	B8F2606	06/26/2018	06/28/2018 00:00	
8060766-05	HRN-05	**50**	1.0	%	1	B8F2606	06/26/2018	06/28/2018 00:00	
8060766-06	HRS-01A	**63**	1.0	%	1	B8F2606	06/26/2018	06/28/2018 00:00	
8060766-07	HRS-02	**63**	1.0	%	1	B8F2534	06/25/2018	06/25/2018 14:16	
8060766-08	HRS-03	**78**	1.0	%	1	B8F2534	06/25/2018	06/25/2018 14:16	
8060766-09	HRS-04	**64**	1.0	%	1	B8F2534	06/25/2018	06/25/2018 14:16	
8060766-10	HRS-05	**73**	1.0	%	1	B8F2534	06/25/2018	06/25/2018 14:16	

Analyte: Nitrate as N [EPA 300.0]

Analyst: MLG

Matrix: Soil

Laboratory ID	Client Sample ID	Result	RL	Units	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
8060766-01	HRN-02	ND	0.28	mg/kg dry	1	B8F2808	06/27/2018	06/27/2018 14:00	
8060766-02	HRN-03A	ND	0.18	mg/kg dry	1	B8F2808	06/27/2018	06/27/2018 14:15	
8060766-03	HRN-03B	ND	0.19	mg/kg dry	1	B8F2808	06/27/2018	06/27/2018 14:30	
8060766-04	HRN-04	ND	0.48	mg/kg dry	1	B8F2808	06/27/2018	06/27/2018 14:45	
8060766-05	HRN-05	ND	0.20	mg/kg dry	1	B8F2808	06/27/2018	06/27/2018 15:00	
8060766-06	HRS-01A	ND	0.27	mg/kg dry	1	B8F2808	06/27/2018	06/27/2018 15:30	
8060766-07	HRS-02	ND	0.27	mg/kg dry	1	B8F2808	06/27/2018	06/27/2018 15:45	
8060766-08	HRS-03	ND	0.48	mg/kg dry	1	B8F2808	06/27/2018	06/27/2018 16:00	
8060766-09	HRS-04	ND	0.27	mg/kg dry	1	B8F2808	06/27/2018	06/27/2018 16:15	
8060766-10	HRS-05	**6.0**	0.44	mg/kg dry	1	B8F2808	06/27/2018	06/27/2018 16:30	

Analyte: Nitrite as N [EPA 300.0]

Analyst: MLG

Matrix: Soil

Laboratory ID	Client Sample ID	Result	RL	Units	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
8060766-01	HRN-02	ND	0.28	mg/kg dry	1	B8F2808	06/27/2018	06/27/2018 14:00	
8060766-02	HRN-03A	ND	0.18	mg/kg dry	1	B8F2808	06/27/2018	06/27/2018 14:15	
8060766-03	HRN-03B	ND	0.19	mg/kg dry	1	B8F2808	06/27/2018	06/27/2018 14:30	
8060766-04	HRN-04	ND	0.48	mg/kg dry	1	B8F2808	06/27/2018	06/27/2018 14:45	
8060766-05	HRN-05	ND	0.20	mg/kg dry	1	B8F2808	06/27/2018	06/27/2018 15:00	
8060766-06	HRS-01A	ND	0.27	mg/kg dry	1	B8F2808	06/27/2018	06/27/2018 15:30	
8060766-07	HRS-02	ND	0.27	mg/kg dry	1	B8F2808	06/27/2018	06/27/2018 15:45	
8060766-08	HRS-03	ND	0.48	mg/kg dry	1	B8F2808	06/27/2018	06/27/2018 16:00	
8060766-09	HRS-04	ND	0.27	mg/kg dry	1	B8F2808	06/27/2018	06/27/2018 16:15	
8060766-10	HRS-05	ND	0.44	mg/kg dry	1	B8F2808	06/27/2018	06/27/2018 16:30	

Analyte: Total Nitrogen [Calculated Analyte]

Analyst: Various

Matrix: Soil

Laboratory ID	Client Sample ID	Result	RL	Units	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
8060766-01	HRN-02	**300**	110	mg/kg dry	40				
8060766-02	HRN-03A	**640**	73	mg/kg dry	40				
8060766-03	HRN-03B	**370**	76	mg/kg dry	40				
8060766-04	HRN-04	**1200**	190	mg/kg dry	40				
8060766-05	HRN-05	**270**	80	mg/kg dry	40				
8060766-06	HRS-01A	**800**	110	mg/kg dry	40				
8060766-07	HRS-02	**660**	110	mg/kg dry	40				
8060766-08	HRS-03	**1400**	190	mg/kg dry	40				
8060766-09	HRS-04	**770**	110	mg/kg dry	40				
8060766-10	HRS-05	**1300**	180	mg/kg dry	40				

Analyte: Phosphorous, Total [EPA 365.2]

Analyst: MLG

Matrix: Soil

Laboratory ID	Client Sample ID	Result	RL	Units	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
8060766-01	HRN-02	**290**	14	mg/kg dry	5	B8F2634	06/27/2018	06/27/2018 12:32	
8060766-02	HRN-03A	**320**	9.0	mg/kg dry	5	B8F2634	06/27/2018	06/27/2018 12:32	
8060766-03	HRN-03B	**310**	9.4	mg/kg dry	5	B8F2634	06/27/2018	06/27/2018 12:32	
8060766-04	HRN-04	**230**	24	mg/kg dry	5	B8F2634	06/27/2018	06/27/2018 12:32	
8060766-05	HRN-05	**290**	9.9	mg/kg dry	5	B8F2634	06/27/2018	06/27/2018 12:32	
8060766-06	HRS-01A	**440**	14	mg/kg dry	5	B8F2634	06/27/2018	06/27/2018 12:32	
8060766-07	HRS-02	**520**	14	mg/kg dry	5	B8F2634	06/27/2018	06/27/2018 12:32	
8060766-08	HRS-03	**520**	24	mg/kg dry	5	B8F2634	06/27/2018	06/27/2018 12:32	
8060766-09	HRS-04	**380**	14	mg/kg dry	5	B8F2634	06/27/2018	06/27/2018 12:32	
8060766-10	HRS-05	**400**	22	mg/kg dry	5	B8F2634	06/27/2018	06/27/2018 12:32	

Analyte: Total Kjeldahl Nitrogen (TKN) [EPA 351.2]

Analyst: MLG

Matrix: Soil

Laboratory ID	Client Sample ID	Result	RL	Units	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
8060766-01	HRN-02	**300**	110	mg/kg dry	40	B8F2732	06/28/2018	06/28/2018 00:00	
8060766-02	HRN-03A	**640**	72	mg/kg dry	40	B8F2732	06/28/2018	06/28/2018 00:00	
8060766-03	HRN-03B	**370**	75	mg/kg dry	40	B8F2732	06/28/2018	06/28/2018 00:00	
8060766-04	HRN-04	**1200**	190	mg/kg dry	40	B8F2732	06/28/2018	06/28/2018 00:00	
8060766-05	HRN-05	**270**	79	mg/kg dry	40	B8F2732	06/28/2018	06/28/2018 00:00	
8060766-06	HRS-01A	**800**	110	mg/kg dry	40	B8F2732	06/28/2018	06/28/2018 00:00	
8060766-07	HRS-02	**660**	110	mg/kg dry	40	B8F2732	06/28/2018	06/28/2018 00:00	
8060766-08	HRS-03	**1400**	190	mg/kg dry	40	B8F2732	06/28/2018	06/28/2018 00:00	
8060766-09	HRS-04	**770**	110	mg/kg dry	40	B8F2732	06/28/2018	06/28/2018 00:00	
8060766-10	HRS-05	**1300**	180	mg/kg dry	40	B8F2732	06/28/2018	06/28/2018 00:00	

Analyte: Mercury [EPA 7471B]

Analyst: KP

Matrix: Soil

Laboratory ID	Client Sample ID	Result	RL	Units	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
8060766-01	HRN-02	ND	0.34	mg/kg dry	1	B8F2611	06/26/2018	06/27/2018 11:40	
8060766-02	HRN-03A	ND	0.23	mg/kg dry	1	B8F2611	06/26/2018	06/27/2018 11:51	
8060766-03	HRN-03B	ND	0.22	mg/kg dry	1	B8F2611	06/26/2018	06/27/2018 11:54	
8060766-04	HRN-04	ND	0.57	mg/kg dry	1	B8F2611	06/26/2018	06/27/2018 12:02	
8060766-05	HRN-05	ND	0.25	mg/kg dry	1	B8F2611	06/26/2018	06/27/2018 12:05	
8060766-06	HRS-01A	ND	0.34	mg/kg dry	1	B8F2611	06/26/2018	06/27/2018 12:08	
8060766-07	HRS-02	ND	0.32	mg/kg dry	1	B8F2611	06/26/2018	06/27/2018 12:11	
8060766-08	HRS-03	ND	0.61	mg/kg dry	1	B8F2611	06/26/2018	06/27/2018 12:14	
8060766-09	HRS-04	ND	0.33	mg/kg dry	1	B8F2611	06/26/2018	06/27/2018 12:17	
8060766-10	HRS-05	ND	0.55	mg/kg dry	1	B8F2611	06/26/2018	06/27/2018 12:20	

CET # : 8060766
Project: Hamilton Reservior, Mass
Project Number: 6291-01

Testing Performed at: M-CT007

Analyte: Total Organic Carbon [EPA 9060A]

Analyst: subcontract

Matrix: Soil

Laboratory ID	Client Sample ID	Result	RL	Units	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
8060766-01	HRN-02	**84000**	100	mg/kg	1		06/25/2018	06/27/2018 00:00	
8060766-02	HRN-03A	**103000**	100	mg/kg	1		06/25/2018	06/28/2018 00:00	
8060766-03	HRN-03B	**48000**	100	mg/kg	1		06/25/2018	06/28/2018 00:00	
8060766-04	HRN-04	**848000**	100	mg/kg	1		06/25/2018	06/28/2018 00:00	
8060766-05	HRN-05	**74000**	100	mg/kg	1		06/25/2018	06/28/2018 00:00	
8060766-06	HRS-01A	**109000**	100	mg/kg	1		06/25/2018	06/28/2018 00:00	
8060766-07	HRS-02	**72000**	100	mg/kg	1		06/25/2018	06/28/2018 00:00	
8060766-08	HRS-03	**319000**	100	mg/kg	1		06/25/2018	06/28/2018 00:00	
8060766-09	HRS-04	**146000**	100	mg/kg	1		06/25/2018	06/28/2018 00:00	
8060766-10	HRS-05	**260000**	100	mg/kg	1		06/25/2018	06/28/2018 00:00	

Client Sample ID HRN-02

Lab ID: 8060766-01

Total Metals **Analyst: SS**

Method: EPA 6010C **Matrix: Soil**

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Lead	**24**	5.3	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 14:42	
Selenium	**3.5**	2.7	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 14:42	
Cadmium	ND	1.3	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 14:42	
Chromium	**45**	5.3	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 14:42	
Arsenic	ND	2.7	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 14:42	
Barium	**90**	5.3	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 14:42	
Silver	ND	5.3	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 14:42	
Copper	**13**	5.3	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 14:42	
Nickel	**16**	5.3	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 14:42	
Zinc	**64**	5.3	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 14:42	

Mass Extractable Hydrocarbons **Analyst: MJH**

Method: Mass DEP **Matrix: Soil**

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
C9-C18 Aliphatic Hydrocarbons	ND	54	1	EPA 3545A	B8F2540	06/25/2018	06/28/2018 15:00	
C19-C36 Aliphatic Hydrocarbons	ND	54	1	EPA 3545A	B8F2540	06/25/2018	06/28/2018 15:00	
C11-C22 Aromatic Hydrocarbons	ND	54	1	EPA 3545A	B8F2540	06/25/2018	06/28/2018 15:00	
Surrogate: o-Terphenyl	*77.9 %*	*40 - 140*			B8F2540	06/25/2018	*06/28/2018 15:00*	
Surrogate: 1-Chloroctadacane	*87.0 %*	*40 - 140*			B8F2540	06/25/2018	*06/28/2018 15:00*	
Surrogate: 2-Bromonapthalene		*40 - 140*			B8F2540	06/25/2018	*06/28/2018 15:00*	**MAFRL**
Surrogate: 2-Fluorobiphenyl		*40 - 140*			B8F2540	06/25/2018	*06/28/2018 15:00*	**MAFRL**

MAFR Sample was not fractionated due to lack of contamination.

MAFR Sample was not fractionated due to lack of contamination.

PCBs by Soxhlet **Analyst: PJB**

Method: EPA 8082A **Matrix: Soil**

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
PCB-1016	ND	0.28	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 05:14	
PCB-1221	ND	0.28	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 05:14	
PCB-1232	ND	0.28	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 05:14	
PCB-1242	ND	0.28	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 05:14	
PCB-1248	ND	0.28	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 05:14	

Client Sample ID HRN-02

Lab ID: 8060766-01

PCBs by Soxhlet **Analyst: PJB**

Method: EPA 8082A **Matrix: Soil**

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
PCB-1254	ND	0.28	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 05:14	
PCB-1260	ND	0.28	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 05:14	
PCB-1268	ND	0.28	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 05:14	
PCB-1262	ND	0.28	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 05:14	
Surrogate: TCMX [1C]	*64.3 %*	*30 - 150*			B8F2633	06/26/2018	*06/30/2018 05:14*	
Surrogate: TCMX [2C]	*60.4 %*	*30 - 150*			B8F2633	06/26/2018	*06/30/2018 05:14*	
Surrogate: DCB [1C]	*82.5 %*	*30 - 150*			B8F2633	06/26/2018	*06/30/2018 05:14*	
Surrogate: DCB [2C]	*75.3 %*	*30 - 150*			B8F2633	06/26/2018	*06/30/2018 05:14*	

Semivolatile Organics **Analyst: EAS**

Method: EPA 8270D **Matrix: Soil**

Analyte	Result (ug/kg dry)	RL (ug/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Naphthalene	ND	830	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 00:45	
2-Methyl Naphthalene	ND	830	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 00:45	
Acenaphthylene	ND	830	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 00:45	
Acenaphthene	ND	830	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 00:45	
Fluorene	ND	830	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 00:45	
Phenanthrene	ND	830	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 00:45	
Anthracene	ND	830	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 00:45	
Fluoranthene	ND	830	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 00:45	
Pyrene	ND	830	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 00:45	
Benzo[a]anthracene	ND	830	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 00:45	
Chrysene	ND	830	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 00:45	
Benzo[b]fluoranthene	ND	830	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 00:45	
Benzo[k]fluoranthene	ND	830	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 00:45	
Benzo[a]pyrene	ND	830	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 00:45	
Indeno[1,2,3-cd]pyrene	ND	830	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 00:45	
Dibenz[a,h]anthracene	ND	830	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 00:45	
Benzo[g,h,i]perylene	ND	830	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 00:45	
Surrogate: Nitrobenzene-d5	*69.5 %*	*30 - 130*			B8F2602	06/26/2018	*06/29/2018 00:45*	
Surrogate: 2-Fluorobiphenyl	*74.1 %*	*30 - 130*			B8F2602	06/26/2018	*06/29/2018 00:45*	
Surrogate: Terphenyl-d14	*71.2 %*	*30 - 130*			B8F2602	06/26/2018	*06/29/2018 00:45*	

Client Sample ID HRN-02

Lab ID: 8060766-01

Volatile Organics **Analyst: DAH**

Method: EPA 8260C **Matrix: Soil**

Analyte	Result (ug/kg dry)	RL (ug/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Dichlorodifluoromethane	ND	42	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
Chloromethane	ND	28	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
Vinyl Chloride	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
Bromomethane	ND	28	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
Chloroethane	ND	28	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
Trichlorofluoromethane	ND	110	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	*C1
Acetone	ND	420	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
Acrylonitrile	ND	22	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
Trichlorotrifluoroethane	ND	110	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
1,1-Dichloroethene	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	*F1*C1
Methylene Chloride	ND	140	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
Carbon Disulfide	ND	28	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	*F1*C1
Methyl-t-Butyl Ether (MTBE)	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
trans-1,2-Dichloroethene	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
1,1-Dichloroethane	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
2-Butanone (MEK)	ND	70	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
2,2-Dichloropropane	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
cis-1,2-Dichloroethene	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
Bromochloromethane	ND	5.6	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
Chloroform	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
Tetrahydrofuran	ND	70	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
1,1,1-Trichloroethane	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
Carbon Tetrachloride	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
1,1-Dichloropropene	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
Benzene	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
1,2-Dichloroethane	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
Trichloroethene	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
1,2-Dichloropropane	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
Dibromomethane	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
Bromodichloromethane	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
Methyl Isobutyl Ketone	ND	70	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
cis-1,3-Dichloropropene	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
Toluene	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
trans-1,3-Dichloropropene	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
2-Hexanone	ND	70	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
1,1,2-Trichloroethane	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
Tetrachloroethene	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	*C1

Client Sample ID HRN-02

Lab ID: 8060766-01

Volatile Organics **Analyst: DAH**

Method: EPA 8260C **Matrix: Soil**

Analyte	Result (ug/kg dry)	RL (ug/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
1,3-Dichloropropane	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
Dibromochloromethane	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
1,2-Dibromoethane	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
trans-1,4-Dichloro-2-Butene	ND	70	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
Chlorobenzene	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
1,1,1,2-Tetrachloroethane	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
Ethylbenzene	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
m+p Xylenes	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
o-Xylene	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
Styrene	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
Bromoform	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
Isopropylbenzene	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
1,1,2,2-Tetrachloroethane	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
Bromobenzene	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
1,2,3-Trichloropropane	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
n-Propylbenzene	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
2-Chlorotoluene	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
4-Chlorotoluene	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
1,3,5-Trimethylbenzene	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
tert-Butylbenzene	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
1,2,4-Trimethylbenzene	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
sec-Butylbenzene	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
1,3-Dichlorobenzene	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
4-Isopropyltoluene	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
1,4-Dichlorobenzene	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
1,2-Dichlorobenzene	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
n-Butylbenzene	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	*C2
1,2-Dibromo-3-Chloropropane	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
1,2,4-Trichlorobenzene	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
Hexachlorobutadiene	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
Naphthalene	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
1,2,3-Trichlorobenzene	ND	14	2.03	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 17:26	
Surrogate: 1,2-Dichloroethane-d4	*92.8 %*		*70 - 130*		B8F2247	06/22/2018	*06/22/2018 17:26*	
Surrogate: Toluene-d8	*97.8 %*		*70 - 130*		B8F2247	06/22/2018	*06/22/2018 17:26*	
Surrogate: 4-Bromofluorobenzene	*72.2 %*		*70 - 130*		B8F2247	06/22/2018	*06/22/2018 17:26*	

Client Sample ID HRN-02

Lab ID: 8060766-01

Testing Performed at: M-CT007

Mass Volatile Petroleum Hydrocarbons

Method: MA-VPH

Analyst: subcontract

Matrix: Soil

Analyte	Result (mg/kg)	RL (mg/kg)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Methyl-t-Butyl Ether (MTBE)	ND	0.091	50			06/26/2018	06/26/2018 00:00	
Benzene	ND	0.045	50			06/26/2018	06/26/2018 00:00	
Toluene	ND	0.091	50			06/26/2018	06/26/2018 00:00	
Ethyl Benzene	ND	0.091	50			06/26/2018	06/26/2018 00:00	
m+p Xylenes	ND	0.091	50			06/26/2018	06/26/2018 00:00	
o-Xylene	ND	0.091	50			06/26/2018	06/26/2018 00:00	
Naphthalene	ND	0.45	50			06/26/2018	06/26/2018 00:00	
C5-C8 Aliphatic	ND	9	50			06/26/2018	06/26/2018 00:00	
C9-C12 Aliphatic	ND	9	50			06/26/2018	06/26/2018 00:00	
C9-C10 Aromatic	ND	9	50			06/26/2018	06/26/2018 00:00	
Surrogate: 2,5-Dibromotoluene-PID	*89 %*		*70 - 130*			06/26/2018	*06/26/2018 00:00*	
Surrogate: 2,5-Dibromotoluene-FID	*91 %*		*70 - 130*			06/26/2018	*06/26/2018 00:00*	

Client Sample ID HRN-03A

Lab ID: 8060766-02

Total Metals **Analyst: SS**

Method: EPA 6010C **Matrix: Soil**

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Lead	**9.2**	3.0	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 14:46	
Selenium	**1.9**	1.5	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 14:46	
Cadmium	ND	0.75	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 14:46	
Chromium	**24**	3.0	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 14:46	
Arsenic	ND	1.5	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 14:46	
Barium	**53**	3.0	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 14:46	
Silver	ND	3.0	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 14:46	
Copper	**9.6**	3.0	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 14:46	
Nickel	**10**	3.0	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 14:46	
Zinc	**38**	3.0	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 14:46	

Mass Extractable Hydrocarbons **Analyst: MJH**

Method: Mass DEP **Matrix: Soil**

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
C9-C18 Aliphatic Hydrocarbons	ND	35	1	EPA 3545A	B8F2540	06/25/2018	06/28/2018 15:22	
C19-C36 Aliphatic Hydrocarbons	ND	35	1	EPA 3545A	B8F2540	06/25/2018	06/28/2018 15:22	
C11-C22 Aromatic Hydrocarbons	ND	35	1	EPA 3545A	B8F2540	06/25/2018	06/28/2018 15:22	
Surrogate: o-Terphenyl	*72.1 %*	*40 - 140*			B8F2540	06/25/2018	*06/28/2018 15:22*	
Surrogate: 1-Chloroctadacane	*77.5 %*	*40 - 140*			B8F2540	06/25/2018	*06/28/2018 15:22*	
Surrogate: 2-Bromonapthalene		*40 - 140*			B8F2540	06/25/2018	*06/28/2018 15:22*	**MAFRL**
Surrogate: 2-Fluorobiphenyl		*40 - 140*			B8F2540	06/25/2018	*06/28/2018 15:22*	**MAFRL**

MAFR Sample was not fractionated due to lack of contamination.

MAFR Sample was not fractionated due to lack of contamination.

PCBs by Soxhlet **Analyst: PJB**

Method: EPA 8082A **Matrix: Soil**

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
PCB-1016	ND	0.18	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 05:33	
PCB-1221	ND	0.18	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 05:33	
PCB-1232	ND	0.18	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 05:33	
PCB-1242	ND	0.18	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 05:33	
PCB-1248	ND	0.18	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 05:33	

Client Sample ID HRN-03A

Lab ID: 8060766-02

PCBs by Soxhlet **Analyst: PJB**

Method: EPA 8082A **Matrix: Soil**

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
PCB-1254	ND	0.18	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 05:33	
PCB-1260	ND	0.18	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 05:33	
PCB-1268	ND	0.18	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 05:33	
PCB-1262	ND	0.18	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 05:33	
Surrogate: TCMX [1C]	*61.9 %*	*30 - 150*			B8F2633	06/26/2018	*06/30/2018 05:33*	
Surrogate: TCMX [2C]	*54.1 %*	*30 - 150*			B8F2633	06/26/2018	*06/30/2018 05:33*	
Surrogate: DCB [1C]	*72.4 %*	*30 - 150*			B8F2633	06/26/2018	*06/30/2018 05:33*	
Surrogate: DCB [2C]	*66.2 %*	*30 - 150*			B8F2633	06/26/2018	*06/30/2018 05:33*	

Semivolatile Organics **Analyst: EAS**

Method: EPA 8270D **Matrix: Soil**

Analyte	Result (ug/kg dry)	RL (ug/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Naphthalene	ND	540	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 01:22	
2-Methyl Naphthalene	ND	540	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 01:22	
Acenaphthylene	ND	540	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 01:22	
Acenaphthene	ND	540	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 01:22	
Fluorene	ND	540	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 01:22	
Phenanthrene	ND	540	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 01:22	
Anthracene	ND	540	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 01:22	
Fluoranthene	ND	540	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 01:22	
Pyrene	ND	540	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 01:22	
Benzo[a]anthracene	ND	540	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 01:22	
Chrysene	ND	540	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 01:22	
Benzo[b]fluoranthene	ND	540	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 01:22	
Benzo[k]fluoranthene	ND	540	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 01:22	
Benzo[a]pyrene	ND	540	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 01:22	
Indeno[1,2,3-cd]pyrene	ND	540	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 01:22	
Dibenz[a,h]anthracene	ND	540	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 01:22	
Benzo[g,h,i]perylene	ND	540	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 01:22	
Surrogate: Nitrobenzene-d5	*70.7 %*	*30 - 130*			B8F2602	06/26/2018	*06/29/2018 01:22*	
Surrogate: 2-Fluorobiphenyl	*71.2 %*	*30 - 130*			B8F2602	06/26/2018	*06/29/2018 01:22*	
Surrogate: Terphenyl-d14	*77.1 %*	*30 - 130*			B8F2602	06/26/2018	*06/29/2018 01:22*	

Client Sample ID HRN-03A

Lab ID: 8060766-02

Volatile Organics **Analyst: DAH**

Method: EPA 8260C **Matrix: Soil**

Analyte	Result (ug/kg dry)	RL (ug/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Dichlorodifluoromethane	ND	28	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	*C2
Chloromethane	ND	19	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
Vinyl Chloride	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
Bromomethane	ND	19	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
Chloroethane	ND	19	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
Trichlorofluoromethane	ND	74	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
Acetone	ND	280	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
Acrylonitrile	ND	15	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
Trichlorotrifluoroethane	ND	74	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
1,1-Dichloroethene	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
Methylene Chloride	ND	93	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
Carbon Disulfide	ND	19	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
Methyl-t-Butyl Ether (MTBE)	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
trans-1,2-Dichloroethene	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
1,1-Dichloroethane	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
2-Butanone (MEK)	ND	46	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
2,2-Dichloropropane	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	*C2
cis-1,2-Dichloroethene	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
Bromochloromethane	ND	3.7	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
Chloroform	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
Tetrahydrofuran	ND	46	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
1,1,1-Trichloroethane	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
Carbon Tetrachloride	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
1,1-Dichloropropene	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
Benzene	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
1,2-Dichloroethane	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
Trichloroethene	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
1,2-Dichloropropane	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
Dibromomethane	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
Bromodichloromethane	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
Methyl Isobutyl Ketone	ND	46	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
cis-1,3-Dichloropropene	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
Toluene	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
trans-1,3-Dichloropropene	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
2-Hexanone	ND	46	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
1,1,2-Trichloroethane	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
Tetrachloroethene	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	*C2

Client Sample ID HRN-03A

Lab ID: 8060766-02

Volatile Organics **Analyst: DAH**

Method: EPA 8260C **Matrix: Soil**

Analyte	Result (ug/kg dry)	RL (ug/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
1,3-Dichloropropane	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
Dibromochloromethane	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
1,2-Dibromoethane	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
trans-1,4-Dichloro-2-Butene	ND	46	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
Chlorobenzene	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
1,1,1,2-Tetrachloroethane	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
Ethylbenzene	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
m+p Xylenes	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
o-Xylene	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
Styrene	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
Bromoform	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
Isopropylbenzene	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
1,1,2,2-Tetrachloroethane	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
Bromobenzene	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
1,2,3-Trichloropropane	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
n-Propylbenzene	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
2-Chlorotoluene	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
4-Chlorotoluene	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
1,3,5-Trimethylbenzene	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
tert-Butylbenzene	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
1,2,4-Trimethylbenzene	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
sec-Butylbenzene	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
1,3-Dichlorobenzene	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
4-Isopropyltoluene	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
1,4-Dichlorobenzene	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
1,2-Dichlorobenzene	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
n-Butylbenzene	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
1,2-Dibromo-3-Chloropropane	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
1,2,4-Trichlorobenzene	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
Hexachlorobutadiene	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
Naphthalene	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
1,2,3-Trichlorobenzene	ND	9.3	2.05	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 11:36	
Surrogate: 1,2-Dichloroethane-d4	*105 %*		*70 - 130*		B8F2529	06/25/2018	*06/25/2018 11:36*	
Surrogate: Toluene-d8	*98.4 %*		*70 - 130*		B8F2529	06/25/2018	*06/25/2018 11:36*	
Surrogate: 4-Bromofluorobenzene	*96.9 %*		*70 - 130*		B8F2529	06/25/2018	*06/25/2018 11:36*	

Client Sample ID HRN-03A

Lab ID: 8060766-02

Testing Performed at: M-CT007

Mass Volatile Petroleum Hydrocarbons

Method: MA-VPH

Analyst: subcontract

Matrix: Soil

Analyte	Result (mg/kg)	RL (mg/kg)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Methyl-t-Butyl Ether (MTBE)	ND	0.13	50			06/26/2018	06/26/2018 00:00	
Benzene	ND	0.066	50			06/26/2018	06/26/2018 00:00	
Toluene	ND	0.13	50			06/26/2018	06/26/2018 00:00	
Ethyl Benzene	ND	0.13	50			06/26/2018	06/26/2018 00:00	
m+p Xylenes	ND	0.13	50			06/26/2018	06/26/2018 00:00	
o-Xylene	ND	0.13	50			06/26/2018	06/26/2018 00:00	
Naphthalene	ND	0.66	50			06/26/2018	06/26/2018 00:00	
C5-C8 Aliphatic	ND	13	50			06/26/2018	06/26/2018 00:00	
C9-C12 Aliphatic	ND	13	50			06/26/2018	06/26/2018 00:00	
C9-C10 Aromatic	ND	13	50			06/26/2018	06/26/2018 00:00	
Surrogate: 2,5-Dibromotoluene-PID	*89 %*		*70 - 130*			06/26/2018	*06/26/2018 00:00*	
Surrogate: 2,5-Dibromotoluene-FID	*92 %*		*70 - 130*			06/26/2018	*06/26/2018 00:00*	

Client Sample ID HRN-03B

Lab ID: 8060766-03

Total Metals **Analyst: SS**

Method: EPA 6010C **Matrix: Soil**

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Lead	**12**	3.1	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 14:51	
Selenium	ND	1.5	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 14:51	
Cadmium	ND	0.77	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 14:51	
Chromium	**22**	3.1	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 14:51	
Arsenic	**3.1**	1.5	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 14:51	
Barium	**44**	3.1	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 14:51	
Silver	ND	3.1	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 14:51	
Copper	**12**	3.1	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 14:51	
Nickel	**8.4**	3.1	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 14:51	
Zinc	**31**	3.1	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 14:51	

Mass Extractable Hydrocarbons **Analyst: MJH**

Method: Mass DEP **Matrix: Soil**

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
C9-C18 Aliphatic Hydrocarbons	ND	37	1	EPA 3545A	B8F2540	06/25/2018	06/28/2018 15:45	
C19-C36 Aliphatic Hydrocarbons	ND	37	1	EPA 3545A	B8F2540	06/25/2018	06/28/2018 15:45	
C11-C22 Aromatic Hydrocarbons	ND	37	1	EPA 3545A	B8F2540	06/25/2018	06/28/2018 15:45	
Surrogate: o-Terphenyl	*90.7 %*	*40 - 140*			B8F2540	06/25/2018	*06/28/2018 15:45*	
Surrogate: 1-Chloroctadacane	*97.3 %*	*40 - 140*			B8F2540	06/25/2018	*06/28/2018 15:45*	
Surrogate: 2-Bromonapthalene		*40 - 140*			B8F2540	06/25/2018	*06/28/2018 15:45*	**MAFRL**
Surrogate: 2-Fluorobiphenyl		*40 - 140*			B8F2540	06/25/2018	*06/28/2018 15:45*	**MAFRL**

MAFR Sample was not fractionated due to lack of contamination.

MAFR Sample was not fractionated due to lack of contamination.

PCBs by Soxhlet **Analyst: PJB**

Method: EPA 8082A **Matrix: Soil**

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
PCB-1016	ND	0.19	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 05:52	
PCB-1221	ND	0.19	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 05:52	
PCB-1232	ND	0.19	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 05:52	
PCB-1242	ND	0.19	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 05:52	
PCB-1248	ND	0.19	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 05:52	

Client Sample ID HRN-03B

Lab ID: 8060766-03

PCBs by Soxhlet **Analyst: PJB**

Method: EPA 8082A **Matrix: Soil**

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
PCB-1254	ND	0.19	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 05:52	
PCB-1260	ND	0.19	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 05:52	
PCB-1268	ND	0.19	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 05:52	
PCB-1262	ND	0.19	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 05:52	
Surrogate: TCMX [1C]	*70.3 %*	*30 - 150*			B8F2633	06/26/2018	*06/30/2018 05:52*	
Surrogate: TCMX [2C]	*61.8 %*	*30 - 150*			B8F2633	06/26/2018	*06/30/2018 05:52*	
Surrogate: DCB [1C]	*82.7 %*	*30 - 150*			B8F2633	06/26/2018	*06/30/2018 05:52*	
Surrogate: DCB [2C]	*77.8 %*	*30 - 150*			B8F2633	06/26/2018	*06/30/2018 05:52*	

Semivolatile Organics **Analyst: EAS**

Method: EPA 8270D **Matrix: Soil**

Analyte	Result (ug/kg dry)	RL (ug/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Naphthalene	ND	560	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 01:58	
2-Methyl Naphthalene	ND	560	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 01:58	
Acenaphthylene	ND	560	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 01:58	
Acenaphthene	ND	560	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 01:58	
Fluorene	ND	560	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 01:58	
Phenanthrene	ND	560	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 01:58	
Anthracene	ND	560	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 01:58	
Fluoranthene	ND	560	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 01:58	
Pyrene	ND	560	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 01:58	
Benzo[a]anthracene	ND	560	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 01:58	
Chrysene	ND	560	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 01:58	
Benzo[b]fluoranthene	ND	560	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 01:58	
Benzo[k]fluoranthene	ND	560	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 01:58	
Benzo[a]pyrene	ND	560	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 01:58	
Indeno[1,2,3-cd]pyrene	ND	560	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 01:58	
Dibenz[a,h]anthracene	ND	560	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 01:58	
Benzo[g,h,i]perylene	ND	560	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 01:58	
Surrogate: Nitrobenzene-d5	*56.3 %*	*30 - 130*			B8F2602	06/26/2018	*06/29/2018 01:58*	
Surrogate: 2-Fluorobiphenyl	*67.6 %*	*30 - 130*			B8F2602	06/26/2018	*06/29/2018 01:58*	
Surrogate: Terphenyl-d14	*74.6 %*	*30 - 130*			B8F2602	06/26/2018	*06/29/2018 01:58*	

Client Sample ID HRN-03B

Lab ID: 8060766-03

Volatile Organics **Analyst: DAH**

Method: EPA 8260C **Matrix: Soil**

Analyte	Result (ug/kg dry)	RL (ug/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Dichlorodifluoromethane	ND	29	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
Chloromethane	ND	19	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
Vinyl Chloride	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
Bromomethane	ND	19	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
Chloroethane	ND	19	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
Trichlorofluoromethane	ND	77	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	*C1
Acetone	ND	290	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
Acrylonitrile	ND	15	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
Trichlorotrifluoroethane	ND	77	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
1,1-Dichloroethene	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	*F1*C1
Methylene Chloride	ND	96	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
Carbon Disulfide	ND	19	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	*F1*C1
Methyl-t-Butyl Ether (MTBE)	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
trans-1,2-Dichloroethene	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
1,1-Dichloroethane	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
2-Butanone (MEK)	ND	48	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
2,2-Dichloropropane	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
cis-1,2-Dichloroethene	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
Bromochloromethane	ND	3.9	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
Chloroform	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
Tetrahydrofuran	ND	48	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
1,1,1-Trichloroethane	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
Carbon Tetrachloride	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
1,1-Dichloropropene	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
Benzene	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
1,2-Dichloroethane	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
Trichloroethene	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
1,2-Dichloropropane	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
Dibromomethane	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
Bromodichloromethane	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
Methyl Isobutyl Ketone	ND	48	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
cis-1,3-Dichloropropene	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
Toluene	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
trans-1,3-Dichloropropene	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
2-Hexanone	ND	48	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
1,1,2-Trichloroethane	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
Tetrachloroethene	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	*C1

Client Sample ID HRN-03B

Lab ID: 8060766-03

Volatile Organics **Analyst: DAH**

Method: EPA 8260C **Matrix: Soil**

Analyte	Result (ug/kg dry)	RL (ug/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
1,3-Dichloropropane	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
Dibromochloromethane	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
1,2-Dibromoethane	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
trans-1,4-Dichloro-2-Butene	ND	48	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
Chlorobenzene	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
1,1,1,2-Tetrachloroethane	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
Ethylbenzene	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
m+p Xylenes	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
o-Xylene	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
Styrene	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
Bromoform	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
Isopropylbenzene	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
1,1,2,2-Tetrachloroethane	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
Bromobenzene	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
1,2,3-Trichloropropane	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
n-Propylbenzene	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
2-Chlorotoluene	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
4-Chlorotoluene	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
1,3,5-Trimethylbenzene	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
tert-Butylbenzene	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
1,2,4-Trimethylbenzene	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
sec-Butylbenzene	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
1,3-Dichlorobenzene	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
4-Isopropyltoluene	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
1,4-Dichlorobenzene	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
1,2-Dichlorobenzene	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
n-Butylbenzene	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	*C2
1,2-Dibromo-3-Chloropropane	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
1,2,4-Trichlorobenzene	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
Hexachlorobutadiene	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
Naphthalene	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
1,2,3-Trichlorobenzene	ND	9.6	2.05	EPA 5035A-L	B8F2247	06/22/2018	06/22/2018 18:10	
Surrogate: 1,2-Dichloroethane-d4	*94.2 %*		*70 - 130*		B8F2247	06/22/2018	*06/22/2018 18:10*	
Surrogate: Toluene-d8	*101 %*		*70 - 130*		B8F2247	06/22/2018	*06/22/2018 18:10*	
Surrogate: 4-Bromofluorobenzene	*77.9 %*		*70 - 130*		B8F2247	06/22/2018	*06/22/2018 18:10*	

Client Sample ID HRN-03B

Lab ID: 8060766-03

Testing Performed at: M-CT007

Mass Volatile Petroleum Hydrocarbons

Method: MA-VPH

Analyst: subcontract

Matrix: Soil

Analyte	Result (mg/kg)	RL (mg/kg)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Methyl-t-Butyl Ether (MTBE)	ND	0.089	50			06/26/2018	06/26/2018 00:00	
Benzene	ND	0.044	50			06/26/2018	06/26/2018 00:00	
Toluene	ND	0.089	50			06/26/2018	06/26/2018 00:00	
Ethyl Benzene	ND	0.089	50			06/26/2018	06/26/2018 00:00	
m+p Xylenes	ND	0.089	50			06/26/2018	06/26/2018 00:00	
o-Xylene	ND	0.089	50			06/26/2018	06/26/2018 00:00	
Naphthalene	ND	0.44	50			06/26/2018	06/26/2018 00:00	
C5-C8 Aliphatic	ND	8.8	50			06/26/2018	06/26/2018 00:00	
C9-C12 Aliphatic	ND	8.8	50			06/26/2018	06/26/2018 00:00	
C9-C10 Aromatic	ND	8.8	50			06/26/2018	06/26/2018 00:00	
Surrogate: 2,5-Dibromotoluene-PID	*90 %*		*70 - 130*			06/26/2018	*06/26/2018 00:00*	
Surrogate: 2,5-Dibromotoluene-FID	*93 %*		*70 - 130*			06/26/2018	*06/26/2018 00:00*	

Client Sample ID HRN-04

Lab ID: 8060766-04

Total Metals **Analyst: SS**

Method: EPA 6010C **Matrix: Soil**

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Lead	**31**	9.8	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 14:55	
Selenium	**5.7**	4.9	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 14:55	
Cadmium	ND	2.4	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 14:55	
Chromium	ND	9.8	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 14:55	
Arsenic	ND	4.9	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 14:55	
Barium	**72**	9.8	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 14:55	
Silver	ND	9.8	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 14:55	
Copper	**15**	9.8	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 14:55	
Nickel	**11**	9.8	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 14:55	
Zinc	**69**	9.8	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 14:55	

Mass Extractable Hydrocarbons **Analyst: MJH**

Method: Mass DEP **Matrix: Soil**

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
C9-C18 Aliphatic Hydrocarbons	ND	94	1	EPA 3545A	B8F2540	06/25/2018	06/28/2018 16:08	
C19-C36 Aliphatic Hydrocarbons	ND	94	1	EPA 3545A	B8F2540	06/25/2018	06/28/2018 16:08	
C11-C22 Aromatic Hydrocarbons	ND	94	1	EPA 3545A	B8F2540	06/25/2018	06/28/2018 16:08	
Surrogate: o-Terphenyl	*58.3 %*	*40 - 140*			B8F2540	06/25/2018	*06/28/2018 16:08*	
Surrogate: 1-Chloroctadacane	*63.0 %*	*40 - 140*			B8F2540	06/25/2018	*06/28/2018 16:08*	
Surrogate: 2-Bromonapthalene		*40 - 140*			B8F2540	06/25/2018	*06/28/2018 16:08*	**MAFRL**
Surrogate: 2-Fluorobiphenyl		*40 - 140*			B8F2540	06/25/2018	*06/28/2018 16:08*	**MAFRL**

MAFR Sample was not fractionated due to lack of contamination.

MAFR Sample was not fractionated due to lack of contamination.

PCBs by Soxhlet **Analyst: PJB**

Method: EPA 8082A **Matrix: Soil**

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
PCB-1016	ND	0.48	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 06:12	
PCB-1221	ND	0.48	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 06:12	
PCB-1232	ND	0.48	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 06:12	
PCB-1242	ND	0.48	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 06:12	
PCB-1248	ND	0.48	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 06:12	

Client Sample ID HRN-04

Lab ID: 8060766-04

PCBs by Soxhlet **Analyst: PJB**

Method: EPA 8082A **Matrix: Soil**

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
PCB-1254	ND	0.48	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 06:12	
PCB-1260	ND	0.48	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 06:12	
PCB-1268	ND	0.48	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 06:12	
PCB-1262	ND	0.48	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 06:12	
Surrogate: TCMX [1C]	*73.5 %*	*30 - 150*			B8F2633	06/26/2018	*06/30/2018 06:12*	
Surrogate: TCMX [2C]	*71.5 %*	*30 - 150*			B8F2633	06/26/2018	*06/30/2018 06:12*	
Surrogate: DCB [1C]	*80.2 %*	*30 - 150*			B8F2633	06/26/2018	*06/30/2018 06:12*	
Surrogate: DCB [2C]	*74.9 %*	*30 - 150*			B8F2633	06/26/2018	*06/30/2018 06:12*	

Semivolatile Organics **Analyst: EAS**

Method: EPA 8270D **Matrix: Soil**

Analyte	Result (ug/kg dry)	RL (ug/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Naphthalene	ND	1400	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 02:35	
2-Methyl Naphthalene	ND	1400	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 02:35	
Acenaphthylene	ND	1400	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 02:35	
Acenaphthene	ND	1400	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 02:35	
Fluorene	ND	1400	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 02:35	
Phenanthrene	ND	1400	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 02:35	
Anthracene	ND	1400	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 02:35	
Fluoranthene	ND	1400	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 02:35	
Pyrene	ND	1400	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 02:35	
Benzo[a]anthracene	ND	1400	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 02:35	
Chrysene	ND	1400	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 02:35	
Benzo[b]fluoranthene	ND	1400	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 02:35	
Benzo[k]fluoranthene	ND	1400	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 02:35	
Benzo[a]pyrene	ND	1400	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 02:35	
Indeno[1,2,3-cd]pyrene	ND	1400	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 02:35	
Dibenz[a,h]anthracene	ND	1400	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 02:35	
Benzo[g,h,i]perylene	ND	1400	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 02:35	
Surrogate: Nitrobenzene-d5	*78.5 %*	*30 - 130*			B8F2602	06/26/2018	*06/29/2018 02:35*	
Surrogate: 2-Fluorobiphenyl	*77.6 %*	*30 - 130*			B8F2602	06/26/2018	*06/29/2018 02:35*	
Surrogate: Terphenyl-d14	*77.1 %*	*30 - 130*			B8F2602	06/26/2018	*06/29/2018 02:35*	

Client Sample ID HRN-04

Lab ID: 8060766-04

Volatile Organics **Analyst: DAH**

Method: EPA 8260C **Matrix: Soil**

Analyte	Result (ug/kg dry)	RL (ug/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Dichlorodifluoromethane	ND	73	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	*C2
Chloromethane	ND	49	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
Vinyl Chloride	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
Bromomethane	ND	49	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
Chloroethane	ND	49	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
Trichlorofluoromethane	ND	190	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
Acetone	ND	730	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
Acrylonitrile	ND	39	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
Trichlorotrifluoroethane	ND	190	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
1,1-Dichloroethene	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
Methylene Chloride	ND	240	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
Carbon Disulfide	ND	49	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
Methyl-t-Butyl Ether (MTBE)	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
trans-1,2-Dichloroethene	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
1,1-Dichloroethane	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
2-Butanone (MEK)	ND	120	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
2,2-Dichloropropane	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	*C2
cis-1,2-Dichloroethene	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
Bromochloromethane	ND	9.7	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
Chloroform	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
Tetrahydrofuran	ND	120	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
1,1,1-Trichloroethane	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
Carbon Tetrachloride	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
1,1-Dichloropropene	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
Benzene	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
1,2-Dichloroethane	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
Trichloroethene	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
1,2-Dichloropropane	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
Dibromomethane	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
Bromodichloromethane	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
Methyl Isobutyl Ketone	ND	120	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
cis-1,3-Dichloropropene	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
Toluene	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
trans-1,3-Dichloropropene	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
2-Hexanone	ND	120	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
1,1,2-Trichloroethane	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
Tetrachloroethene	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	*C2

Client Sample ID HRN-04

Lab ID: 8060766-04

Volatile Organics **Analyst: DAH**

Method: EPA 8260C **Matrix: Soil**

Analyte	Result (ug/kg dry)	RL (ug/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
1,3-Dichloropropane	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
Dibromochloromethane	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
1,2-Dibromoethane	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
trans-1,4-Dichloro-2-Butene	ND	120	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
Chlorobenzene	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
1,1,1,2-Tetrachloroethane	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
Ethylbenzene	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
m+p Xylenes	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
o-Xylene	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
Styrene	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
Bromoform	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
Isopropylbenzene	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
1,1,2,2-Tetrachloroethane	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
Bromobenzene	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
1,2,3-Trichloropropane	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
n-Propylbenzene	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
2-Chlorotoluene	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
4-Chlorotoluene	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
1,3,5-Trimethylbenzene	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
tert-Butylbenzene	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
1,2,4-Trimethylbenzene	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
sec-Butylbenzene	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
1,3-Dichlorobenzene	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
4-Isopropyltoluene	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
1,4-Dichlorobenzene	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
1,2-Dichlorobenzene	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
n-Butylbenzene	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
1,2-Dibromo-3-Chloropropane	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
1,2,4-Trichlorobenzene	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
Hexachlorobutadiene	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
Naphthalene	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
1,2,3-Trichlorobenzene	ND	24	2.02	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:02	
Surrogate: 1,2-Dichloroethane-d4	*102 %*		*70 - 130*		B8F2529	06/25/2018	*06/25/2018 12:02*	
Surrogate: Toluene-d8	*97.9 %*		*70 - 130*		B8F2529	06/25/2018	*06/25/2018 12:02*	
Surrogate: 4-Bromofluorobenzene	*92.6 %*		*70 - 130*		B8F2529	06/25/2018	*06/25/2018 12:02*	

Client Sample ID HRN-04

Lab ID: 8060766-04

Testing Performed at: M-CT007

Mass Volatile Petroleum Hydrocarbons

Method: MA-VPH

Analyst: subcontract

Matrix: Soil

Analyte	Result (mg/kg)	RL (mg/kg)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Methyl-t-Butyl Ether (MTBE)	ND	0.47	50			06/26/2018	06/26/2018 00:00	
Benzene	ND	0.24	50			06/26/2018	06/26/2018 00:00	
Toluene	ND	0.47	50			06/26/2018	06/26/2018 00:00	
Ethyl Benzene	ND	0.47	50			06/26/2018	06/26/2018 00:00	
m+p Xylenes	ND	0.47	50			06/26/2018	06/26/2018 00:00	
o-Xylene	ND	0.47	50			06/26/2018	06/26/2018 00:00	
Naphthalene	ND	2.4	50			06/26/2018	06/26/2018 00:00	
C5-C8 Aliphatic	ND	47	50			06/26/2018	06/26/2018 00:00	
C9-C12 Aliphatic	ND	47	50			06/26/2018	06/26/2018 00:00	
C9-C10 Aromatic	ND	47	50			06/26/2018	06/26/2018 00:00	
Surrogate: 2,5-Dibromotoluene-PID	*85 %*		*70 - 130*			06/26/2018	*06/26/2018 00:00*	
Surrogate: 2,5-Dibromotoluene-FID	*88 %*		*70 - 130*			06/26/2018	*06/26/2018 00:00*	

Client Sample ID HRN-05

Lab ID: 8060766-05

Total Metals **Analyst: SS**

Method: EPA 6010C **Matrix: Soil**

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Lead	**20**	4.0	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 15:08	
Selenium	ND	2.0	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 15:08	
Cadmium	ND	1.0	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 15:08	
Chromium	**33**	4.0	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 15:08	
Arsenic	ND	2.0	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 15:08	
Barium	**98**	4.0	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 15:08	
Silver	ND	4.0	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 15:08	
Copper	**16**	4.0	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 15:08	
Nickel	**17**	4.0	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 15:08	
Zinc	**83**	4.0	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 15:08	

Mass Extractable Hydrocarbons **Analyst: MJH**

Method: Mass DEP **Matrix: Soil**

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
C9-C18 Aliphatic Hydrocarbons	ND	39	1	EPA 3545A	B8F2540	06/25/2018	06/28/2018 16:30	
C19-C36 Aliphatic Hydrocarbons	ND	39	1	EPA 3545A	B8F2540	06/25/2018	06/28/2018 16:30	
C11-C22 Aromatic Hydrocarbons	ND	39	1	EPA 3545A	B8F2540	06/25/2018	06/28/2018 16:30	
Surrogate: o-Terphenyl	*67.3 %*	*40 - 140*			B8F2540	06/25/2018	*06/28/2018 16:30*	
Surrogate: 1-Chloroctadacane	*75.3 %*	*40 - 140*			B8F2540	06/25/2018	*06/28/2018 16:30*	
Surrogate: 2-Bromonapthalene		*40 - 140*			B8F2540	06/25/2018	*06/28/2018 16:30*	**MAFRL**
Surrogate: 2-Fluorobiphenyl		*40 - 140*			B8F2540	06/25/2018	*06/28/2018 16:30*	**MAFRL**

MAFR Sample was not fractionated due to lack of contamination.

MAFR Sample was not fractionated due to lack of contamination.

PCBs by Soxhlet **Analyst: PJB**

Method: EPA 8082A **Matrix: Soil**

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
PCB-1016	ND	0.20	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 06:31	
PCB-1221	ND	0.20	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 06:31	
PCB-1232	ND	0.20	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 06:31	
PCB-1242	ND	0.20	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 06:31	
PCB-1248	ND	0.20	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 06:31	

Client Sample ID HRN-05

Lab ID: 8060766-05

PCBs by Soxhlet **Analyst: PJB**

Method: EPA 8082A **Matrix: Soil**

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
PCB-1254	ND	0.20	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 06:31	
PCB-1260	ND	0.20	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 06:31	
PCB-1268	ND	0.20	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 06:31	
PCB-1262	ND	0.20	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 06:31	
Surrogate: TCMX [1C]	*77.4 %*	*30 - 150*			B8F2633	06/26/2018	*06/30/2018 06:31*	
Surrogate: TCMX [2C]	*74.9 %*	*30 - 150*			B8F2633	06/26/2018	*06/30/2018 06:31*	
Surrogate: DCB [1C]	*78.9 %*	*30 - 150*			B8F2633	06/26/2018	*06/30/2018 06:31*	
Surrogate: DCB [2C]	*73.0 %*	*30 - 150*			B8F2633	06/26/2018	*06/30/2018 06:31*	

Semivolatile Organics **Analyst: EAS**

Method: EPA 8270D **Matrix: Soil**

Analyte	Result (ug/kg dry)	RL (ug/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Naphthalene	ND	600	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 03:12	
2-Methyl Naphthalene	ND	600	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 03:12	
Acenaphthylene	ND	600	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 03:12	
Acenaphthene	ND	600	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 03:12	
Fluorene	ND	600	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 03:12	
Phenanthrene	ND	600	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 03:12	
Anthracene	ND	600	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 03:12	
Fluoranthene	ND	600	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 03:12	
Pyrene	ND	600	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 03:12	
Benzo[a]anthracene	ND	600	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 03:12	
Chrysene	ND	600	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 03:12	
Benzo[b]fluoranthene	ND	600	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 03:12	
Benzo[k]fluoranthene	ND	600	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 03:12	
Benzo[a]pyrene	ND	600	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 03:12	
Indeno[1,2,3-cd]pyrene	ND	600	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 03:12	
Dibenz[a,h]anthracene	ND	600	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 03:12	
Benzo[g,h,i]perylene	ND	600	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 03:12	
Surrogate: Nitrobenzene-d5	*67.6 %*	*30 - 130*			B8F2602	06/26/2018	*06/29/2018 03:12*	
Surrogate: 2-Fluorobiphenyl	*69.7 %*	*30 - 130*			B8F2602	06/26/2018	*06/29/2018 03:12*	
Surrogate: Terphenyl-d14	*73.0 %*	*30 - 130*			B8F2602	06/26/2018	*06/29/2018 03:12*	

Client Sample ID HRN-05

Lab ID: 8060766-05

Volatile Organics **Analyst: DAH**

Method: EPA 8260C **Matrix: Soil**

Analyte	Result (ug/kg dry)	RL (ug/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Dichlorodifluoromethane	ND	31	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	*C2
Chloromethane	ND	21	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
Vinyl Chloride	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
Bromomethane	ND	21	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
Chloroethane	ND	21	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
Trichlorofluoromethane	ND	83	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
Acetone	ND	310	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
Acrylonitrile	ND	17	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
Trichlorotrifluoroethane	ND	83	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
1,1-Dichloroethene	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
Methylene Chloride	ND	100	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
Carbon Disulfide	ND	21	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
Methyl-t-Butyl Ether (MTBE)	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
trans-1,2-Dichloroethene	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
1,1-Dichloroethane	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
2-Butanone (MEK)	ND	52	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
2,2-Dichloropropane	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	*C2
cis-1,2-Dichloroethene	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
Bromochloromethane	ND	4.1	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
Chloroform	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
Tetrahydrofuran	ND	52	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
1,1,1-Trichloroethane	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
Carbon Tetrachloride	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
1,1-Dichloropropene	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
Benzene	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
1,2-Dichloroethane	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
Trichloroethene	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
1,2-Dichloropropane	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
Dibromomethane	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
Bromodichloromethane	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
Methyl Isobutyl Ketone	ND	52	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
cis-1,3-Dichloropropene	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
Toluene	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
trans-1,3-Dichloropropene	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
2-Hexanone	ND	52	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
1,1,2-Trichloroethane	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
Tetrachloroethene	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	*C2

Client Sample ID HRN-05

Lab ID: 8060766-05

Volatile Organics **Analyst: DAH**

Method: EPA 8260C **Matrix: Soil**

Analyte	Result (ug/kg dry)	RL (ug/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
1,3-Dichloropropane	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
Dibromochloromethane	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
1,2-Dibromoethane	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
trans-1,4-Dichloro-2-Butene	ND	52	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
Chlorobenzene	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
1,1,1,2-Tetrachloroethane	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
Ethylbenzene	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
m+p Xylenes	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
o-Xylene	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
Styrene	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
Bromoform	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
Isopropylbenzene	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
1,1,2,2-Tetrachloroethane	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
Bromobenzene	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
1,2,3-Trichloropropane	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
n-Propylbenzene	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
2-Chlorotoluene	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
4-Chlorotoluene	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
1,3,5-Trimethylbenzene	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
tert-Butylbenzene	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
1,2,4-Trimethylbenzene	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
sec-Butylbenzene	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
1,3-Dichlorobenzene	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
4-Isopropyltoluene	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
1,4-Dichlorobenzene	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
1,2-Dichlorobenzene	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
n-Butylbenzene	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
1,2-Dibromo-3-Chloropropane	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
1,2,4-Trichlorobenzene	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
Hexachlorobutadiene	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
Naphthalene	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
1,2,3-Trichlorobenzene	ND	10	2.08	EPA 5035A-L	B8F2529	06/25/2018	06/25/2018 12:26	
Surrogate: 1,2-Dichloroethane-d4	*104 %*		*70 - 130*		B8F2529	06/25/2018	*06/25/2018 12:26*	
Surrogate: Toluene-d8	*98.9 %*		*70 - 130*		B8F2529	06/25/2018	*06/25/2018 12:26*	
Surrogate: 4-Bromofluorobenzene	*94.9 %*		*70 - 130*		B8F2529	06/25/2018	*06/25/2018 12:26*	

Client Sample ID HRN-05

Lab ID: 8060766-05

Testing Performed at: M-CT007

Mass Volatile Petroleum Hydrocarbons **Analyst: subcontract**

Method: MA-VPH

Matrix: Soil

Analyte	Result (mg/kg)	RL (mg/kg)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Methyl-t-Butyl Ether (MTBE)	ND	0.1	50			06/26/2018	06/26/2018 00:00	
Benzene	ND	0.051	50			06/26/2018	06/26/2018 00:00	
Toluene	ND	0.1	50			06/26/2018	06/26/2018 00:00	
Ethyl Benzene	ND	0.1	50			06/26/2018	06/26/2018 00:00	
m+p Xylenes	ND	0.1	50			06/26/2018	06/26/2018 00:00	
o-Xylene	ND	0.1	50			06/26/2018	06/26/2018 00:00	
Naphthalene	ND	0.51	50			06/26/2018	06/26/2018 00:00	
C5-C8 Aliphatic	ND	10	50			06/26/2018	06/26/2018 00:00	
C9-C12 Aliphatic	ND	10	50			06/26/2018	06/26/2018 00:00	
C9-C10 Aromatic	ND	10	50			06/26/2018	06/26/2018 00:00	
Surrogate: 2,5-Dibromotoluene-PID	*81 %*		*70 - 130*			06/26/2018	*06/26/2018 00:00*	
Surrogate: 2,5-Dibromotoluene-FID	*84 %*		*70 - 130*			06/26/2018	*06/26/2018 00:00*	

Client Sample ID HRS-01A

Lab ID: 8060766-06

Total Metals **Analyst: SS**

Method: EPA 6010C **Matrix: Soil**

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Lead	**14**	4.9	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 15:12	
Selenium	**2.6**	2.4	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 15:12	
Cadmium	ND	1.2	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 15:12	
Chromium	**36**	4.9	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 15:12	
Arsenic	ND	2.4	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 15:12	
Barium	**96**	4.9	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 15:12	
Silver	ND	4.9	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 15:12	
Copper	**18**	4.9	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 15:12	
Nickel	**20**	4.9	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 15:12	
Zinc	**83**	4.9	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 15:12	

Mass Extractable Hydrocarbons **Analyst: MJH**

Method: Mass DEP **Matrix: Soil**

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
C9-C18 Aliphatic Hydrocarbons	ND	53	1	EPA 3545A	B8F2540	06/25/2018	06/28/2018 16:53	
C19-C36 Aliphatic Hydrocarbons	ND	53	1	EPA 3545A	B8F2540	06/25/2018	06/28/2018 16:53	
C11-C22 Aromatic Hydrocarbons	ND	53	1	EPA 3545A	B8F2540	06/25/2018	06/28/2018 16:53	
Surrogate: o-Terphenyl	*89.8 %*	*40 - 140*			B8F2540	06/25/2018	*06/28/2018 16:53*	
Surrogate: 1-Chloroctadacane	*91.4 %*	*40 - 140*			B8F2540	06/25/2018	*06/28/2018 16:53*	
Surrogate: 2-Bromonapthalene		*40 - 140*			B8F2540	06/25/2018	*06/28/2018 16:53*	**MAFRL**
Surrogate: 2-Fluorobiphenyl		*40 - 140*			B8F2540	06/25/2018	*06/28/2018 16:53*	**MAFRL**

MAFR Sample was not fractionated due to lack of contamination.
MAFR Sample was not fractionated due to lack of contamination.

PCBs by Soxhlet **Analyst: PJB**

Method: EPA 8082A **Matrix: Soil**

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
PCB-1016	ND	0.27	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 06:50	
PCB-1221	ND	0.27	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 06:50	
PCB-1232	ND	0.27	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 06:50	
PCB-1242	ND	0.27	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 06:50	
PCB-1248	ND	0.27	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 06:50	

Client Sample ID HRS-01A

Lab ID: 8060766-06

PCBs by Soxhlet **Analyst: PJB**

Method: EPA 8082A **Matrix: Soil**

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
PCB-1254	ND	0.27	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 06:50	
PCB-1260	ND	0.27	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 06:50	
PCB-1268	ND	0.27	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 06:50	
PCB-1262	ND	0.27	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 06:50	
Surrogate: TCMX [1C]	*70.2 %*	*30 - 150*			B8F2633	06/26/2018	*06/30/2018 06:50*	
Surrogate: TCMX [2C]	*72.3 %*	*30 - 150*			B8F2633	06/26/2018	*06/30/2018 06:50*	
Surrogate: DCB [1C]	*82.0 %*	*30 - 150*			B8F2633	06/26/2018	*06/30/2018 06:50*	
Surrogate: DCB [2C]	*77.3 %*	*30 - 150*			B8F2633	06/26/2018	*06/30/2018 06:50*	

Semivolatile Organics **Analyst: EAS**

Method: EPA 8270D **Matrix: Soil**

Analyte	Result (ug/kg dry)	RL (ug/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Naphthalene	ND	820	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 03:49	
2-Methyl Naphthalene	ND	820	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 03:49	
Acenaphthylene	ND	820	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 03:49	
Acenaphthene	ND	820	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 03:49	
Fluorene	ND	820	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 03:49	
Phenanthrene	ND	820	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 03:49	
Anthracene	ND	820	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 03:49	
Fluoranthene	ND	820	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 03:49	
Pyrene	ND	820	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 03:49	
Benzo[a]anthracene	ND	820	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 03:49	
Chrysene	ND	820	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 03:49	
Benzo[b]fluoranthene	ND	820	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 03:49	
Benzo[k]fluoranthene	ND	820	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 03:49	
Benzo[a]pyrene	ND	820	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 03:49	
Indeno[1,2,3-cd]pyrene	ND	820	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 03:49	
Dibenz[a,h]anthracene	ND	820	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 03:49	
Benzo[g,h,i]perylene	ND	820	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 03:49	
Surrogate: Nitrobenzene-d5	*61.1 %*	*30 - 130*			B8F2602	06/26/2018	*06/29/2018 03:49*	
Surrogate: 2-Fluorobiphenyl	*62.6 %*	*30 - 130*			B8F2602	06/26/2018	*06/29/2018 03:49*	
Surrogate: Terphenyl-d14	*62.7 %*	*30 - 130*			B8F2602	06/26/2018	*06/29/2018 03:49*	

Client Sample ID HRS-01A

Lab ID: 8060766-06

Volatile Organics **Analyst: DAH**

Method: EPA 8260C **Matrix: Soil**

Analyte	Result (ug/kg dry)	RL (ug/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Dichlorodifluoromethane	ND	42	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	*F2*C2
Chloromethane	ND	28	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
Vinyl Chloride	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
Bromomethane	ND	28	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
Chloroethane	ND	28	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	*C1
Trichlorofluoromethane	ND	110	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
Acetone	ND	420	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
Acrylonitrile	ND	23	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
Trichlorotrifluoroethane	ND	110	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
1,1-Dichloroethene	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
Methylene Chloride	ND	140	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	*C1
Carbon Disulfide	ND	28	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
Methyl-t-Butyl Ether (MTBE)	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
trans-1,2-Dichloroethene	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
1,1-Dichloroethane	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
2-Butanone (MEK)	ND	71	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
2,2-Dichloropropane	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
cis-1,2-Dichloroethene	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
Bromochloromethane	ND	5.6	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
Chloroform	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
Tetrahydrofuran	ND	71	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
1,1,1-Trichloroethane	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
Carbon Tetrachloride	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
1,1-Dichloropropene	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
Benzene	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
1,2-Dichloroethane	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
Trichloroethene	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
1,2-Dichloropropane	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
Dibromomethane	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	*C2
Bromodichloromethane	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
Methyl Isobutyl Ketone	ND	71	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
cis-1,3-Dichloropropene	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
Toluene	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
trans-1,3-Dichloropropene	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
2-Hexanone	ND	71	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
1,1,2-Trichloroethane	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
Tetrachloroethene	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	

Client Sample ID HRS-01A

Lab ID: 8060766-06

Volatile Organics **Analyst: DAH**

Method: EPA 8260C **Matrix: Soil**

Analyte	Result (ug/kg dry)	RL (ug/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
1,3-Dichloropropane	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
Dibromochloromethane	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
1,2-Dibromoethane	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
trans-1,4-Dichloro-2-Butene	ND	71	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
Chlorobenzene	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
1,1,1,2-Tetrachloroethane	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
Ethylbenzene	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
m+p Xylenes	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
o-Xylene	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
Styrene	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
Bromoform	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
Isopropylbenzene	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
1,1,2,2-Tetrachloroethane	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
Bromobenzene	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
1,2,3-Trichloropropane	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
n-Propylbenzene	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
2-Chlorotoluene	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
4-Chlorotoluene	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
1,3,5-Trimethylbenzene	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
tert-Butylbenzene	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
1,2,4-Trimethylbenzene	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
sec-Butylbenzene	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
1,3-Dichlorobenzene	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
4-Isopropyltoluene	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
1,4-Dichlorobenzene	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
1,2-Dichlorobenzene	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
n-Butylbenzene	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
1,2-Dibromo-3-Chloropropane	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
1,2,4-Trichlorobenzene	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
Hexachlorobutadiene	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
Naphthalene	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
1,2,3-Trichlorobenzene	ND	14	2.07	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:01	
Surrogate: 1,2-Dichloroethane-d4	*110 %*		*70 - 130*		B8F2249	06/22/2018	*06/22/2018 18:01*	
Surrogate: Toluene-d8	*96.7 %*		*70 - 130*		B8F2249	06/22/2018	*06/22/2018 18:01*	
Surrogate: 4-Bromofluorobenzene	*95.4 %*		*70 - 130*		B8F2249	06/22/2018	*06/22/2018 18:01*	

Client Sample ID HRS-01A

Lab ID: 8060766-06

Testing Performed at: M-CT007

Mass Volatile Petroleum Hydrocarbons **Analyst: subcontract**

Method: MA-VPH

Matrix: Soil

Analyte	Result (mg/kg)	RL (mg/kg)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Methyl-t-Butyl Ether (MTBE)	ND	0.22	50			06/26/2018	06/26/2018 00:00	
Benzene	ND	0.11	50			06/26/2018	06/26/2018 00:00	
Toluene	ND	0.22	50			06/26/2018	06/26/2018 00:00	
Ethyl Benzene	ND	0.22	50			06/26/2018	06/26/2018 00:00	
m+p Xylenes	ND	0.22	50			06/26/2018	06/26/2018 00:00	
o-Xylene	ND	0.22	50			06/26/2018	06/26/2018 00:00	
Naphthalene	ND	1.1	50			06/26/2018	06/26/2018 00:00	
C5-C8 Aliphatic	ND	22	50			06/26/2018	06/26/2018 00:00	
C9-C12 Aliphatic	ND	22	50			06/26/2018	06/26/2018 00:00	
C9-C10 Aromatic	ND	22	50			06/26/2018	06/26/2018 00:00	
Surrogate: 2,5-Dibromotoluene-PID	*89 %*		*70 - 130*			06/26/2018	*06/26/2018 00:00*	
Surrogate: 2,5-Dibromotoluene-FID	*92 %*		*70 - 130*			06/26/2018	*06/26/2018 00:00*	

Client Sample ID HRS-02

Lab ID: 8060766-07

Total Metals **Analyst: SS**

Method: EPA 6010C **Matrix: Soil**

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Lead	**20**	4.9	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 15:16	
Selenium	**3.2**	2.5	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 15:16	
Cadmium	ND	1.2	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 15:16	
Chromium	**33**	4.9	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 15:16	
Arsenic	ND	2.5	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 15:16	
Barium	**96**	4.9	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 15:16	
Silver	ND	4.9	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 15:16	
Copper	**17**	4.9	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 15:16	
Nickel	**26**	4.9	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 15:16	
Zinc	**82**	4.9	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 15:16	

Mass Extractable Hydrocarbons **Analyst: MJH**

Method: Mass DEP **Matrix: Soil**

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
C9-C18 Aliphatic Hydrocarbons	ND	54	1	EPA 3545A	B8F2540	06/25/2018	06/28/2018 17:15	
C19-C36 Aliphatic Hydrocarbons	ND	54	1	EPA 3545A	B8F2540	06/25/2018	06/28/2018 17:15	
C11-C22 Aromatic Hydrocarbons	ND	54	1	EPA 3545A	B8F2540	06/25/2018	06/28/2018 17:15	
Surrogate: o-Terphenyl	*63.9 %*	*40 - 140*			B8F2540	06/25/2018	*06/28/2018 17:15*	
Surrogate: 1-Chloroctadacane	*76.9 %*	*40 - 140*			B8F2540	06/25/2018	*06/28/2018 17:15*	
Surrogate: 2-Bromonapthalene		*40 - 140*			B8F2540	06/25/2018	*06/28/2018 17:15*	**MAFRL**
Surrogate: 2-Fluorobiphenyl		*40 - 140*			B8F2540	06/25/2018	*06/28/2018 17:15*	**MAFRL**

MAFR Sample was not fractionated due to lack of contamination.

MAFR Sample was not fractionated due to lack of contamination.

PCBs by Soxhlet **Analyst: PJB**

Method: EPA 8082A **Matrix: Soil**

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
PCB-1016	ND	0.27	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 07:09	
PCB-1221	ND	0.27	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 07:09	
PCB-1232	ND	0.27	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 07:09	
PCB-1242	ND	0.27	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 07:09	
PCB-1248	ND	0.27	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 07:09	

Client Sample ID HRS-02

Lab ID: 8060766-07

PCBs by Soxhlet **Analyst: PJB**

Method: EPA 8082A **Matrix: Soil**

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
PCB-1254	ND	0.27	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 07:09	
PCB-1260	ND	0.27	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 07:09	
PCB-1268	ND	0.27	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 07:09	
PCB-1262	ND	0.27	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 07:09	
Surrogate: TCMX [1C]	*90.4 %*	*30 - 150*			B8F2633	06/26/2018	*06/30/2018 07:09*	
Surrogate: TCMX [2C]	*86.3 %*	*30 - 150*			B8F2633	06/26/2018	*06/30/2018 07:09*	
Surrogate: DCB [1C]	*92.0 %*	*30 - 150*			B8F2633	06/26/2018	*06/30/2018 07:09*	
Surrogate: DCB [2C]	*87.0 %*	*30 - 150*			B8F2633	06/26/2018	*06/30/2018 07:09*	

Semivolatile Organics **Analyst: EAS**

Method: EPA 8270D **Matrix: Soil**

Analyte	Result (ug/kg dry)	RL (ug/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Naphthalene	ND	810	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 04:26	
2-Methyl Naphthalene	ND	810	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 04:26	
Acenaphthylene	ND	810	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 04:26	
Acenaphthene	ND	810	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 04:26	
Fluorene	ND	810	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 04:26	
Phenanthrene	ND	810	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 04:26	
Anthracene	ND	810	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 04:26	
Fluoranthene	ND	810	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 04:26	
Pyrene	ND	810	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 04:26	
Benzo[a]anthracene	ND	810	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 04:26	
Chrysene	ND	810	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 04:26	
Benzo[b]fluoranthene	ND	810	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 04:26	
Benzo[k]fluoranthene	ND	810	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 04:26	
Benzo[a]pyrene	ND	810	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 04:26	
Indeno[1,2,3-cd]pyrene	ND	810	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 04:26	
Dibenz[a,h]anthracene	ND	810	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 04:26	
Benzo[g,h,i]perylene	ND	810	1	EPA 3545A	B8F2602	06/26/2018	06/29/2018 04:26	
Surrogate: Nitrobenzene-d5	*70.9 %*	*30 - 130*			B8F2602	06/26/2018	*06/29/2018 04:26*	
Surrogate: 2-Fluorobiphenyl	*69.0 %*	*30 - 130*			B8F2602	06/26/2018	*06/29/2018 04:26*	
Surrogate: Terphenyl-d14	*65.0 %*	*30 - 130*			B8F2602	06/26/2018	*06/29/2018 04:26*	

Client Sample ID HRS-02

Lab ID: 8060766-07

Volatile Organics **Analyst: DAH**

Method: EPA 8260C **Matrix: Soil**

Analyte	Result (ug/kg dry)	RL (ug/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Dichlorodifluoromethane	ND	43	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	*F2*C2
Chloromethane	ND	29	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
Vinyl Chloride	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
Bromomethane	ND	29	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
Chloroethane	ND	29	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	*C1
Trichlorofluoromethane	ND	120	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
Acetone	ND	430	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
Acrylonitrile	ND	23	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
Trichlorotrifluoroethane	ND	120	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
1,1-Dichloroethene	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
Methylene Chloride	ND	140	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	*C1
Carbon Disulfide	ND	29	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
Methyl-t-Butyl Ether (MTBE)	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
trans-1,2-Dichloroethene	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
1,1-Dichloroethane	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
2-Butanone (MEK)	ND	72	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
2,2-Dichloropropane	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
cis-1,2-Dichloroethene	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
Bromochloromethane	ND	5.8	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
Chloroform	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
Tetrahydrofuran	ND	72	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
1,1,1-Trichloroethane	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
Carbon Tetrachloride	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
1,1-Dichloropropene	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
Benzene	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
1,2-Dichloroethane	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
Trichloroethene	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
1,2-Dichloropropane	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
Dibromomethane	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	*C2
Bromodichloromethane	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
Methyl Isobutyl Ketone	ND	72	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
cis-1,3-Dichloropropene	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
Toluene	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
trans-1,3-Dichloropropene	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
2-Hexanone	ND	72	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
1,1,2-Trichloroethane	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
Tetrachloroethene	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	

Client Sample ID HRS-02

Lab ID: 8060766-07

Volatile Organics **Analyst: DAH**

Method: EPA 8260C **Matrix: Soil**

Analyte	Result (ug/kg dry)	RL (ug/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
1,3-Dichloropropane	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
Dibromochloromethane	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
1,2-Dibromoethane	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
trans-1,4-Dichloro-2-Butene	ND	72	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
Chlorobenzene	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
1,1,1,2-Tetrachloroethane	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
Ethylbenzene	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
m+p Xylenes	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
o-Xylene	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
Styrene	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
Bromoform	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
Isopropylbenzene	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
1,1,2,2-Tetrachloroethane	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
Bromobenzene	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
1,2,3-Trichloropropane	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
n-Propylbenzene	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
2-Chlorotoluene	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
4-Chlorotoluene	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
1,3,5-Trimethylbenzene	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
tert-Butylbenzene	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
1,2,4-Trimethylbenzene	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
sec-Butylbenzene	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
1,3-Dichlorobenzene	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
4-Isopropyltoluene	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
1,4-Dichlorobenzene	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
1,2-Dichlorobenzene	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
n-Butylbenzene	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
1,2-Dibromo-3-Chloropropane	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
1,2,4-Trichlorobenzene	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
Hexachlorobutadiene	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
Naphthalene	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
1,2,3-Trichlorobenzene	ND	14	2.13	EPA 5035A-L	B8F2249	06/22/2018	06/22/2018 18:24	
Surrogate: 1,2-Dichloroethane-d4	*110 %*		*70 - 130*		B8F2249	06/22/2018	*06/22/2018 18:24*	
Surrogate: Toluene-d8	*97.1 %*		*70 - 130*		B8F2249	06/22/2018	*06/22/2018 18:24*	
Surrogate: 4-Bromofluorobenzene	*95.4 %*		*70 - 130*		B8F2249	06/22/2018	*06/22/2018 18:24*	

Client Sample ID HRS-02

Lab ID: 8060766-07

Testing Performed at: M-CT007

Mass Volatile Petroleum Hydrocarbons

Method: MA-VPH

Analyst: subcontract

Matrix: Soil

Analyte	Result (mg/kg)	RL (mg/kg)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Methyl-t-Butyl Ether (MTBE)	ND	0.13	50			06/26/2018	06/26/2018 00:00	
Benzene	ND	0.064	50			06/26/2018	06/26/2018 00:00	
Toluene	ND	0.13	50			06/26/2018	06/26/2018 00:00	
Ethyl Benzene	ND	0.13	50			06/26/2018	06/26/2018 00:00	
m+p Xylenes	ND	0.13	50			06/26/2018	06/26/2018 00:00	
o-Xylene	ND	0.13	50			06/26/2018	06/26/2018 00:00	
Naphthalene	ND	0.64	50			06/26/2018	06/26/2018 00:00	
C5-C8 Aliphatic	ND	13	50			06/26/2018	06/26/2018 00:00	
C9-C12 Aliphatic	ND	13	50			06/26/2018	06/26/2018 00:00	
C9-C10 Aromatic	ND	13	50			06/26/2018	06/26/2018 00:00	
Surrogate: 2,5-Dibromotoluene-PID	*86 %*		*70 - 130*			06/26/2018	*06/26/2018 00:00*	
Surrogate: 2,5-Dibromotoluene-FID	*87 %*		*70 - 130*			06/26/2018	*06/26/2018 00:00*	

Client Sample ID HRS-03

Lab ID: 8060766-08

Total Metals **Analyst: SS**

Method: EPA 6010C **Matrix: Soil**

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
Lead	**36**	9.5	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 15:20	
Selenium	**8.2**	4.7	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 15:20	
Cadmium	ND	2.4	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 15:20	
Chromium	**20**	9.5	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 15:20	
Arsenic	ND	4.7	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 15:20	
Barium	**73**	9.5	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 15:20	
Silver	ND	9.5	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 15:20	
Copper	**19**	9.5	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 15:20	
Nickel	**14**	9.5	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 15:20	
Zinc	**92**	9.5	1	EPA 3051A	B8F2916	06/29/2018	06/29/2018 15:20	

Mass Extractable Hydrocarbons **Analyst: MJH**

Method: Mass DEP **Matrix: Soil**

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
C9-C18 Aliphatic Hydrocarbons	ND	96	1	EPA 3545A	B8F2540	06/25/2018	06/28/2018 17:38	
C19-C36 Aliphatic Hydrocarbons	ND	96	1	EPA 3545A	B8F2540	06/25/2018	06/28/2018 17:38	
C11-C22 Aromatic Hydrocarbons	ND	96	1	EPA 3545A	B8F2540	06/25/2018	06/28/2018 17:38	
Surrogate: o-Terphenyl	*41.3 %*	*40 - 140*			B8F2540	06/25/2018	*06/28/2018 17:38*	
Surrogate: 1-Chloroctadacane	*51.9 %*	*40 - 140*			B8F2540	06/25/2018	*06/28/2018 17:38*	
Surrogate: 2-Bromonapthalene		*40 - 140*			B8F2540	06/25/2018	*06/28/2018 17:38*	**L**
Surrogate: 2-Fluorobiphenyl		*40 - 140*			B8F2540	06/25/2018	*06/28/2018 17:38*	**L**

PCBs by Soxhlet **Analyst: PJB**

Method: EPA 8082A **Matrix: Soil**

Analyte	Result (mg/kg dry)	RL (mg/kg dry)	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
PCB-1016	ND	0.48	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 07:28	
PCB-1221	ND	0.48	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 07:28	
PCB-1232	ND	0.48	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 07:28	
PCB-1242	ND	0.48	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 07:28	
PCB-1248	ND	0.48	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 07:28	
PCB-1254	ND	0.48	1	EPA 3540C	B8F2633	06/26/2018	06/30/2018 07:28	