Phase II Environmental Site Assessment (ESA) Work Plan / Site-Specific Quality Assurance Project Plan Addendum

Former True Temper Site
575 Concord Avenue
St. Johnsbury, Vermont 05819

EPA Cooperative Agreement Number: 4B-00A01260
EPA QA Tracking #24013
VTDEC SMS #2024-5394
Montrose Project No. 13733-223544 Task 3.C.04a

Prepared for:
Northeastern Vermont Development Association (NVDA)
36 Eastern Avenue, Suite 1
St. Johnsbury, VT 05819

Prepared by:

MONTROSE ENVIRONMENTAL

500 Horizon Drive, Suite 540
Robbinsville, New Jersey 08691

December 6, 2023

Revision 1: February 14, 2024

ENVIRONMENTAL PROFESSIONAL SIGNATURES

I certify under penalty of perjury that I am an environmental professional and that all content contained within this deliverable is to the best of my knowledge true and correct.

Prepared By:

March 18, 2024

Robert Lemanowicz — Date

Reviewed By:

March 18, 2024

Kevin Ignaszak — Date

Montrose Environmental Group Project Manager

March 18, 2024

Andrea Pedersen — Date

TITLE PAGE AND APPROVALS

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Name	Title	Signature	Date
Christine Beling	EPA Region 1 Project Officer	Christine J. Beling	4/3/2024
Jessica Iverson	EPA Region 1 QA Officer	Jessica Iverson	4/3/24
Kassandra Kimmey	VT DEC Environmental Analyst VI	Kassandra Kimmey	3/27/24
David Snedeker	NVDA Project Director	David Snedeker	3/25/24
Andrea Pedersen	Montrose Project Manager	Andrea Pedersen	3/18/24
Lydia Work, LRS	Montrose Project Quality Assurance Officer	Lydia Work	3/18/24

Table of Contents

Tables

Figures

Appendices

1.0 Introduction

On behalf of Northeastern Vermont Development Agency (NVDA or the "Client"), Montrose Environmental Solutions, Inc. (Montrose) has prepared this Phase II Environmental Site Assessment Work Plan (SAWP) / Site-specific Quality and Assurance Protection Plan Addenda (SQA) to perform a Phase II Environmental Site Assessment (ESA) at the former True Temper Site located at 575 Concord Avenue, St Johnsbury, Vermont (the "Site"). NVDA received a United Stated Environmental Protection Agency (US EPA) Brownfields Assessment Grant (Cooperative Agreement No. 4B-00A01260) to complete environmental assessments for selected properties for the purpose of potential future redevelopment including the completion of Phase II ESAs. The work will be completed in accordance with revision 2 of the generic Quality Assurance Project Plan (QAPP) QA#24013 prepared by Montrose which was submitted for United States Environmental Protection Agency (EPA) and Vermont Department of Environmental Conservation (VTDEC) review on December 1, 2023 and pending approval.

This document has been prepared using guidance from EPA-New England, Region 1's March 2009 "*Planning and Documenting Brownfields Projects, Generic Quality Assurance Project Plans and Site-specific QAPP Addenda*". The following required SQA elements are organized in this document as follows:

- Title and Approval Page / Introduction – Section 1
- Problem Definition – Section 1
- Project Description / Project Timeline – Section 2 / Section 7
- Sampling Design and Site Figures – Section 4, Figures 4A & 4B
- Sampling and Analytical Method Requirements – Section 5

1.1 Project Organization

The project organization follows the submitted QAPP of this SAWP/SQA. A site specific Worksheet #9 Project Planning Session Summary and Scoping Meetings (Sample provided in the generic QAPP) is included as **Appendix A**. All field personnel will be current on 40-hour Occupational Safety and Health Administration (OSHA) training requirements and will have familiarity with applicable SOPs and the submitted QAPP.

The following roles and responsibilities have been added:

- The Health and Safety Officer (HSO) for the project is Ana Mora, Montrose Corporate Safety Director. Preparation of the HASP, selection of personal protective equipment (PPE), health and safety recordkeeping, and evaluation of HASP effectiveness are the responsibility of the HSO.
- The Aquatic Resource Assessment team leader (Montrose) is Robin Hunter (Senior Biologist II).
- Vegetation Clearing: Vegetation clearing will be subcontracted to J.A. McDonald, Inc. of Middlesex, Vermont. The project manager for J.A. McDonald, Inc. is Buddy Bancroft.
- Boundary and Topographical Survey: The boundary and topographical survey will be subcontracted to Truline Land Surveyors (TLS). TLS' project manager will be Shane Clark.
- Utility Survey: A utility locating survey will be conducted by Ground Penetrating Radar Systems (GPRS). The project coordinator for GPRS is Tom Mell.

- Geophysical Investigation: A near-surface geophysical survey will be conducted by HydroGeo Environmental. The project manager for HydroGeo Environmental is Ernest Beasley.
- The regulated building material (RBM) survey will be subcontracted to Clay Point Associates, Inc. (CPAI). The Project Manager for the Regulated Building Material Survey will be Kyle Austin of Clay Point Associates.
- Montrose has selected Eurofins perform analytical services. Eurofins is a NELAP certified laboratory. A copy of this SQA and QAPP will be provided to the laboratories at least 10 days prior to sample receipt. Data packages will be requested in electronic format and will include internal laboratory and data handling records.
- CPAI has designated the following laboratories for completing regulated building material (RBM) analytical services: Asbestos samples will be analyzed by Optimum Analytical and Consulting, LLC (Optimum). PCB building material samples to be collected during the RBM Survey will be analyzed by Eastern Analytical, Inc. (EAI). The SOPs (extraction and analysis) for PCB analytical services are included in **Appendix B** is listed below.

1.2 Objectives

The purpose of this SAWP/SQA is to provide a document describing why the Phase II ESA is warranted for the Site and the Phase II ESA approach for the Site at this time. The primary objectives of this SQA are to:

- Describe the history of the Site as determined from the review of previous investigations and available regulatory files.
- Describe the Site assessment activities necessary to better determine the nature and extent of contaminants of potential concern and to properly evaluate the applicable exposure pathways.
- Develop a preliminary Conceptual Site Model (CSM).

Sample-collection procedures and project data quality objectives will follow the generic QAPP (QA#24013), revision 2 submitted for approval to the US EPA on behalf of NVDA by Montrose on December 1, 2023 unless otherwise specified in this SAWP/SQA. The QAPP includes project management roles and responsibilities, measurement and data acquisition guidelines, sample-collection standard operating procedures (SOPs), assessment and oversight protocols, and data validation and usability guidelines.

2.0 Site Information

2.1 Site Description and Location

The Site is identified by the Town of St. Johnsbury as Parcel Identification (ID) 024-002-054-001 at 575 Concord Avenue, St. Johnsbury, in Caledonia County, Vermont and consists of approximately 7.68 acres of land. Various parcel identifying resources indicate slightly different acreage numbers for the Site parcel. The Site's total area will be verified by a boundary survey discussed in **Section 4.5** below.

Geographic coordinates representing an approximate center point of the Site are:

- 44°25'19.96" N Latitude, 72°00'14.51" W Longitude
- Vermont State Plane (feet) VT83F Easting X: 1,769,958' Northing Y: 701,013'

A USGS Site location map is provided as **Figure 1**. A Site location map depicting the parcel boundary against an aerial image is shown of **Figure 2** and a Site Plan depicting Recognized Environmental Conditions (RECs) is provided on **Figure 3**. A narrative general description of the Site and adjacent features is provided below.

- Moose River borders the parcel boundary to the northwest.
- An unimproved 2 acre commercially zoned parcel ID 027-001-008-000 with an address of "Ely Street" borders the Site boundary to the northeast and east.
- A 40-foot portion of the southeastern Site boundary shares a border with the Ely Street Right-Of-Way.
- A formerly used railroad line of the Main Central / Twin State Railroad and Concord Avenue to the south followed by the northern property boundaries of commercial parcels on Portland Street to the south.
- Residential property borders the Site boundary to the west.
- Vehicle entrance to the Site is from Concord Avenue to the south.
- The southwestern portion of the Site contains a gravel driveway (Site entrance) leading to an area formerly used during the 2023 construction season by a construction company (J.A. McDonald, Inc.) for storage of construction equipment and materials for a local project.
- The eastern portion of the Site contains a single story interconnected and approximately 29,300 square-feet former industrial complex previously used for the manufacturing of wood handles for farming tools. The former industrial complex footprint represents approximately 8.7% of the total parcel size. The original construction of the complex dates back to approximately 1940. Over 70% of the former industrial complex has collapsed roofing and compromised structure. It is assessed by the Town of St. Johnsbury as having no value. The building was constructed on a concrete slab with a steel frame and a gable roof. The roof and floor have been destroyed by weather events and are in a collapsing state.
- A separate concrete (pad) was observed adjacent to the southern and western portions of the former industrial complex without a structure built on it.
- A former boiler house (approximately 170 square feet) is present adjacent to the northern side of the interconnected industrial complex. There is a covered car port with the roof still intact as of August 2023 immediately adjacent to the west side of the former boiler house building.

- A historical scrap metal junkyard pile abuts the Site to the northeast.

2.2 Site History

The Property was historically used as a wood dowel or tool handle mill since the late 1800s until 1989. According to historical Sanborn Maps the southeast corner of the Site was used as a wood yard (depicted as "Summerville Wood Yard") and developed with commercial buildings in 1900. Between 1900 and 1905, the southeast corner of the Site was developed with a handle storehouse and a handle shop. From 1912 to 1927, the southeastern corner was developed with a handle storage building, and the southern boundary was developed with a small office building, a wood sawing building, and a coal shed. Between 1912 and 1919, the Site was labeled as a wood yard and a dwelling was depicted in the southwestern corner. Between 1919 and 1927, the handle storage warehouse in the southeastern was labeled as A.F.& H. Co. (which stands for American Fork and Hoe Company) warehouse. From 1943 until at least 1964, five buildings (current buildings) labeled as "The American Fork & Hoe Co." were developed in the southeastern corner, which manufactured handles for agricultural tools. The American Fork and Hoe Company (Ely Works) business was reportedly acquired by True Temper, Inc. by the mid-1950s, which continued to operate until at least 1989.

According to information obtained during the 1990 Johnson Company ESA (see **Section 2.3**), True Temper operated a mill on-Site to manufacture wooden dowels from raw timber. The dowels were shipped off-Site for final shaping and manufacturing into wooden handles for agricultural tools.

The True Temper "on-Site" facility received raw timber by truck. The timber was stored on-Site in a field on the western half of the Site. The timber was kept moist by spraying it with water supplied by the municipal water system. The timber was debarked and shaped into dowels within the mill building. Sawdust generated from this process was burned in the boiler. The activities associated with manufacturing of wood tools were reportedly limited to storage of timber, spraying of the timber with water, sawing and milling of the timber into wooden dowels to be later shaped handles, and kiln drying of the handles. Reportedly, no chemical treatment of the wood was conducted on-Site.

Identified waste streams formerly included waste oil generated when the engine oil in the company pick-up truck was changed. The oil was allegedly changed weekly, thus generating approximately 4-5 quarts of oil per week or 65 gallons of oil per year. An assumption was documented in the October 2022 Phase I ESA that the oil was disposed on-Site or incinerated in the boiler.

2.2.1 Off-site metal working operations

Historical Sanborn Fire Insurance maps indicated that Prior to 1940, additional (metal) manufacturing operations conducted under The American Fork & Hoe Company (Ely Works) name were depicted as taking place at a nearby off-Site location between Ely Street and Moose River on the present-day (off-Site) parcel (027-001-008-001). These additional metal operations which did not take place on the subject Site included brazing, polishing, tempering, forging, and pressing. At some point between 1927 and 1943, the off-Site (Ely Street) metal operations ceased as the 1943 Sanborn map depicts "ruins" where the metal operations once took place. This off-Site parcel is not associated with the Site and is not included in this SAWP/SQA.

2.3 Previous Environmental Investigations

2.3.1 1990 ESAs

Previous Phase I, II, and III ESAs were conducted by The Johnson Company and documented in a report prepared by The Johnson Company, Inc., in February 1990 (February 1990 ESA). In summary these investigations identified methyl tert-butyl ether (MTBE) and acetone to be present in groundwater in MW-2 above Vermont's Groundwater Enforcement Standards (VGES) which resulted in the listing of the Site on Vermont's Hazardous Sites List. The source of these impacts could not be determined; however, it was assumed to be due to occasional spills. The Johnson Company concluded that while several compounds had been detected it had not resulted in significant environmental degradation and VTDEC determined at the time that site management activities were complete.

2.3.2 2022 Phase I ESA

Stantec performed a Phase I ESA and prepared a Phase I ESA report dated October 7, 2022 (October 2022 Phase I ESA). The following RECs, Historical RECs (HRECs), and Business Environmental Risks (BERs) were identified.

REC #1/Potential Vapor Encroachment Condition (PVEC) #1 – Observed On-Site Petroleum and Hazardous Substance Storage:

During the October 2022 Phase I ESA site visit approximately 70, 55-gallon drums were observed on the Site in at least eight separate interior and outdoor areas. Based on the drums that had readable labels, the contents included amino-methyl propanol, ULAR latex-1635, propylene glycol, motor oil, used antifreeze, and racing fuel. There were numerous drums in outdoor areas that were observed to be empty and tipped over. One or more drums in a drum storage area inside the southwestern portion of the building were observed to be leaking at the time of the site visit. Three, 3 to 5-gallon metal gasoline cans were observed in separate areas outside of the building. Numerous 5-gallon plastic and metal buckets were observed inside and outside of the building, mostly unlabeled.

The presence of drums and other container storing various hazardous substances and petroleum products in at least eight locations, combined with observed releases from one or more drums, is considered to be a REC and a Potential Vapor Encroachment Condition (PVEC).

In November, 2022 an initial effort was made by the current Site owner to remove drums that were identified in the October 2022 Phase I ESA. In November 2022, drums, containers, and debris were removed and transported off-site for disposal. Approximately less than 50 empty drums remained at the Site as of August 2023. These empty drums were collected by the Owner's Contractor and are staged on the concrete floor are located inside the eastern portion of the building to the east and referenced on Figure 3. A summary of drums, containers and debris removed is provide below:

Quantity	Container Size (Gallons)	Contents	Disposal Class
44	55	Empty	Non RCRA Non DOT
2	5	empty gas cans	Solid waste
2	30	empty LP cylinders	Solid waste
3	55	Polyurethane	Flammable Liquid
2	55	Rhodoline 643	Oily Liquid
4	55	Waste Oil	Oily Liquid
2	55	Unknown content	likely Flammable Liquid
2	55	Silagard 70 - sealer	Flammable Liquid
1	55	TBS 9603 Concrete sealer	Flammable Liquid
1	55	80 Primer	Flammable Liquid
1	5	Val Cool cutting fluid	Oily Liquid
1	5	ZEP Lubese 28	Flammable Liquid
1	5	cement cold press (tar)	Oily Solid
1	5	BIO-Cool 250	Non RCRA Non DOT
2	5	Resin solution	Flammable Liquid
3	5	Elasto-seal Liquid Membrane	Flammable Liquid
4	5	Sit Act ATS-22	Flammable Liquid
1	5	F,L,M 1000 premix	Flammable Liquid
3	5	Premier Blind Nailing cement	Flammable Liquid
1	5	Canadian Chem coating mastic	Flammable Liquid
1	5	Dayton Day Chem (Anti Spall) J-33	Flammable Liquid
5	5	Bemac Products Asphalt primer	Flammable Liquid
1	5	Hilnard wood gym finish	Flammable Liquid
1	5	Bitumastic 300 M Part A	Flammable Liquid
1	5	SoPracone 300 H	Flammable Liquid
1	5	Robbins Miracle urethane sealer	Flammable Liquid
40	Bags (40 lb)	concrete additive	Non RCRA Non DOT

A sample representing liquid (oil) contents of one of the drums was collected and analyzed for Resource Conservation and Recovery Act (RCRA) metals (arsenic, barium, cadmium, chromium, lead, selenium, silver, and mercury) and total organic halides (TOX). RCRA metals were not detected in the sample. Total organic halides were reported at a concentration of 127 mg/kg.

REC #2 – Evidence of On-Site Filling:

Historical evidence of extensive filling (in particular) along the northern and northwestern edges of the Site, was noted in the February 1990 ESA. The evidence included up to 16 feet of fill materials observed in test borings. At test pit TP-1, over 8 feet of fill materials were documented, with the materials described as roots, wood scraps, green wine bottles, bricks, asphalt, and a 0.5-pint can with a solvent odor. The approximate location of TP-1 based on narrative information provided in the February 1990 ESA is depicted on **Figure 3**.

The evidence of widespread fill materials of unknown origin to depths up to 16 feet, combined with the presence of observed waste materials within at least some areas of fill has the potential to have resulted in impacts to soil and groundwater at the Site.

REC #3 – Adjacent Junkyard with Debris Encroachment – 34 Ely Street:

On aerial photographs dated 1979 through 2006, debris from what appears to be a junkyard on the east adjacent property is visible encroaching on the northeastern corner of the Site. During the 2022 Site visit a dump site containing primarily metal debris was observed on the northern adjacent property near the northeast corner of the Site. The metal debris included automobile parts, appliances, multiple 55-gallon drums, other metal storage containers, and an old gasoline pump.

The presence of a historical junkyard on the adjacent property, with some areas of debris having encroached on the Site, has the potential to have resulted in impacts to soil and groundwater at the Site.

REC #4 – Former On-Site Rail Spur and Adjacent Railroad Right-of-Way:

A non-operation railroad line is located adjacent the Site's southern boundary. From 1900 until at least 1983, this railroad line operated by the Maine Central Railroad Company. Vermont's publicly accessible Graphic Information Systems (GIS) data identifies this the railroad line as "Twin State Railroad".

The formerly operated railroad line is located off-Site adjacent to the southern boundary of the Site. From 1943 until at least 1964, a spur line (rail road siding) was present within the southern portion of the Site. It is unknown if the on-Site rail road siding was removed or still exists in a buried state.

Historically, railroad lines have frequently been found to be impacted by herbicides, metals, constituents of oil or fuel, polychlorinated biphenyls (PCBs), and wood preservatives such as creosote. The long-term presence and operation of a railroad line adjacent to the Site as well as railroad siding within the Site limits has the potential to have resulted in contaminant releases to soil on the Site.

REC #5 – Evidence of On-Site Disposal of Boiler Ash:

The Johnson Company indicated that a test pit (TP-2) that was excavated in 1989 as part of the Phase II ESA revealed the presence of greater than 8 feet of ash at a location near a former boiler house. An approximate location of TP-2 based on narrative information provided in the February 1990 ESA is depicted on **Figure 3**. Ash can potentially contain elevated concentrations of metals and polycyclic aromatic hydrocarbons (PAHs). Historical information obtained from the February 1990 ESA indicated that wood was the primary fuel for the boiler; however, the former use of coal and/or motor oil cannot be eliminated based on currently available information. Additionally, an assumption was documented in the October 2022 Phase I ESA that vehicle waste oil was disposed on-Site or incinerated in the boiler. Potential COCs in boiler ash related to potential waste oil incineration may include additional PAHs from incomplete combustion of motor oil in the boiler.

The long-term operation of the boiler and the known or suspected materials that were incinerated therein (wood fuel, potential coal fuel, and potential waste oil), combined with the apparent extensive on-Site disposal of ash from the boiler has the potential to have resulted in impacts to soil and groundwater at the Site.

REC #6/PVEC #2 – Upgradient Former Bulk Fuel Storage Depot – 535 Concord Avenue:

This upgradient property is shown on historic Sanborn fire insurance maps dated 1943-1964 as being a bulk fuel depot with 6 to 11 petroleum aboveground storage tanks (ASTs). There are no records of environmental assessment or cleanup activities related to this former use, and there is significant potential for petroleum impacts to soil and/or groundwater to be present. The nearest portion of the Site is approximately 50 feet north from the edge the 535 Concord Avenue property.

Based on the proximity to the Site and estimated hydraulically upgradient location, this former facility has the potential to have impacted the Site.

REC #7/PVEC #3 – Upgradient Former Gas Station/Auto Repair Facility – 599 Portland Street:

This upgradient property is documented as a gas/service station in historical records dated from 1943-1966 and continued in use as an auto repair facility through at least 2000. There are no records of assessment activities having been completed other than a Phase I ESA in 2020 that recommended performance of a Phase II ESA. The nearest portion of the Site is approximately 65 feet north from the edge of the 599 Portland Street property.

Based on the proximity to the Site and estimated hydraulically upgradient location, this facility has the potential to have impacted the Site.

REC #8/PVEC #4 – Upgradient Former Dry Cleaner and Filling Station – 642-648 Portland Street:

This upgradient property was subject to a wide range of commercial and industrial uses, including a carriage works, blacksmith shop, paint shop, woodworking shop, auto storage garage, junk yard, drycleaner, auto parts store, and filling station. Use as a filling station extended from at least 1943-1964 and included the presence of at least two gasoline underground storage tanks (USTs). Records reviewed in the October 2022 Phase I ESA document use as a dry cleaner from at least 1989-1995. Although there is a record of a former 1,000-gal fuel oil UST having been removed in 2002 (with no release reported), there are no clear records of assessment activities having been completed for either the former dry cleaner or filling station. The nearest portion of the Site is approximately 200 feet north from the edge of the 642-648 Portland Street property.

Based on the proximity to the Site and estimated hydraulically upgradient location, this facility has the potential to have impacted the Site.

REC #9/PVEC #5 – Upgradient Former Gas Station – 667 Portland Street:

Historic maps dated 1919 through 1958 show the presence of up to three gasoline USTs at this property and/or label it as a filling station. There are no records of USTs having been removed from the property or of any environmental assessment activities having been completed. The nearest portion of the Site is approximately 65 feet north from the edge of the 667 Portland Street property.

Based on the proximity to the Site and estimated hydraulically upgradient location, this property has the potential to have impact the Site.

REC #10/PVEC #6 – Upgradient Former Gas/Service Station – 709 Portland Street:

This property is shown on a historic map dated 1943 as being an auto sales and service facility with two gasoline USTs. Environmental records document the removal of three petroleum USTs in 2013 (one 2000-gallon gasoline, one 4,000-gallon gasoline, and one 550-gallon heating oil). Contamination was detected, assessment activities completed, and monitoring initiated (which is still on-going). However, the downgradient extent of the groundwater contamination plume has not been fully delineated. In addition, the tanks that were removed and the assessment activities that were performed did not include the area where tanks are shown on the historic map. The nearest portion of the Site is approximately 65 feet northwest from the edge of the 709 Portland Street property.

Based on the proximity to the Site and estimated hydraulically upgradient location this property has the potential to have impacted the Site.

HREC #1 – PCE in Soil:

Tetrachloroethene (PCE) was detected in soil at the Site as documented in the February 1990 ESA below current applicable soil standards and represents a HREC.

BER #1 - Historical On-Site Industrial Activities:

The types of businesses and industrial processes performed at the Site (primarily the manufacturing of wooden tool handles through a process that included storage of timber, wetting of timber with water, milling of handles, use of a kiln to dry the handles, and storage of handles) are not those commonly associated with having significant potential for on-Site releases of petroleum and/or hazardous substances. However, industrial use of the Property potentially dates back more than 140 years to 1880 when the Property was reportedly acquired by the Eli Hoe and Fork Company. Based on the extended history of industrial use, there is increased potential for cumulative impacts to surface soil from on-site activities, and this is considered to represent a BER relevant to redevelopment and reuse of the Site.

BER #1 – Regulated Building Materials (RBMs):

Based on the reported date of construction of the buildings at the Site (circa 1940), it is likely that asbestos containing materials (ACM), lead-based paint (LBP), and other hazardous building materials were used in construction or maintenance of the buildings. These materials will need to be assessed, sampled, and appropriately managed or abated in conjunction with future renovation or demolition of the buildings. These required activities will be further complicated by the poor and/or collapsed condition of the buildings and represent a BER relevant to redevelopment and reuse of the Site.

2.3.3 Aquatic Resource Assessment, 2023

An Aquatic Resource Assessment was performed on October 23, 2023 by Montrose to support this SAWP/SQA. It is noted that this survey performed in late October) was constrained by project schedule goals when many of the herbaceous species lacked diagnostic features and when many trees had lost their leaves, making vegetation identification more challenging.

The intent of the assessment was to identify wetland areas and buffers for avoidance during the Phase II investigation. It is noted that an aquatic resource (preliminary jurisdictional or jurisdictional) delineation for submittal to the United States Army Corps of Engineers (USACE) was not prepared under this scope of work.

The parcel was searched for evidence of wetland indicators such as hydrophytic vegetation, ponding, or saturated conditions. Evidence of the ordinary high-water mark (OHWM) as indicated by the presence of bed/banks, scour lines, change in vegetative cover, changes in soil texture, presence of leaf litter and debris deposits was mapped along channels and ponds. The OHWM was used to determine the extents of potential non-wetland wastes.

The locations of wetlands boundaries and OHWM were mapped using the ESRI Field Maps application on a mobile tablet device. GPS data were imported into ARCGIS software for developing aquatic resources. Georeferenced, high-resolution aerial photographs and elevation data were also used to interpret boundaries of potential wastes and wetlands in conjunction with on-Site data.

Surface water features documented included a perennial stream, to intermittent streams, two ditches, one ponded area and wetland areas. A total of approximately 0.9 acres of surface water wetlands were mapped within the parcel. Based on the findings of the Aquatic Resource Assessment, the following avoidance buffers will be implemented during the project to avoid adverse impact to these features:

- Wetland ditches: 5 feet from the edge of the channel.
- Moose River: 50 feet from the top of the bank to the Moose River.
- Intermittent or perennial riverine features other than the Moose River: 25 feet from the top
- of the bank.
- Pond, freshwater wetland, wet meadow, and floodplain wetland: 50 feet from the edge of pond or wetland.

The location of surface water features, potential wetlands areas, and avoidance buffer features (and their relative location to proposed phase II ESA activities) are depicted on **Figures 3, 4A** and **4B**.

Additional information regarding the findings of the Aquatic Resource Assessment is provided as **Appendix C.**

2.4 Physical Setting

2.4.1 Topography

A review of the USGS 7.5-minute Series (St. Johnsbury and Concord, VT) topographic quadrangles was conducted to obtain topographic information for the Site and surrounding area. The Site is located in the "St. Johnsbury VT" 7.5m quadrangle. The Site's elevation ranges between 565 and 614 feet above Mean Sea Level (MSL). The former industrial complex is approximately between 600 and 610 feet MSL.

The greatest elevation is located in southwest corner of the Site (approximately 614 feet MSL) and the lowest elevation is located in the northwestern portion of the Site (approximately 565 feet MSL) adjacent to the Moose River. The Site is located in a local river valley between the peak of Harris Hill (>900 feet MSL) located approximately 0.5 miles to the south and the peak of Saddleback mountain (>1,300 feet MSL) located 1.7 miles to the northeast.

Site elevation dips by approximately 40 feet from the south to north towards the Moose River over a distance of approximately 450 feet. The Site is relatively level in the area of the former industrial complex generally across the southern half of the Site and decreases in elevation sharply towards the Moose River north of the tree line running from the southwest to the northeast.

2.4.2 Regional Geology

The Site is located within the Connecticut Valley Trough of the new England uplands USGS physiographic province. The Connecticut valley trough is characterized by Silurian-Devonian metasedimentary rocks. Pleistocene glaciation events have removed interglacial or preglacial soils throughout the region. Regional sedimentary features are commonly glacial till and other ice-contact deposits (sand and gravel esker and outwash deposits) overlain by lacustrine deposits. Holocene alluvial deposits are common in the study area. These are comprised of coarse-grained point bar deposits and finer grained overbank deposits.

2.4.3 Surficial Geology

A review of Vermont Open Geodata (Surficial Geologic Map of Vermont, 1970, Units) consisting of surficial geologic features as digitized from the 1:62,500 15-minute series USGS quadrangle map sheets compiled by the Vermont Geological Survey 1956-1970 was conducted to preliminary identify surficial geology at the Site. This data indicates that the surficial geology at the Site is classified as Alluvium (glacial-fluvial sands and gravels).

2.4.4 Bedrock Geology

A review the USGS "Bedrock Geologic Map of Vermont, 2011" (Scientific Investigations Map 3184) was conducted to identify bedrock geologic formations at the Site. The Site is located within the rhythmically graded member of the Connecticut Valley Trough (Gile Mountain Formation) characterized by light to medium-gray, fine-grained micaceous quartzite to dark-gray muscovite-quartz-biotite carbonaceous phyllite or schist in beds 10 to 25 cm thick and dark-gray micaceous phyllite or schist containing beds of micaceous quartzite.

2.4.5 Hydrogeology

Groundwater flow direction can be influenced by the presence of local wetland and surface water features, ditches, topography, geology, recharge and discharge areas, supply and injection wells, and other factors. The Site-specific depth to groundwater data necessary to determine actual shallow groundwater flow direction for the Site is not available, and as such, groundwater flow direction at the Site cannot be accurately assessed at this time. However, based on surface topography, it is expected that groundwater under the Site and regional groundwater generally flows to the north, toward the Moose River.

Limited subsurface investigation activities were conducted as part of the February 1990 ESA. Several test pits and soil borings with associated monitoring wells encountered groundwater at variable depths during the investigation. Hydrogeologic observations made more than 30 years ago may no longer be representative of current Site conditions and it is difficult to draw definitive conclusions based on the observations documented in the report without precise information location (textual descriptions of the locations were included but the sample location figure is missing from the report). The information provided suggests the following conditions were true at the time (1989-1990) of the investigation:

- Groundwater was not encountered in test pit TP-1 or soil boring SB-1, located approximately halfway across the western portion of the Site near the steep bank. The approximate locations of TP-1 and SB-1 based on narrative information provided in the February 1990 ESA is depicted on **Figure 3**. Native gray silt was encountered beneath gravelly fill approximately 14.5 feet below ground surface (bgs) in this area.
- In the eastern portion of the Site, depth to groundwater and native fill was variable. The thickness of fill and depth to groundwater generally increased from east to west, ranging from 3 feet to greater than 9 feet bgs. The depth to groundwater generally increased from north to south, ranging from 6.5 feet to greater than 9 feet bgs.

2.4.6 Surface Water / Wetlands

An Aquatic Resource Assessment was conducted by Montrose to support this SAWP/SQA as discussed in **Section 2.3.3**.

The closest off-Site surface water body is the Moose River located immediately adjacent to the northwestern Site boundary and up to 200 feet off-Site to the north from the northeastern Site boundary. The Moose River flows from east to west into the Passumsic River is located approximately 1,200 feet to the west (confluence of the Passumsic and Moose River). The Passumsic River flows in a general north to south direction where it ultimately discharges to the Long Island Sound (Atlantic Ocean) in southern Connecticut.

Surface water consisting of one pond area roughly equating to 0.5 acres has been identified. It is located within the forested portion of the Site in proximity to Moose River and discharges to the Moose River.

3.0 Preliminary Conceptual Site Model

The Conceptual Site Model (CSM) is a tool to identify sources, receptors, and pathways associated with the Site and should support scientific and technical decisions. The CSM is an iterative process of characterizing site contamination based on available site data and both historical and existing conditions. The following CSM evaluates and presents data in a narrative format that depicts potential fate and transport mechanisms of site contaminants, address the threat or potential threat to human health and the environmental from the site contaminants, and identifies data gaps.

This CSM provides information that identifies the following; or how the following information will be obtained by the proposed activities herein.

- Sources of releases, contaminants of concern, potentially affected environmental media, geology, hydrogeology, contaminant fate and transport, receptor study and evaluation.
- The location depths, and characteristics of existing and former engineered structures, surface infrastructure, tanks, and containers, from which or through which the suspected contaminants may have been released, transported, or may impact a sensitive receptor.
- Historical and current land uses and activities from the Site and immediate surrounding area.

Section 2.1 above provides a description of the Site and its location, **Section 2.2** above provides a description of Site history and **Section 2.4** above provides a description of the anticipated general environmental conditions at the Site. **Section 4** below descries Contaminants of Concern (COCs) identified for each REC, data gaps, assumptions and investigation goals.

This preliminary CSM is based on the current understanding of potential Site contaminants and will be updated following completion of the Phase II ESA.

3.1 Contaminant Fate and Transport

Currently there has been no useful data generated to date to quantitively characterize fate and transport at the Site. In general, a preliminary fate and transport model includes surface soil discharges and subsurface soil discharges with the potential for migration from soil to groundwater, and groundwater into the Moose River. There is also the potential for overland stormwater flow to have transported surface soil contaminants to ecological receptors such as surface water and wetlands in addition to the Moose River. Potential receptors and exposure pathways are described below.

3.2 Potential Receptors and Exposure Pathways

<u>Soils</u>: Approximately 29,300 square feet (8.7%) are covered by the deteriorating industrial complex building footprint. Trespassers and construction workers are at risk of direct contact and /or inhalation exposure to potential COCs in soil. The Site is in the early planning stages for anticipated re-development to mixed use residential and commercial properties. Future residents and commercial employees are potential receptors of soil contamination through potential direct contact and/or inhalation exposure scenarios. Overland stormwater is a potential exposure pathway to ecological receptors (potential on-wetlands, potential on-Site surface water (ponds), and off-Site surface water (Moose River).

<u>Groundwater</u>: The Site is in a mixed-use commercial / residential area of St. Johnsbury. Municipal water sourced from Stiles Pond (located approximately 4 miles east of the Site), is available in St. Johnsbury.

Given that the Site and surrounding area is serviced by municipal water it is not anticipated that potential COCs from the Site, if any, would affect local commercial properties due to ingestion of impacted groundwater nor are any irrigation wells anticipated as part of the future redevelopment. Future residents and commercial employees are potential receptors of groundwater contamination by way of vapor-intrusion.

The Moose River is located adjacent to the Site and is anticipated to be the discharge area for shallow groundwater in the vicinity of the Site. As such impacts in groundwater at the Site could, therefore, impact the river; however, dilution in the river would likely decrease contaminant concentrations. Groundwater depth at the Site has not been determined.

Soil Vapor/Indoor Air: The potential for VOCs in soils and groundwater also means there is a possibility for soil vapor intrusion (SVI) into on-Site and off-Site buildings and future residential or commercial buildings. Potential SVI may be addressed in a subsequent Phase II investigation upon the review of analytical data for the scope of work described herein.

Regulated Building Materials: In the immediate future, building demolition construction workers are potential receptors of RBMs that may be present which have been damaged or may be encountered during future renovations/demolitions. Damaged RBMs including asbestos, lead based paint and PCB containing building materials has the potential to be inhaled or accidently ingested by building trespassers or construction workers.

3.3 Regulatory Criteria utilized for this phase II-ESA Workplan

Based on the potential receptors, the results of soil investigation will be compared to the Vermont Residential and Non-Residential Soil Standards. The results of groundwater investigation will be compared to the Vermont Groundwater Enforcement Standards (VGES). Additional regulatory criteria associated with vapor encroachment and ecological scenarios may be used in a follow up phase of environmental assessment based on the results of this initial assessment. See Section 3 and 4 for additional information.

3.4 Data Gaps

A discussion of data gaps for each REC to be investigated are described in **Section 4** below.

4.0 Site Characterization Strategy and Data Gaps

Sample design information including REC #, environmental media, proposed sample field ID, estimated sample depth, proposed sample rational description, sample obtainment method, and proposed laboratory analysis is summarized on **Table 1.** The minimum sample volume, container type, preservative, and technical holding time of each media (*i.e.,* solid or aqueous) and analytical parameters to be requested are summarized in **Table 2.** VTDEC action levels compared with Eurofins' Reporting Limits (RLs) and Method Detection Limits (MDLs) are presented on **Table 3A**. Applicable Regulated Building Materials (RBM) project action limits compared with RLs and MDLs are provided on Table 3B. Proposed soil and groundwater sample locations are depicted on **Figures 4A and 4B.** It is noted that final sample locations are to be determined by field conditions and the results of geophysical investigations, test pits and field observations.

References to "TCL/TAL" in this report and attached tables includes the following parameter subset groups:

- TCL VOCs (including but not limited to petroleum and chlorinated solvent compounds)
- TCL SVOCs (including alpha acids, base neutrals, and Poly Aromatic Hydrocarbons (PAHs)
- TAL Metals
- TCL Poly Chlorinated Biphenyls (PCBs)
- TCL Pesticides/Herbicides

Sample rationale and locations (Worksheets #17 & 18), sample handling procedures (Worksheets #19 & 30), tracking and chain-of-custody (Worksheets #26 & 27), and laboratory analytical methods (Worksheets #24, 25 & 26) are designed to be consistent with those specified in the requirements of the Generic QAPP (QA Tracker #24013).

The QAPP includes sample chain-of-custody form, custody seal, and sample label examples (Figures 26-1, 26-2, and 26-3).

The following **Sections 4.1** through **4.6** describe the field sampling plan for each identified REC. Methodology for installation and sampling of investigation locations are described in **Section 5**.

4.1 REC #1 Observed On-Site Petroleum and Hazardous Substance Storage

Approximately 70, 55-gallon drums observed in at least eight separate interior and outdoor areas. Contents of Drums (based on labels that could be read) included amino-methyl propanol, ULAR latex 1635, propylene glycol, motor oil, antifreeze, racing fuel. The approximate locations of the observed drums are depicted on **Figure 4A** as D1 through D8. In November, 2022 an initial effort was made by the current Site owner to remove drums that were identified in the October 2022 Phase I ESA. In November 2022, the drums, containers, and debris were removed and transported off-site for disposal. Approximately less than 50 empty drums remained at the Site as of August 2023. These empty drums were collected by the Owner's Contractor and are staged on the concrete floor are located inside the eastern portion of the building to the east and referenced on Figure 3. A summary of drums and debris removed is provided in **Section 2.3.2** above.

4.1.1 Data Gap Statements

- There is limited location information documenting the "at least" eight separate interior and outdoor areas containing drums.
- It is unknown if the drums were connected to former Site operations and the nature of contents to be unknown.
- The volume of release(s) by drums is not known (somewhere between diminimus quantities and 3,850 gallons if all 70 drums were at one point full and discharged all or most contents on-Site).
- The Site has been unsecured for over 30 years and there is a potential that there are/were an additional number of drums and drum locations / potential drum discharge locations at the Site.

4.1.2 Assumption Statements

- Discharges are assumed to have originated at the surface therefore, surface and near surface soil has the most potential to be impacted. Given that potential discharges may have occurred several decades ago, surficial COC degradation may have occurred leading to a situation where the most impacted vertical interval may be deeper than expected. During field activities, Montrose will document evidence of vertical migration through soil through visual observations, olfactory observations, and photoionization detector (PID) readings. Adjustments may be made to the CSM and sampling plan based on visual observations, olfactory observations or PID readings.
- Since complete documentation of the former drum contents and potential volume discharged is not able to be obtained, the appropriate laboratory analysis will be conducted under the conservative approach assumption that the contents of the drums were unknown and thus analysis of all analytes for all analyte groups under the full TCL/TAL list will be performed.
- Potential COCs in soil and groundwater include VOCs, SVOCs, Metals, PCBs, Pesticides, and Per-and Polyfluorinated Substances (PFAS).

4.1.3 Site Investigation Goals

- Initially characterize the quality of soil and groundwater due to known and potentially unknown drum releases to the environment. A number of the drums are located within the industrial building which is in disrepair and is unsafe to work in. Only three of the drum locations are accessible and can be investigated at this time (D2, D5 and D8). The remaining locations will be investigated following future building demolition.
- Use initial data to modify the CSM and plan second investigation phase for horizontal and vertical delineation of soil/groundwater and the evaluation of soil gas for potential future vapor intrusion conditions.

4.1.4 Sampling Approach

- Collect two (2) surface/near surface soil samples (six samples total) at three of the eight former drum locations that were documented the October 2022 Phase I ESA. Montrose will make the best possible and reasonable effort to characterize former drum areas with regards determining the appropriate sample locations at each former drum location area. Soil samples will be analyzed for all parameters on the TCL/TAL list.

- Collect soil samples from the surface (0-0.5 feet bgs) for all parameters except for Volatile Organic Compounds (VOCs). VOCs will be collected at 0.5-1 feet bgs given that VOCs at the soil/air interface have the potentially to dissipate quicker that at the near surface (0.0-0.5 feet bgs).
- Install one (1) groundwater monitoring well screened across the water table. Collect a groundwater sample via low-flow methods to be analyzed for all parameters on the TCL/TAL list and PFAS.

4.2 REC #2 Evidence of On-Site Filling

Evidence of extensive filling, in particular, along the northern and northwestern edges of the Site, was noted in the February 1990 ESA. The evidence included up to 16 feet of fill materials observed in test borings.

4.2.1 Data gap statements

- Location (map) information could not be obtained depicting the location of former test pit locations documented in the February 1990 ESA. The locations of former test pits are estimated based on narrative describes provided in the February 1990 ESA and the inferred locations are depicted on **Figure 3**.
- The specific locations of filled areas are unknown. An attempt will be made to gather more data during land survey, clearing, and geophysical investigation activities as to specific areas of fill to target during sampling.

4.2.2 Assumption Statements

- Potential COCs in soil/and or groundwater are VOCs, SVOCs, Metals, PCBs, Pesticides/Herbicides, and PFAS.

4.2.3 Site Investigation Goals

- Qualitatively characterize fill material and quantitatively characterize potential COCs in the fill material.
- Qualitatively characterize fill via soil borings and material descriptions.
- Evaluate the bottom of fill with geophysical survey, test pit, and/or soil boring at one or more locations.
- This goal of this initial ESA does not include full delineation of the horizontal fill areas at this time.

4.2.4 Sampling Approach

- Test pit excavations at targeted areas (to be determined by the results of the geophysical investigation).
- Analyze five (5) fill soil samples for all parameters on the TCL/TAL list. The sampling approach is to collect five samples of visually distinct (fill vs native soil) fill material or potential fill material (if there are no visual observations of fill material made) in order to initially characterize the general nature and concentrations of potentially impacted fill material.
- The sample depths will be determined by the depth to the middle of any observed visually distinct fill material. If there are two or more visually distinct layers of fill observed in any test pit location, an effort will be made to collect at least one sample at the middle depth per visually distinct fill

layer. This may result in more than one sample being collected for any one test pit and no samples collected from another. If no visual indication of fill is observed any one particular test pit location than a sample will be collected at 3-3.5 feet below ground surface to represent an interval will fill material would likely be. A checklist summarizing hierarchy of selecting is provided below.

Fill Material Sampling Goal: Collect up to but not exceeding 5 fill samples for TCL/TAL (Full)
Example: Text Pit (x) of 5
Is fill visually distinct material present?
If yes, collect sample from the middle depth of the fill material
If no, no sample will be collected.
Are there multiple layers visually distinct fill material observed in this test pit?
If Yes, collect additional "middle depth of fill" samples from each visually distinct fill material observed.
Eliminate samples from test pits if a particular type of fill material has already been sampled in another test pit in order to maintain a total of no more than 5 samples being submitted for laboratory analysis.
If more than 5 visually distinct layers of fill are observed in the 5 test pits, select the top five most visually contaminated and collected a “middle depth of fill” sample.

- Based on the results of initial investigation sampling, it will be determined if an expanded fill material soil sample investigation or delineation of fill material will be needed.
- Install three (3) monitoring wells (locations to be determined after test pit excavation activities) screened across water table, if present. Monitoring wells will be installed adjacent to test pits exhibiting the most visual evidence of non-native material being present. If non-native fill material is not observed, the location of monitoring wells will be installed at an up-gradient location (in proximity to, but outside of the wetland and disturbance buffer areas. Collect groundwater samples via low-flow methods to be analyzed for all parameters on the TCL/TAL list and PFAS.

4.3 REC #3 Adjacent Junkyard with Debris Encroachment - 34 Ely Street (Site J)

During the October 2022 Phase I ESA Site visit, an adjacent dump site containing primarily metal debris was observed adjacent to the Site. The metal debris included automobile parts, appliances, multiple 55-gallon drums, other metal storage containers, and an old gasoline pump. Historical observations made during Site visits have shown previous encroachment of debris from this adjacent property onto the Site.

4.3.1 Data Gap Statements

- The amount of on-Site encroachment from the off-Site debris pile has not been determined. A land survey will be performed to determine the Site boundary and the extent of debris pile encroachment.

4.3.2 Assumption Statements

- The total volume of the adjacent junkyard debris pile is estimated to be less than five cubic yards.
- Impacts to soil are expected to be the greatest at surface soil.
- There is a potential that contaminants from the encroached junkyard debris pile were discharged both on and off site that may be negatively impacting the on-Site groundwater quality.
- Potential COCs in soil are SVOCs, Metals, PCBs, and Pesticides/Herbicides.
- Potential COCs in groundwater are VOCs, SVOCs, Metals, PCBs, and Pesticides/Herbicides.

4.3.3 Site Investigation Goals

- Quantitatively characterize contaminants that have potentially leached from the debris pile into surface soil.
- Quantitatively characterize groundwater contaminants that have potentially leached in to groundwater.
- The CSM will be updated, and additional investigation activities may be proposed including but not limited to additional soil borings and permanent monitoring wells for horizontal and vertical delineation and the collection of environmental media samples that may include but are not limited to soil, groundwater, and soil vapor.

4.3.4 Sampling Approach

- The on-Site (encroached) part of the debris pile will be not be disposed at this time. A portion of the on-site (encroached) part of the debris pile will be temporarily excavated to facilitate collection of two (2) surface samples under the on-Site (encroached) debris pile. The temporarily excavated debris will be placed within the existing debris pile footprint as to not potentially impact areas outside of the existing footprint. The samples will be analyzed for TCL SVOCs, TCL Pesticides/Herbicides, TCL PCBs, and TAL Metals.

- Two (2) monitoring wells will be installed at an approximate location immediately downgradient of encroached junkyard debris pile and a groundwater sample from each monitoring well will be collected via low-flow methods and analyzed for all parameters on the TCL/TAL list, and PFAS analysis.

4.4 REC #4 Former On-Site Rail Spur and Adjacent Railroad Right-Of-Way

From 1900 until at least 1983, a rail line operated by the Maine Central Railroad Company was in operation along the southern boundary of the Site. According to historical Sanborn Fire Insurance Maps, from 1943 until at least 1964, a spur line (railroad siding) was present depicted in the southern portion of the Site and was aligned parallel with the Maine Central / Twin States formerly operated line.

4.4.1 Data Gap Statements

- At this time, it is unknown if the railroad siding formerly depicted on historical Sanborn Fire Insurance Maps is still present. There is the potential that railroad siding may have been removed at some point in the past or buried. A best effort and reasonable attempt will be made to locate the on-Site rail spur (siding) during geophysical survey activities.

4.4.2 Assumption Statements

- There is approximately 800 linear feet of Main Central / Twin States formerly operated rail road located adjacent to the southern Site boundary.
- There is (or was) approximately 650 linear feet of on-Site railroad siding as depicted on historical Sanborn Fire Insurance Maps.
- Potential contaminants of concern are limited to those historically commonly associated with rail road operations. COCs include PAHs (from motor oils, grease, lubricants), Metals (deposited from moving train equipment), PCBs (from leaky electrical transformers on moving trains and stationary switching equipment), and Pesticides/Herbicides (used to limit vegetation growth in proximity to tracks).

4.4.3 Site Investigation Goals

- Quantitatively characterize contaminants that may be present in soil as a result of former railroad operations.
- The goal of this initial soil assessment at REC #5 does not include horizontal or vertical delineation and is limited to initially identifying if railroad operations impacted soil on a yes/no basis.
- This goal of this initial assessment does not include groundwater evaluation at this time. Should the results of initial soil investigation indicate the need for vertical soil delineation, the need to investigate groundwater at REC #5 will be re-evaluated.
- After review of the initial surface soil and groundwater data, the CSM will be updated, and additional investigation activities may be proposed including but not limited to additional soil borings, installation of test pits, and installation of permanent monitoring wells for horizontal and vertical delineation, and the collection of soil and groundwater samples for laboratory analysis.

4.4.4 Sampling Approach

- The area within and in proximity to the tracks is overgrown, targeted areas samples areas will be pre-cleared during vegetation clearing activities prior to sampling access.
- **Main Central / Twin States Railroad (adjacent to Site boundary):** Three (3) soil samples will be collected to characterize soil in proximity to Main Central/Twin States railroad in proximity to the southern Site boundary with hand augers at locations approximated on **Figure 4A**. Please note that the adjacent Main-Central / Twin States Railroad line is not within site limits therefore soil samples will be collected at the southern property boundary as close to the formerly operated Main Central / Twin States Railroad line as possible to identify if off-site railroad operations impacted on-site soils. No off-Site samples will be collected. The soil samples will be analyzed for TCL PAHs, TAL Metals, TCL PCBs, TCL Pesticides/Herbicides.
- **Potential On-Site Railroad Siding**: Per the October 2022 Phase I ESA site visit the on-site railroad siding is no longer visible. If the on-Site railroad siding is identified by the geophysical investigation, two (2) test pit excavations will be performed and sidewall samples will be collected. If potential railroad siding is identified not identified by geophysics, then two linear trench-like excavations with approximate dimensions of 1 bucket width wide x 3 feet deep x 20 feet long will be performed at an orientation perpendicular to suspected former railroad siding in an attempt to locate evidence buried railroad siding features such as wooden ties, iron rails, railroad ballast

(stones), etc. for the purpose of selecting a sample location. To the extent possible, samples will be biased towards visual, olfactory, or field screening instrument evidence of soil impacts. If no evidence of former railroad siding features are observed by this test pitting method, then no samples will be collected.

- A groundwater investigation for this REC is not proposed at this time. However, the results of soil sample laboratory analysis may require the implementation a groundwater investigation for this REC.

4.5 REC #5 Evidence of On-Site Disposal of Boiler Ash

Test pit TP-2 excavated in 1989 documented the presence of greater than 8 feet of ash at a location near a former boiler house. An approximate location of TP-2 based on narrative information provided in the February 1990 ESA is depicted on **Figure 3**. Ash can potentially contain elevated concentrations of metals and polycyclic aromatic hydrocarbons (PAHs). Additionally, an assumption was documented in the October 2022 Phase I ESA that vehicle waste oil was disposed on-Site or incinerated in the boiler. Potential COCs in boiler ash related to potential waste oil incineration may include additional PAHs from incomplete combustion of motor oil in the boiler.

4.5.1 Data Gap Statements

- The exact location of TP-2 is unknown however the former boiler house location is known and the test pit was excavation adjacent to the former boiler house.
- The extent of buried boiler ash is unknown. An attempt will be made to gather more data during geophysical Site activities as to the horizontal extents of buried boiler ash.
- It was documented in the February 1990 ESA that wood was used to fuel the boiler however there is also the potential that coal was also used fuel for the former boiler.

4.5.2 Assumption Statements

- Contaminant concentrations in buried boiler ash is considered to be homogenized unless information gathered during Site investigation activities that suggest otherwise.
- The boiler ash fill is not impacted by contamination associate with other RECs.
- Contaminants of concern include Poly-Aromatic Hydrocarbons (PAHs) (from incomplete potential coal combustion, and incomplete potential waste oil combustion) and Metals (from incomplete potential coal combustion).

4.5.3 Site Investigation Goals

- Quantitatively characterize contaminants that may be present in the buried boiler ash.
- Quantitatively characterize groundwater for the potential that the buried boiler ash has negatively affected ground water quality.
- Perform a limited test pit excavation investigation to qualitatively characterize the buried boiler ash material and to obtain basic location information used to guide future delineation of the horizontal extents of the buried boiler ash.
- Determine the approximate bottom of boiler ash with soil boring or test pit excavation.

- This goal of this initial assessment does not include delineating the horizontal limits of boiler ash fill at this time.
- After review of the initial surface soil and groundwater data, the CSM will be updated, and additional investigation activities may be proposed including but not limited to additional soil borings, installation of test pits, and installation of permanent monitoring wells for horizontal and vertical delineation, and the collection of soil and groundwater samples for laboratory analysis.

4.5.4 Sampling Approach

- Conduct test pit excavations and collect a sample representing the approximate vertical mid-point of the boiler ash depth to be analyzed for TCL PAHs, and TAL Metals.
- Install one (1) monitoring well screened across the water table and collect a groundwater sample to via low-flow methods to be analyzed for TCL PAHs, and TAL Metals.

4.6 RECs #6-10

RECs #6 through 10 include potential off-Site sources of groundwater contamination.

- REC #6: Upgradient Former Bulk Fuel Storage Depot - 535 Concord Ave.
- REC #7: Upgradient Former Gas Station / Auto Repair Facility - 599 Portland Street
- REC #8: Upgradient Former Dry Cleaner and Filling Station - 642-648 Portland Street
- REC #9: Upgradient Former Gas Station - 67 Portland Street
- REC #10: Upgradient Former Gas/Service Station - 709 Portland Street

4.6.1 Data Gap Statements

- No existing or no known Site investigation data for potential off-Site groundwater sources.

4.6.2 Assumption Statements

- The prevailing groundwater flow direction is estimated to be to the south of RECs #6-10 towards the Site and Moose River.
- Potential COCs are limited to VOCs (from bulk fuel storage sources), SVOCs (from bulk fuel storage sources), and lead (from potential leaded gasoline storage).

4.6.3 Site Investigation Goals

- Quantitatively characterize groundwater for the potential that upgradient off-Site operations have negatively affected on-Site ground water quality.

4.6.4 Sampling Approach

- Install five (5) monitoring wells in proximity to the southern Site boundary and collect a groundwater sample from each well via low-flow methods to be analyzed for TCL VOCs, TCL SVOCs, and lead.

4.7 Regulated Building Materials Survey and Sampling

Building demolition and removal of construction and demolition debris will not be conducted as part of this initial Site assessment. Using the RBM survey results as outlined in below, building demolition will be required as a subsequent phase to allow appropriate and safe access to properly assess potential soil, groundwater and soil vapor impacts below the building footprints.

The regulated building material survey will be subcontracted to Clay Point Associates, Inc (CPAI). CPAI has designated the following laboratories for completing regulated building material (RBM) analytical services:

- Asbestos samples will be analyzed by Optimum Analytical and Consulting, LLC (Optimum).
- PCB building material samples to be collected during the RBM Survey will be analyzed by Eastern Analytical, Inc. (EAI). The SOPs for PCB analytical services are included in **Appendix B** and are listed below.
- The lead-based paint survey will be performed with a portable XRF spectrometer. A performance Characteristic Sheet for the Heuresis Model pb200i is also provided in **Appendix B**.

4.7.1 Asbestos Inspection

The asbestos inspection will be conducted in accordance with the practices/procedures provided in U.S. EPA "National Emissions Standard for Hazardous Air Pollutants" (NESHAP) 40 CFR 61. The asbestos inspection will be conducted by a CPAI inspector(s) who is a certified Vermont Regulations for Asbestos Control (VRAC, V.S.A Title 18, Chapter 26) and Asbestos Hazard Emergency Response Act (AHERA) building inspector.

The inspection will include an evaluation of readily accessible building construction materials for the presence of suspect asbestos-containing material (ACM). Bulk samples of accessible materials will be collected for the purposes of determining the presence or absence of asbestos. A material is considered to be an ACM if it contains >1% asbestos.

An initial walkthrough of the structurally safe portions of the buildings will be conducted to inventory suspected ACM and identify homogenous areas based on color, texture, size and location. Representative samples from each homogenous area will be collected in accordance with state and federal regulations. Samples shall be collected by removing a sufficient quantity of the building material with a hand tool and sealing in a container such as a plastic bag. Asbestos sampling requires a small amount of building materials to be extracted and is destructive in nature. Efforts will be made to collect samples with as minimal damage as possible and collection efforts are not expected to impact the structural integrity of the building.

Each sample will have a unique identified number. Bulk samples will be submitted to an accredited laboratory. Sample analysis will be performed using polarize light microscopy (PLM) in accordance with the U.S. EPA Recommended Method for the Determination of Asbestos in Bulk Samples by Polarized Light Microscopy and Dispersion Staining (PLM/DS) (EPA-600/M4-82-020, EPA-600/ R-93-116). Results will be presented as estimated percentages of asbestos by mineral type.

CPAI will make a good faith effort to locate all suspect ACM; however, for any facility there is the possibility of concealed materials or debris such as underground piping or concealed materials in a wall cavity. Montrose and CPAI does not warrant, guarantee, or agree to have the ability to locate or identify all asbestos within the subject site.

Given the dilapidated condition of portions of the buildings, and other buildings that have totally collapsed, it may not be accessible or safe to enter to assess all potential ACM or RBMs. Materials in these areas will assume to be asbestos containing unless testing shows otherwise. Additionally, a select number of representative samples for asbestos may be collected from piles of building debris where the building has collapsed.

4.7.1.1 Asbestos Sampling Requirements

Asbestos samples will be collected in accordance with Vermont Regulations for Asbestos Control (VRAC) and Asbestos Hazard Emergency Response Act (AHERA) regulations. A minimum of two (2) samples for suspect asbestos containing materials will be collected. For surfacing materials and thermal system insulation (TSI), CPAI will collect samples in accordance with AHERA protocols:

- Surfacing Materials - less than 1,000 sq. ft., three samples/1,000 - 5,000 sq. ft. five samples/greater than 5,000 sq. ft. a minimum of seven samples.
- TSI - minimum of three samples for each unique type.
- Miscellaneous Materials - minimum of two samples for each unique type.

4.7.2 PCBs

The U.S. EPA believes there was widespread use of building material containing PCBs used for construction and renovation primarily between about 1950 and 1979. The use of PCBs in the United States was banned in 1979. Building materials such as paint, mastic and caulk may contain PCBs.

A PCB-containing building material assessment will be conducted by CPAI concurrent with the asbestos inspection. Bulk sampling will be conducted in general accordance with the procedures *How to Test for PCBs and Characterize Suspect Materials* (https://www.epa.gov/pcbs/how-test-pcbs-and-characterize-suspect-materials#01). Sufficient mass of the sample will be collected so the laboratory can meet the detection limits required per 40 CFR part 761.61. Two (2) samples of each suspect homogenous area will be collected for PCB analysis and will be submitted to a certified laboratory for analysis of PCBs per EPA Method 8082.

4.7.3 Lead-Based Paint

A lead-based paint inspection on/within the building will be performed by CPAI according to the 2012 revision of Chapter 7: Lead-Based Paint Inspections of the U.S. Department of Housing and Urban Development's, "Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing", June 1995 (HUD). Certified staff from CPAI will perform the inspection with use of an X-ray Fluorescence Analyzer (XRF) (Viken Detection (Heuresis) Pb200i, Lead Paint Analyzer serial number #2074). Lead-based paint is defined as paint or other coatings that contain lead concentrations equal to or greater than 1 milligram per square centimeter (mg/cm^2) or 0.5% by weight. CPAI staff performing the inspection will be properly certified with the Vermont Regulations for Lead Control (VRLC).

5.0 Field Sampling Plan

The scope of work for this Phase II ESA is designed to initially assess the potential impacts to soil and groundwater associated with (RECs 1 through 10) as described in the October 2022 Phase I ESA. Due to the significant amount of data gaps, the environmental sampling data proposed to be gathered in this Phase II ESA Workplan will not include the goal of vertically and horizontally delineating potential identified impacts to soil and groundwater. Rather, the goal of this scope of work is to collect enough preliminary data to qualitatively and quantitatively characterize potential impacts at the identified RECs in order to adequately and efficiently complete delineation in all potentially affected media. The Phase II ESA data will be used to update the CSM for the Site to identify the data gaps after initial and planning any subsequent environmental assessment activities.

The proposed regulated building material survey is designed to address BER 2 identified in the October 2022 Phase I ESA.

5.1 Standard Operating Procedures

The Field Activities Standard Operating Procedures (QAPP Worksheet #21) will be followed. The SOPs applicable to the activities outlined in this SAWP/SQA are listed below:

- SOP 001: Field Documentation Procedures, March 31, 23, Revision No. 2
- SOP 002: Field Screening and Instrumentation Procedures, January 30, 2019, Revision No. 2
- SOP 003: Utility Clearance, April 29, 2021, Revision No. 2
- SOP 004: Surficial and Subsurface Soil Sampling, April 28, 2023, Revision No. 2
- SOP 013: Low-Flow Groundwater Sampling, April 30, 2021, Revision No. 2
- SOP 015: Field Quality Control Sampling, May 5, 2021, Revision No. 2
- SOP 016: Sample Labeling, Packaging, and Shipping, May 5, 2021, Revision No. 2
- SOP 017: Decontamination of Field Equipment, April 29, 2021, Revision No. 2
- SOP 018: Management of Investigation Derived Waste, April 30, 2021, Revision No. 2

Eurofins's laboratory SOPs for tasks associated with analysis of samples are presented in the Generic QAPP (QA Tracker #24013). The SOPs applicable to the activities outlined in this SQA are listed below:

- **SOP No. BR-GC-005, Rev. 15.0**: *Polychlorinated Biphenyls (PCBs) by GC/ECD (SW846 8082A, USEPA TO4A/TO10A)*, 06/30/2021
- **SOP No. BR-LC-009, Rev. 8.0**: *Per- and Poly-fluorinated Substances (PFAS) in Water, Soils, Sediments and Tissue*, 04/29/2022
- **SOP No. ED-GCS-005, Rev. 12**: *Analysis of Organochlorine Herbicides by SW846 Method 8151A*, 10/17/2022
- **OP No. ED-GCS-016, Rev. 7**: *SW846 Method SW8081B, Analysis of Organochlorine Pesticides by Gas Chromatography*, 10/17/2022.
- **OP No. ED-GCS-017, Rev. 7**: *SW846 Method 8082A, Analysis of Polychlorinated Biphenyls by Gas Chromatography*, 10/21/2022

- **SOP No. ED-MSS-009, Rev. 10**: *Semivolatile Organic Compounds by Gas*
- *Chromatography/Mass Spectrometry (GC/MS), SW846 Methods 8270E*, 10/18/2022.
- **SOP No. ED-MSV-014, Rev.10**: *Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS) by SW846 Method 8260D*, 08/09/2023
- **SOP No. ED-MT-004, Rev.15**: *Trace Metals Analysis by Inductively Coupled Plasma Emission Spectroscopy by SW846 Method 6010D*, 03/01/2022
- **SOP No. ED-MT-017, Rev. 15:** *Mercury Analysis for Water and Wastewater using EPA 245.1 and SW846 7470A; Mercury in Drinking Water using EPA 245.1; Leeman Mercury Analyzer (Cold Vapor Technique)*, 09/20/2023
- **SOP No. ED-MT-034: Rev. 11**: *SW-846 Method 6020B, Trace Metals Analysis of Water, Wastewater, Soil, Sediment and Leachate Samples by ICP-MS*, 04/21/2023
- **SOP No. ED-MT-035, Rev. 5**: *Mercury Analysis for Solid and Semisolid Waste Samples using the Leeman Mercury Analyzer (Cold Vapor Technique) by SW846 Method 7471B*, 08/11/2022
- **SOP No. ED-WET-002, Rev. 18:** *Analysis of Total and Amenable Cyanide in Water, Drinking water, Wastewater and Soil- Automated by Method EPA SW846 9012B; 335.4 and Standard Method 4500 CN¯C, G*, 11/08/2023

The RBM Survey will be conducted by CPAI. SOPs for tasks associated with RBM Survey presented in the Generic QAPP are listed below.

- Performance of Asbestos Inspection Activities, Updated October 16, 2023.
- Performance of Lead-Based Paint Inspection & Confirmatory Paint Chip Sample Collection/Analysis, Updated October 16, 2023. (Note: while this SOP includes information related to paint chip sampling, there will be no paint chip samples collected as part of this workplan.

Asbestos samples to be collected during the RBM Survey will be analyzed by Optimum Analytical and Consulting, LLC (Optimum). The SOP for asbestos analytical services presented in the Generic QAPP is listed below.

- SOP 2.1: Polarized Light Microscopy for the Determination of Asbestos in Bulk (Building) Materials, July 5, 2019.

PCB building material samples to be collected during the RBM Survey will be analyzed by Eastern Analytical, Inc. (EAI). The SOPs for PCB analytical services are included in **Appendix B** is listed below.

- QA45600_00_8081B_8082A_608.3: Method 8081B, 8082A and 608.3 Pesticides and PCB Analysis, August 1, 2018.
- QA3540C_07_Soxhlet: Soxhlet Extraction, January 29, 2015.

5.2 Health and Safety and Pre-Field Work Activities

Prior to conducting on- Site investigation activities, Montrose will perform the following:

- Prepare a site-specific health and safety plan in accordance with Title 29 of the U.S. Code of Federal Regulations, part 1910.120, and Montrose protocols;

- Provide notification to Dig Safe to mark underground utilities located on the public right-of-way adjacent to the Site;
- Provide notification to the St. Johnsbury Police Department that field activities will be conducted and the schedule;
- Contract with a Vermont Licensed Land Surveyor to conduct the Topographic and Boundary Survey of the Site;
- Contract with a vegetation clearing contractor;
- Contract a private utility location service provider and geophysical investigation provider to identify potential underground utilities/structures at the planned sampling locations;
- Contract with a Vermont certified laboratory for soil and groundwater analytical testing services;
- Contract with a Vermont-licensed driller for the advancement of soil borings and installation of temporary groundwater monitoring wells;
- Contract a Vermont Regulations for Asbestos Control (VRAC) licensed entity to conduct a Regulated Building Materials (RBM) survey for the Site's structures; and
- A health and safety briefing will be presented by Montrose personnel to the field staff prior to initiating field activities.

5.3 Site Preparation

Prior to collecting soil and groundwater samples for soil and groundwater characterization at each documented REC, activities will need to be performed prior to the initial soil and groundwater characterization with that will:

- Enable improved observation of field conditions for the purpose of biasing media samples collected in the field (i.e., areas of stained soil or subsurface anomalies identified in geophysical surveys).
- Enable physical access to each REC during environmental field sampling (i.e., clearing vegetation, trees, and debris).
- Identify areas where activities would potentially need to be restricted. This task has been performed and is discussed in **Section 2.3.3 Aquatic Resource Assessment, 2023**.

These pre-sampling will include a topographical and boundary survey, vegetation clearing, utility identification, and geophysical investigation. Additional details regarding the proposed activities are provided in **Sections 4.4.1** through **4.4.3** below.

5.3.1 Vegetation/Tree Clearing

In order obtain physical access to complete Site assessment activities including geophysical investigation, test pit investigation, soil boring and monitoring well installations; vegetation and tree clearing will need to be performed. Vegetation and tree clearing will be performed byJA McDonald Inc. of Middlesex, Vermont. Vegetation (tall grasses, bushes, shrubs, etc.) will be mulched and left in place. Trees will be cut down and chipped on Site. The chipped trees will be transported and disposed off-Site.

Based on the findings of the Aquatic Resource Assessment discussed in **Section 2.3.3** avoidance buffers will be implemented during the project to avoid adverse impact to surface water and potential wetland features. The location of surface water features, potential wetlands areas, and avoidance buffer features (and their relative location to proposed phase II ESA activities) are depicted on **Figures 3, 4A** and **4B**.

5.3.2 Topography and Boundary survey

A topography and boundary survey will be performed by Truline Land Surveyors, Inc. of St. Johnsbury, Vermont (TLS). Topography data will be used to update the Site's CSM and will also be used for any subsequent phases of the project. The boundary survey will establish the property corners and property lines of the Site parcel in accordance with the deed's metes and bounds description. The end users of the topographic and boundary survey may include, but are not limited to: realtors, architects, engineers, and environmental professionals.

5.3.3 Utility Clearing and Geophysical Investigation

A geophysical services company will be retained to perform a near-surface geophysical investigation to identify subsurface features of interest such as underground storage tanks, buried drums, and lithologic contacts of fill material, native soil, and bedrock (to the extent possible). The combination of geophysical techniques selected to achieve these data objectives include electromagnetic induction (EM) and seismic multichannel analysis of surface waves (MASW).

EM31 and EM38 are commonly used to identify geologic variations, groundwater contaminants, or any subsurface feature associated with changes in ground conductivity, including but not limited to underground storage tanks and buried drums. EM survey methods measure magnetic susceptibility and subsurface conductivity at high resolution to depths of up to 20 feet bgs. These surveys will be traversed along intersecting georeferenced transects using the EM31 and EM38. The resulting data will be processed using software to generate 2-Dimensional (2-D) cross-sectional profiles visualizing the subsurface conditions. The data generated can also be interpolated to generate a 3-D model.

Seismic MASW is commonly used to identify the top of bedrock or other changes in soil properties for geotechnical engineering projects. MASW evaluates ground stiffness by measuring shear-wave velocity at depths of up to 100 feet bgs. This survey will be completed along georeferenced transects using an active seismic source (e.g., a sledge hammer) and a linear receiver array. The data generated can be used to evaluated the subsurface conditions in 1-D, 2-D, or 3-D.

Prior to drilling activities, notification will be provided to Dig Safe to mark underground utilities that may enter the Site. Additionally, a private utility locating company will be retained to mark underground utilities within the Site. If utilities are identified in the vicinity of proposed investigation locations, the investigation locations will be relocated to avoid them.

5.4 Soil and Groundwater Sample Collection

In general soil and groundwater samples will be collected utilizing the following methods and in accordance with Montrose SOPs discussed **Section 5.1** above.

5.4.1 Soil Field Screening Methods

Soil will be screened for the presence of volatile organic vapors using a properly calibrated photoionization detector (PID). Prior to sample collection soil will be screened with a PID and the resulting readings shall be documented in the field logbook or on project-specific soil boring logs. Field screening procedures will be performed in accordance with SOP 002 “Field Screening and Instrumentation and Procedures” provided in the master QAPP.

Soil samples shall be examined and logged for soil classification, color, and moisture according to ASTM D2488-17e1 Standard Practice for Description and Identification of Soils (Visual-Manual Procedures). This practice describes a procedure for identifying soils, at the option of the user, based on the classification system described in ASTM D2487-17 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System [USCS]).

Soil samples shall be examined for evidence of impacts such as odors, staining, or other field observations. Such potential impacts/observations shall be documented along with other pertinent observations in the field logbook or on project-specific soil boring logs. See the attached USCS Field Sheet (Attachment 1) for a description of the USCS.

5.4.2 Soil Sample Collection

Surface soil and near-surface soil will be collected with hand tools (hand auger, and/or spade). **Table 1** presents locations where surface/near-surface soil samples will be collected (designated as HA) and proposed depths.

Subsurface samples collected from test pit (TP) locations as designated on **Table 1** for REC #2 to investigate on-Site fill, REC #4 to investigate former railroad siding (only if railroad siding is observed during geophysical survey) and REC #5 to investigate on-Site boiler ash. The locations of the test pits will be finalized following the geophysical survey. Where possible, test pits will be excavated to native soil and/or the water table or to refusal, whichever occurs first. Test pit dimensions, orientation, and a lithologic description will be recorded and photographs will be taken at each test pit location. At least one subsurface soil sample will be collected from each location analysis based on indications of potential contamination, such as discoloration or fill material, for the parameters specified in **Table 1**.

Soils will be visually classified by a Montrose Geologist/Environmental Scientist in the field according to color, texture, and moisture content and screened for visual/olfactory observations including for VOCs using a PID equipped with a 10.6 electron-volt lamp. The samples are proposed to be collect per **Table 1** and will be collected according to the QAPP referenced SOPs.

Hand augers/spade and the excavator bucket, will be decontaminated between uses, following procedures referenced in the QAPP. Decontamination of smaller equipment will consist of a wash with Alconox (or equivalent) solution and a potable water rinse. Decontamination of the excavation equipment and downhole drilling equipment will be accomplished with a steam cleaner. No other reusable sampling equipment is anticipated to be used.

Soil samples requiring VOC analysis will be collected utilizing En Core® samplers. The En Core sampler is a one-time, single use sample collection device made of an inert, composite polymer and is available in 5-gram and 25-gram sizes. Soil requiring VOC analysis will be placed into three 5-gram En Core samplers for each VOC sample location. An En Core stainless steel T-Handle is required when using the En Core sampler. The procedures for Encore® sampling are described in Montrose’s SOP 004: Surficial and Subsurface Soil Sampling, April 28, 2023, Revision No. 2 described in Section 5.1.

The location of investigation locations and soil samples will be documented with photographs and surveyed for horizontal location with a GPS device capable achieving minimum accuracy goals of less than of 5 feet. Factors such as proximity to power lines, buildings, and available satellites may affect the accuracy of GPS coordinates.

5.4.3 Groundwater Sample Collection

The scope of groundwater assessment only includes the shallow (overburden) aquifer at this time. It is noted that overburden groundwater may not be present at all areas of the Site. If such a condition exists in the area of any REC, groundwater samples may not be collected. According to previous environmental investigations at the Site, groundwater was previously encountered at 6.5 feet to greater than 9 feet bgs. (see **Section 2.4.5**).

Groundwater samples will be collected via the installation of a permanent monitoring well per **Table 1** in order to investigate REC #1, REC #2, REC #3, REC #5 and REC #6. Monitoring wells will be installed with a rotary drill rig using 4¼-inch hollow stem augers and are proposed to be installed to a depth of 5 feet below the observed water table. Monitoring wells are proposed to be constructed using 2-inch diameter, schedule-40 PVC with 10-feet of 0.010-inch slot well screen. When possible, the monitoring wells will be screened across the water table. Sand packs will extend approximately 12 inches above the well screens. The sand packs will be capped with a 2-feet bentonite seal and the remaining annulus will be filled to ground surface with concrete. Dimensions of the screen, sand pack and seal may vary depending on observed field conditions. A protective stick-up casing will be installed at the surface.

Following installation, monitoring wells will be developed by surging and pumping to remove fines potentially introduced during installation. An attempt will be made to evacuate three well volumes of groundwater during a maximum well development period of one hour per well.

One round of groundwater sampling is proposed. Prior to sample collection, the water level will be measured and recorded. In addition, each well will be gauged for the presence of product (non-aqueous phase liquids). If product is encountered, that will be measured and recorded in lieu of sampling.

Montrose will collect groundwater samples via low-flow sampling techniques with a peristaltic pump. Following initial readings, purging will be initiated at an approximate rate of 100 to 300 milliliter (mL) per minute (min) based on known well recharge characteristics and to maintain less than 0.3 feet of drawdown, when practical. The pump discharge will be connected directly to a flow-through cell for measuring specific conductance, pH, temperature, dissolved oxygen, oxidation reduction potential (ORP), and turbidity. Purging of each well will continue until the field water-quality readings stabilize (± 3 percent for conductance and temperature, ±- 0.3 mg/L or 3% of readings for dissolved oxygen, ±10 millivolts for redox; and ±0.1 units for pH). Following the stabilization of field parameters, the flow-through cell will be disconnected prior to sampling and the sample will be drawn directly from the discharge line into appropriate sample containers.

The location of the monitoring wells documented with photographs and surveyed for horizontal and vertical location. Horizontal (Northing and Easting coordinates) and vertical (elevation) survey data will aid in calculating the estimated groundwater flow direction with the understanding that the most accurate groundwater elevation data.

5.4.4 Data Quality Objectives

To evaluate if additional assessment, remediation, or removal is necessary at the Site, the data collected during the field sampling activities will be screened and compared to the following regulatory benchmarks and action limits:

- VSS Vermont Soil Standards, Investigation and Remediation of Contaminated Properties Rule, July 6, 2019 (§35-Appendix A1 - Soil Standards).
- Vermont Department of Environmental Conservation Chapter 12 of the Environmental Protection Rules: Groundwater Protection Rule and Strategy, dated July 6, 2019. - VTDEC Groundwater Enforcement Standards (GES).

The laboratory will meet the minimum QA/QC requirements of the analytical methods listed on **Table 2**. The control limit for field duplicate sample analyses, measured as precision, is 30% for aqueous sample and 50% for soil samples. Control limits for matrix spike/matrix spike duplicate sample analyses will be determined by the laboratory's internal QA plan. Completeness goal is 90%.

When received from the analytical laboratory, the data will undergo an internal data validation process. If laboratory reporting limits (RLs) are above applicable VTDEC action levels, Montrose will ask the laboratory to report the data to the method detection limit (MDLs) which are normally lower than the RLs. If MDLs are above the VTDEC action levels, Montrose will include a statement as to whether the compounds with elevated MDLs represent a likely risk based on other available data. If it is evaluated that they do represent a possible risk, identification of other analytical methods with lower MDLs, if available, will be provided. VTDEC action levels, laboratory RLs and MDLs are presented in **Table 3.**

5.4.5 Quality Assurance/Quality Control (QA/QC) Samples

Field QA/QC samples, including field duplicates, equipment (rinsate) blanks, trip blanks, and matrix spike/matrix spike duplicates, will be collected and analyzed in accordance with the master QAPP and **Table 1**.

Duplicate Soil and Groundwater Samples

Duplicate samples are two samples taken from and representative of the same sample and carried through all steps of the sampling and analytical procedures in an identical manner. Duplicate samples are used to assess variance in the laboratory's execution of analytical methods and procedures. Soil and groundwater duplicate samples will be collected at a rate of 1 per 10 samples for each media collected (soil and groundwater).

Equipment (Rinsate) Blanks

If soil sampling equipment requires decontamination between sample collection, equipment (rinsate) blanks will be collected during the field investigation at a rate of one per day each day where decontaminated equipment was used in the sample collection process. The requested analysis for the rinsate blank will include all analyses requested for environmental samples collected with decontaminated equipment for that day. If dedicated or disposable sampling equipment is used and decontamination is not applicable, then equipment blanks will not be collected for those samples.

Trip Blanks

A trip blank is clean aqueous (deionized water) that is carried to the sampling site and transported to the laboratory for analysis without having been exposed to sampling procedures. Trip blanks will be provided by the laboratory and will accompany the sample containers submitted to the laboratory for VOCs analysis.

Matrix Spike / Matrix Spike Duplicates

A Matrix Spike and Spike Duplicate (MS/MSD) are representative but randomly chosen samples that have known concentrations of analytes of interest added to the samples prior to sample preparation and analysis and they are processed along with the same un-spiked sample.

A MS is prepared from an aliquot of a field sample that is spiked by the laboratory with known concentrations of method-specific target analytes, then carried through the entire sample preparation and analytical process. Accuracy is calculated from the spike recoveries in the matrix spike sample and results are used to assess the nature of the sample matrix and direction of analytical bias.

An MSD is prepared from a second aliquot of a field sample that is spiked by the laboratory with known concentrations of method-specific target analytes, then carried through the entire sample preparation and analytical process. Accuracy is calculated from the spike recoveries in the matrix spike duplicate sample and direction of analytical bias.

MS and MSD are typically performed for organic analyses. A minimum of one MS/MSD pair will be collected per 20 field samples for each matrix (organic analyses) collected. Sampling locations selected for the purpose of assigning an MS/MSD should be an area anticipated to be free from contamination or with low concentrations of targeted analytes. During collection of soil MS/MSD samples, field personnel will avoid areas that are stained or known or suspected to have high levels of contamination.

Laboratory QA/QC Samples

Laboratory QA/QC samples will include a method blank (a sample of lab reagent water that is known to be contaminant free) in each QC batch to assess that the analytical procedure is free of contaminants. Lab Control Sample/Lab Control Sample Duplicate (LCS/LCSD) samples, which are aliquots of spiked laboratory reagent water, will also be analyzed to evaluate precision and accuracy.

5.4.6 Investigation Derived Waste

Soil cuttings and purge water generated as part of the planned activities will be containerized in labeled 55-gallon DOT-approved drums (open top for soil, closed top for water) and staged in an appropriate location on-Site. Drum contents will be sampled for waste characterization parameters based on the results of the investigation findings and the selected disposal facility's requirements which may include but are not limited to the following:

- VOCs using EPA Method 8260;
- SVOCs using EPA Method 8270;
- RCRA Metals using EPA Methods 6010D and 7471B (mercury only);
- Polychlorinated Biphenyls (PCBs) using EPA Method 8082;
- Pesticides using EPA Method 8081;

- Herbicides using EPA Method 8151A;
- Total Petroleum Hydrocarbons using EPA Method 8015;
- Flashpoint using EPA Method 1010;
- Corrosivity (pH) using EPA Method 9045D (soil) and 9040C (water);
- Toxicity Characteristic Leaching Procedures (TCLP) followed by specific laboratory analyses which could consist of metals, PCBs, etc. based on type and concentration of contaminants found during the investigation; and
- Reactivity using EPA Method 7.3.

6.0 Documentation and Reporting

Field activities will be documented in a field notebook with sequentially numbered pages and on Montrose field forms. Montrose field sampling SOPs are contained in the QAPP. Representative photographs of the Site activities, where appropriate, will be provided as an appendix to the subsequent Phase II ESA report.

Following receipt of finalized laboratory analytical results and internal data validation, Montrose will prepare the Phase II ESA report that will include a description of the sampling activities, interpretation of the results, and associated conclusions and recommendations. A Site plan showing the sample locations, boring logs and field sampling forms, laboratory analytical data summary tables for soil and groundwater sample results compared to applicable VTDEC regulatory standards, a discussion of any deviations from the procedures described in this SAWP/SQA, and other information as required by §35-305 of the IRule will be included. Electronic copies of the report will be provided to the Site Owner, US EPA, VTDEC and NVDA.

6.1 3D Visualization Model

Montrose will prepare a 3D visualization model to aid in the preparation and update of the CSM after the initial investigation activities are completed. The 3D visualization tool that Montrose will use for this project is Leapfrog Works™.

The 3D visualization model ("3D model") will be an interactive, to-scale, orthographic rendering of the components of the CSM.

The end user will be able to interact with a fully functional 3D model software viewer (free to download and install) which will allow them to manipulate the 3D model in the following ways:

- Share work to show how and why decisions were made
- Pan, zoom, rotate, adjust vertical exaggeration
- Turn layers on/off and adjust transparency
- Switch between pre-saved 3D model views (which are comprised of a specific set of model layers, transparency and symbology settings, camera viewing angle, and zoom level) to illustrate specific features and insights revealed by the modeling effort
- Slice through the model at any location and angle and advance that slice plane through the model.
- Look inside 3D model volumes such as hydrogeological units and impacted soil volumes and create new model cross sections
- Clicking on 3D features onscreen brings up linked attribute tables with further information about each feature such as well construction details, analytical results, feature volumes, etc.

Leapfrog Works™ links 3D features to a SQL database that runs in the background. Montrose's integrated approach to data management and visualization leverages this feature to develop and deliver 3D models that also function as digital archives and 3D databases. These 3D archives can be used for institutional knowledge storage and transfer throughout the brownfields site investigation and redevelopment process.

Visualizing site data early in the project and updating the 3D model through each stage of the brownfields project life cycle can result in quicker and less costly site assessments and cleanups by:

- Visually representing complex environmental datasets to activate key decisions.
- Helping project teams to build confidence that the CSM is well understood.
- Supporting consensus-building and collaborative problem solving.
- Leveraging historical investigation data
- Optimizing sampling locations and excavation areas
- Bridging the gaps among consultants, clients, regulators, and the public by presenting easy-to-understand visualizations of complex site processes and treatment or cleanup plans.
- Creating elegant and convincing graphics and animations for project deliverables, public meetings, and litigation support.

The project will be executed based on state-of-the-science best practices in environmental data management and 3D visualization such as those promoted in *Environmental Data Management Best Practices* (ITRC Web Document, 2023) and Montrose's internal *3D Visualization Data Management Plan* (Montrose, 2023).

During the initial data extraction and compilation phase, optical character recognition (OCR) will be used to automate extraction of tabular data from historical PDF files and minimize the need to manually key-in data. Extracted historical analytical datasets will be imported and managed in MS Access to utilize the query functions and data integrity checks built into MS Access and to eliminate the chance of copy/paste or transcriptions errors.

The initial 3D model will synthesize topography, historical site investigation data, land and geophysical survey datasets, geological datasets, and groundwater information to support the project during the initial site assessment phase. As the project progresses, the 3D model will be updated with the results of field investigation work and extended to include analytical results, impacted soil areas, groundwater plumes, cleanup plans, etc.

Datasets added to the 3D model during the assessment and cleanup phases can be leveraged to reduce costs during the later redevelopment phase. The team of planners, geotechnical engineers, and architects working on future above-ground redevelopment can utilize any underground 3D data to inform their work related to building foundations, drainage, buried utilities, landscape planning, etc.

6.1.1 3D Visualization Model Scope of Work

The scope of work will include the following tasks:

- Develop 3D model domain and basemap layers including:
    - Topography/Digital Elevation Model (DEM)
    - Transportation
    - Hydrography
    - Buildings
    - Municipal Boundaries
- Incorporate available site-specific electronic GIS/CAD datasets into 3D model.
- Import the land survey data into 3D model.

- Import and geo-reference pertinent historical report graphics (scanned/PDF plan view maps and cross sections) into 3D model and digitize significant features from these graphics that are useful for the CSM.
- Represent soil and groundwater sampling locations as 3D cylinders in the 3D model.
- Add all potential source zones into 3D model (including locations of drums identified during previous ESAs)
- Import geophysical survey cross sections/fences into 3D space in the 3D model to facilitate interpretation of subsurface geology/hydrogeology.
- Import measured groundwater elevations and develop water table/potentiometric surface contours. Identify perched water zones and underlying saturated aquifer.
- Digitize geological and hydrogeological data from site boring logs to create simplified stratigraphy (e.g., fill, native soil, bedrock). These data will be represented in the 3D model both as segmented colored cylinders at each borehole and as 3D volumes which connect the boreholes and represent each hydrogeological unit.
- 3D model layers will include any of the following datasets that are available for the project:
  - Water, soil, and sediment analytical data in DB-format or EDDs
  - Groundwater level database (for all historical periods)
  - Groundwater pumping test, slug test, and any other hydrological information
  - AutoCAD®, geographic information system [GIS] data, site surveys, etc.
  - Boring logs and well construction diagrams
  - Well construction table with XY coordinates
  - Geophysical data (surface and downhole)
  - Regional geological and/or GW modeling reports
  - Significant figures (plan view and cross sections) from historical reports and the full PDF reports themselves
  - Source area information (e.g., source outlines and release history)
  - Previous or existing treatment/remedial history (e.g., GW recovery, SVE, air sparging, excavations, injections, slurry walls, PRBs, etc.)

7.0 Project Schedule

Milestone	Timeline (Estimated and as weather permits)
Pre-Assessment Activities (Vegetation/Tree Clearing) (Topological and Boundary Survey) (Utility Clearing and Geophysical Investigation)	November/December 2023, January 2024
Initiate Sample Collection	Within 60 days of the approval for this SAWP/SQA. A Master QAPP covering multiple Sites has been approved (EPA QA Tracking # 24013).
Laboratory Analysis	Within 3 weeks of Sample Collection.
Data Verification and Validation	Within 2 weeks of Laboratory Data Package Receipts.
Phase II ESA Report	Within 60 days of Data Verification and Validation.

Tables

TABLE 1
Sample Design
Former True Temper Site
575 Concord Avenue
St. Johnsbury, Vermont

REC #	Media	Location Note[1]	Sample ID	Estimated Investigation Location Depth (ft bgs)	Estimated Sample Location Depth (ft bgs)[2]	Rationale	Sample Obtainment Method	Laboratory Analysis
REC #1 Historical Drum Storage	Soil	Drum Loc 2 (D2)	REC1-201	0-1	0-0.5 (all other COCs) 0.5-1 (VOCs)	Evaluate potential surface soil impacts from former drum locations	HA	TCL/TAL (Full)
	Soil		REC1-202	0-1	0-0.5 (all other COCs) 0.5-1 (VOCs)		HA	TCL/TAL (Full)
	Soil	Drum Loc 5 (D5)	REC1-501	0-1	0-0.5 (all other COCs) 0.5-1 (VOCs)		HA	TCL/TAL (Full)
	Soil		REC1-502	0-1	0-0.5 (all other COCs) 0.5-1 (VOCs)		HA	TCL/TAL (Full)
	Soil	Drum Loc 8 (D8)	REC1-801	0-1	0-0.5 (all other COCs) 0.5-1 (VOCs)		HA	TCL/TAL (Full)
	Soil		REC1-802	0-1	0-0.5 (all other COCs) 0.5-1 (VOCs)		HA	TCL/TAL (Full)
	GW	---	REC1-MW1	Approximately 5 ft into the water table	Approximately 5 ft into the water table	Initially characterize COCs in proximity to an observed drum location	MW	TCL/TAL (Full), PFAS
REC #2 On-Site Fill	Soil	---	REC2-1	To Native Soil or Water Table (whichever is shallower)	TBD	Initially characterize COC in fill materials.	TP	TCL/TAL (Full)
	Soil	---	REC2-2		TBD		TP	TCL/TAL (Full)
	Soil	---	REC2-3		TBD		TP	TCL/TAL (Full)
	Soil	---	REC2-4		TBD		TP	TCL/TAL (Full)
	Soil	---	REC2-5		TBD		TP	TCL/TAL (Full)
	GW	See Note 3	REC2-MW1	Approximately 5 ft into the water table	Approximately 5 ft into the Water Table	Initially characterize COCs in groundwater within or below fill materials.	MW	TCL/TAL (Full), PFAS
	GW	See Note 3	REC2-MW2				MW	TCL/TAL (Full), PFAS
	GW	See Note 3	REC2-MW3				MW	TCL/TAL (Full), PFAS

Notes

COC: Contaminant of Concern
EB: Equipment Blank
FD: Field Duplicate
ft bgs: feet below ground surface
GW: Groundwater
HA: Hand Auger
MW: Monitoring Well
MS/MSD: Matrix Spike/Matrix Spike Duplicate
NA: Not Applicable
PFAS: Per and Polyfluorinated Substances
REC: Recognized Environmental Condition
SB: Soil Boring
TAL: Target Analyte List
TBD: To Be Determined
TCL: Targe Compound List
TP: Test Pit
TCL/TAL: Compounds and Analytes on the EPA TCL/TAL List including, VOCs, SVOCs, Pesticides/Herbicides, PCBS, metals

1. Proposed sample locations subject to change based on site conditions and findings test pits and geophysical survey.
2. Sample will be collected from the depth interval exhibiting the greatest environmental impact based on field screening, presence of fill material, visual, or olfactory observations.
3. Well locations to be finalized following completion of test pits.
4. Location to be finalized following geophysical survey. If railroad siding is identified on-Site up to two (2) test pits will be installed to further investigate down to the native soil or the water table. If no railroad siding is identified then a hand auger will be used to sample soil between 0 and 1 ft bgs.

TABLE 1
Sample Design
Former True Temper Site
575 Concord Avenue
St. Johnsbury, Vermont

REC #	Media	Location Note[1]	Sample ID	Estimated Investigation Location Depth (ft bgs)	Estimated Sample Location Depth (ft bgs)[2]	Rationale	Sample Obtainment Method	Laboratory Analysis
REC #3 Adjacent Junkyard	Soil	---	REC3-1	0-0.5	0-0.5	Initially characterize COC in fill materials in surface soil under junkyard pile.	HA	TCL SVOCs, TCL Pesticides/Herbicides, TCL PCBs, TAL Metals
	Soil	---	REC3-2	0-0.5	0-0.5		HA	TCL SVOCs, TCL Pesticides/Herbicides, TCL PCBs, TAL Metals
	GW	---	REC3-MW1	Approximately 5 ft into the water table	TBD	Initially characterize COCs in GW below junkyard pile.	MW	TCL/TAL (Full), PFAS
	GW	---	REC3-MW2		TBD		MW	TCL/TAL (Full), PFAS
REC #4 Railroad (adjacent and on-Site)	Soil	---	REC4-1	0-1	0-1	Initially characterize COC in soil potentially impacted adjacent railroad operations.	HA	TCL SVO15, TCL Pesticides/Herbicides, TCL PCBs, TAL Metals
	Soil	---	REC4-2	0-1	0-1		HA	TCL SVO15, TCL Pesticides/Herbicides, TCL PCBs, TAL Metals
	Soil	---	REC4-3	0-1	0-1		HA	TCL SVO15, TCL Pesticides/Herbicides, TCL PCBs, TAL Metals
	Soil	See Note 4	REC4-4	See Note 4	TBD	Initially characterize COC in proximity to potential on-site railroad siding.	See Note 4	TCL SVO15, TCL Pesticides/Herbicides, TCL PCBs, TAL Metals
	Soil	See Note 4	REC4-5	See Note 4	TBD		See Note 4	TCL SVO15, TCL Pesticides/Herbicides, TCL PCBs, TAL Metals
REC #5 On-Site Boiler Ash	Soil	---	REC5-1	To Native Soil or Water Table (whichever is shallower)	TBD	Initially characterize COCs in buried boiler ash	TP	TCL PAHs, TAL Metals
	GW	---	REC5-TW1	Approximately 5 ft into the water table	TBD	Initially characterize COC in GW within or below buried boiler ash	MW	TCL PAHs, TAL Metals
REC #6-10 Off-Site Properties	GW	---	REC6-10-MW1	Approximately 5 ft into the water table	TBD	Initially characterize COCs in GW from off site former petroleum and chlorinated solvent operations.	MW	TCL VOCs, TCL SVOCs, lead
	GW	---	REC6-10-MW2		TBD		MW	TCL VOCs, TCL SVOCs, lead
	GW	---	REC6-10-MW3		TBD		MW	TCL VOCs, TCL SVOCs, lead
	GW	---	REC6-10-MW4		TBD		MW	TCL VOCs, TCL SVOCs, lead
	GW	---	REC6-10-MW5		TBD		MW	TCL VOCs, TCL SVOCs, lead

Notes

COC: Contaminant of Concern
EB: Equipment Blank
FD: Field Duplicate
ft bgs: feet below ground surface
GW: Groundwater
HA: Hand Auger
MW: Monitoring Well
MS/MSD: Matrix Spike/Matrix Spike Duplicate
NA: Not Applicable
PFAS: Per and Polyfluorinated Substances
REC: Recognized Environmental Condition
SB: Soil Boring
TAL: Target Analyte List

TBD: To Be Determined
TCL: Targe Compound List
TP: Test Pit
TCL/TAL: Compounds and Analytes on the EPA TCL/TAL List including, VOCs, SVOCs, Pesticides/Herbicides, PCBS, metals
1. Proposed sample locations subject to change based on site conditions and findings test pits and geophysical survey.
2. Sample will be collected from the depth interval exhibiting the greatest environmental impact based on field screening, presence of fill material, visual, or olfactory observations.
3. Well locations to be finalized following completion of test pits.
4. Location to be finalized following geophysical survey. If railroad siding is identified on-Site up to two (2) test pits will be installed to further investigate down to the native soil or the water table. If no railroad siding is identified then a hand auger will be used to sample soil between 0 and 1 ft bgs.

TABLE 1
Sample Design
Former True Temper Site
575 Concord Avenue
St. Johnsbury, Vermont

REC #	Media	Location Note[1]	Sample ID	Estimated Investigation Location Depth (ft bgs)	Estimated Sample Location Depth (ft bgs)[2]	Rationale	Sample Obtainment Method	Laboratory Analysis
Quality Control Samples								
NA	Soil/GW	---	FD-xx	---	---	Field Duplicate 1 per 10 Samples	---	TCL/TAL, PFAS
NA	Soil/GW	---	MS/MSD	---	---	MS/MSD 1 per 20 Samples	---	TBD
NA	Aqueous		TB-xx	---		1 per cooler with VOC analysis	---	TCL/TAL
NA	Aqueous		PFAS-TB-xx			1 per day	---	PFAS
NA	Aqueous	---	EB-xx	---	---	Equipment (Field) Blank 1 per day for non-dedicated equipment used	---	TCL/TAL, PFAS

Notes

COC: Contaminant of Concern
EB: Equipment Blank
FD: Field Duplicate
ft bgs: feet below ground surface
GW: Groundwater
HA: Hand Auger
MW: Monitoring Well
MS/MSD: Matrix Spike/Matrix Spike Duplicate
NA: Not Applicable
PFAS: Per and Polyfluorinated Substances
REC: Recognized Environmental Condition
SB: Soil Boring
TAL: Target Analyte List
TBD: To Be Determined
TCL: Targe Compound List
TP: Test Pit
TCL/TAL: Compounds and Analytes on the EPA TCL/TAL List including, VOCs, SVOCs, Pesticides/Herbicides, PCBS, metals

1. Proposed sample locations subject to change based on site conditions and findings test pits and geophysical survey.
2. Sample will be collected from the depth interval exhibiting the greatest environmental impact based on field screening, presence of fill material, visual, or olfactory observations.
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TABLE 2
Sample Annalytical Methods, Volume Requirements, Preservation, Technical Hold Times
Former True Temper Site
575 Concord Avenue
St. Johnsbury, Vermont

Analytical Group (Concentration Level)	Matrix	Analytical Method	Containers (number, size, type per sample)	Minimum Volume (mL) or Amount (grams)	Preservation Requirements (chemical, temperature, light protected)	Technical Hold Time (Sample Preparation)	Technical Hold Time (Analysis)
VOCs (Low/Med)	Soil	SW-846 8260C/D	Three 5-gram EnCore (or equivalent) samplers *and Percent Solids vial below*	Two 5-gram EnCore (or equivalent) samplers *and Percent Solids vial below*	Iced to ≤6ºC, not frozen or frozen to < -7 ºC	NA	48 hours; 14 days if frozen
Percent solids for soil VOCs only	Soil	NA	10-gram core tube.	10 grams	Iced to ≤6ºC, not frozen or frozen to < -7 ºC	NA	NA
SVOCs (Low)	Soil	SW-846 8270D/E	One 4-oz glass wide mouth jar with PTFE-lined lid	30 grams	Iced to ≤6ºC, not frozen	14 days (sampling to extraction)	40 days (extraction to analysis)
PAHs by SIM (Trace)	Soil	SW-846 8270D/E	One 8-oz glass wide mouth jar with PTFE-lined lid	20 grams	Iced to ≤6ºC, not frozen	14 days (sampling to extraction)	40 days (extraction to analysis)
OC Pesticides (Low)	Soil	SW-846 8081B	One 8-oz glass wide mouth jar with PTFE-lined lid	10 grams	Iced to ≤6ºC, not frozen	14 days (sampling to extraction)	40 days (extraction to analysis)
PCBs as Aroclors (Low)	Soil	SW-846 8082A	One 8-oz glass wide mouth jar with PTFE-lined lid	10 grams	Iced to ≤6ºC, not frozen	14 days (sampling to extraction)	40 days (extraction to analysis)
Herbicides (Low)	Soil	SW-846 8151A	One 8-oz glass wide mouth jar with PTFE-lined lid	10 grams	Iced to ≤6ºC, not frozen	14 days (sampling to extraction)	40 days (extraction to analysis)
ICP-AES Metals (Low) or ICP-MS Metals (Trace)	Soil	SW-846 6010C/D	One 4-oz glass wide mouth jar	1.5 grams	Iced to ≤6ºC, not frozen	None	6 months
		SW-846 6020A/B		1.5 grams			
Mercury (Low)	Soil	SW-846 7471B	One 4-oz glass wide mouth jar	0.6 grams	Iced to ≤6ºC, not frozen	None	28 days
Cyanide	Soil	SW-846 9012B	One 8-oz glass wide mouth jar with PTFE-lined lid	10 grams	Iced to ≤6ºC, not frozen	14 days (sampling to extraction)	14 days (extraction to analysis)

TABLE 2
Sample Annalytical Methods, Volume Requirements, Preservation, Technical Hold Times
Former True Temper Site
575 Concord Avenue
St. Johnsbury, Vermont

Analytical Group (Concentration Level)	Matrix	Analytical Method	Containers (number, size, type per sample)	Minimum Volume (mL) or Amount (grams)	Preservation Requirements (chemical, temperature, light protected)	Technical Hold Time (Sample Preparation)	Technical Hold Time (Analysis)
VOCs (Trace/Low)	Ground Water	SW-846 8260C/D	Three 40-mL amber glass VOA vials, PTFE septum lid	Two 40-mL amber glass VOA vials, PTFE septum lid	HCl pH<2, Iced to ≤6ºC, not frozen	None	14 days from collection
SVOCs (Low)	Ground Water	SW-846 8270D/E	Two 1-L amber glass with PTFE-lined lid	One 100mL amber glass with PTFE-lined lid	Iced to ≤6ºC, not frozen	7 days (sampling to extraction)	40 days (extraction to analysis)
PAHs by SIM (Trace)	Ground Water	SW-846 8270D/E	Two 1-L amber glass with PTFE-lined lid	One 100mL amber glass with PTFE-lined lid	Iced to ≤6ºC, not frozen	7 days (sampling to extraction)	40 days (extraction to analysis)
OC Pesticides (Low)	Ground Water	SW-846 8081B	Two 1-L amber glass with PTFE-lined lid	One 100mL amber glass with PTFE-lined lid	Iced to ≤6ºC, not frozen	7 days (sampling to extraction)	40 days (extraction to analysis)
PCBs as Aroclors (Low)	Ground Water	SW-846 8082A	Two 1-L amber glass with PTFE- lined cap	One 100mL amber glass with PTFE-lined lid	Iced to ≤6ºC, not frozen	7 days (sampling to extraction)	40 days (extraction to analysis)
Herbicides (Low)	Ground Water	SW-846 8151A	Two 1-L amber glass with PTFE-lined lid	One 1-L amber glass with PTFE-lined lid (750 mL filled)	Iced to ≤6ºC, not frozen	7 days (sampling to extraction)	40 days (extraction to analysis)
PFAS	Ground Water	EPA 537.1 (drinking water)	Three 250 mL HDPE or polypropylene container with unlined HDPE or polypropylene cap	Two 250 mL HDPE or polypropylene container with unlined HDPE or polypropylene cap	1.25 g Trizma (drinking water)	7 days (sampling to extraction)	30 days (extraction to analysis)
ICP-AES Metals (Low) or ICP-MS Metals (Trace)	Ground Water	SW-846 6010C/D EPA 200.7/ 200.8	One 500-ml HDPE bottle	One 500-ml HDPE bottle (50 mL filled)	HNO_3 to pH<2, Iced to ≤6ºC, not frozen	None	6 months
Mercury (Low)	Ground Water	SW-846 7470A	One 250-ml HDPE bottle	One 250-ml HDPE bottle (50 mL filled)	HNO_3 to pH<2, Iced to ≤6ºC, not frozen	None	28 days
Cyanide	Ground Water	SW-846 9012B	One 250-ml HDPE bottle	One 250-ml HDPE bottle (50 mL filled)	NaOH to pH>12, Iced to ≤6ºC, not frozen	14 days (sampling to extraction)	14 days (extraction to analysis)

TABLE 2
Sample Annalytical Methods, Volume Requirements, Preservation, Technical Hold Times
Former True Temper Site
575 Concord Avenue
St. Johnsbury, Vermont

Analytical Group (Concentration Level)	Matrix	Analytical Method	Containers (number, size, type per sample)	Minimum Volume (mL) or Amount (grams)	Preservation Requirements (chemical, temperature, light protected)	Technical Hold Time (Sample Preparation)	Technical Hold Time (Analysis)
Asbestos	Bulk	EPA 600/R-93/116	Reclosable 4 mil polyethylene bags	na	None	None	None
PCBs	Bulk	SW-846 8082A	Reclosable 4 mil polyethylene bags	10 grams	None	None	None
Lead-based paint	Instrument Survey	see Table 3B	NA	NA	NA	NA	NA

Notes
VTDEC does not accept filtered groundwater samples. All groundwater samples submitted will be a total analysis.

Container requirements in this table are based on the CLP Samplers Guide and/or SW846 Chapters 3 and 4 and are considered sufficient volumes for most laboratories. Sample volumes needed by laboratories may vary depending on equipment for preparation methods used by the individual laboratories. Volumes presented in this table should be considered maximum sample amounts needed by the laboratory and include sufficient sample for re-extraction/re-digestion if needed.

If amber containers are not available for VOCs or other organic samples, protect the sample from light. All bottleware is to be QC grade with Certificates of Analysis.
VOA vials for soils are tared and require weighing in the field to the nearest 0.01 gram
^Field sampling for ACM will follow Asbestos Hazard Emergency Response Act (AHERA) sampling protocols. Bulk samples of suspected ACM and LBP will include enough volume to accurately represent these materials.

Abbreviations
HCl = hydrochloric acid
HDPE = high-density polyethylene
HNO_3 = nitric acid
ICP-AES = Inductively Coupled Plasma-Atomic Emission Spectrometer
ICP-MS = Inductively Coupled Plasma-Mass Spectrometer
L = liter
mL = milliliter
OC = Organochlorine
PAH = Polynuclear Aromatic Hydrocarbon
PFAS = Per-and Polyfluoroalkyl Substances
PLM = Polarized Light Microscopy
PTFE = Polytetrafluoroethylene
QC = quality control
S/D = Sample/Duplicate
SIM = selected ion monitoring
SVOC = Semivolatile Organic Compound
VOA = Volatile Organic Analysis
VOC = Volatile Organic Compound

TABLE 3A
Laboratory Reporting Limits, Method Detection Limits, and Regulatory Standards (SOIL)
Former True Tempter Site
575 Concord Avenue
St. Johnsbury, Vermont

Analysis Group	Method Description	Method Code	Prep Method	Analyte Description	Vermont Groundwater Quality Standard (1) - Enforcement Action Level (2)	Vermont Residential Soil Standards (VSS) (3)	Vermont Non-Resident Soil Standards (VSS) (3)	CAS Number	RL	MDL	Units
Herbicides	Herbicides (GC)	8151A	8151A_S	Dicamba	189	---	---	1918-00-9	0.0333	0.00493	mg/kg
				2,4-D	---	---	---	94-75-7	33.3	0.0121	mg/kg
				Silvex (2,4,5-TP)	---	---	---	93-72-1	0.0333	0.00347	mg/kg
				2,4,5-T	---	---	---	93-76-5	0.0333	0.00708	mg/kg
				Pentachlorophenol	---	0.48	2.9	87-86-5	0.0083	0.00285	mg/kg
				Picloram	---	---	---	1918-02-1	0.0083	0.0073	mg/kg
Full TCL/TAL	Organochlorine Pesticides (GC)	8081B	3546	4,4'-DDD	---	---	---	72-54-8	0.0067	0.00114	mg/kg
				4,4'-DDE	---	---	---	72-55-9	0.0067	0.00079	mg/kg
				4,4'-DDT	---	---	---	50-29-3	0.0067	0.00123	mg/kg
				Aldrin	0.05	0.02	0.1	309-00-2	0.0067	0.00101	mg/kg
				alpha-BHC	---	---	---	319-84-6	0.002	0.00068	mg/kg
				beta-BHC	---	---	---	319-85-7	0.002	0.00075	mg/kg
				Chlordane (technical)	2	---	---	12789-03-6	0.067	0.0162	mg/kg
				delta-BHC	---	---	---	319-86-8	0.002	0.00041	mg/kg
				Dieldrin	0.02	---	---	60-57-1	0.002	0.00087	mg/kg
				Endosulfan I	---	---	---	959-98-8	0.0067	0.00102	mg/kg
				Endosulfan II	---	---	---	33213-65-9	0.0067	0.00172	mg/kg
				Endosulfan sulfate	---	---	---	1031-07-8	0.0067	0.00084	mg/kg
				Endrin	2	---	---	72-20-8	0.0067	0.00096	mg/kg
				Endrin aldehyde	---	---	---	7421-93-4	0.0067	0.00158	mg/kg
				Endrin ketone	---	---	---	53494-70-5	0.0067	0.0013	mg/kg
				gamma-BHC (Lindane)	0.2	---	---	58-89-9	0.002	0.00062	mg/kg
				Heptachlor	0.4	---	---	76-44-8	0.0067	0.00079	mg/kg
				Heptachlor epoxide	0.2	---	---	1024-57-3	0.0067	0.001	mg/kg
				Methoxychlor	---	---	---	72-43-5	0.0067	0.00153	mg/kg
				Toxaphene	---	---	---	8001-35-2	0.067	0.0242	mg/kg
Full TCL/TAL	Polychlorinated Biphenyls (PCBs) by Ga	8082A_DKQP	3546	Aroclor 1016	0.5	0.114 G	0.68 G	12674-11-2	0.067	0.0178	mg/kg
				Aroclor 1221	0.5	0.114 G	0.68 G	11104-28-2	0.067	0.0178	mg/kg
				Aroclor 1232	0.5	0.114 G	0.68 G	11141-16-5	0.067	0.0178	mg/kg
				Aroclor 1242	0.5	0.114 G	0.68 G	53469-21-9	0.067	0.0178	mg/kg
				Aroclor 1248	0.5	0.114 G	0.68 G	12672-29-6	0.067	0.0178	mg/kg
				Aroclor 1254	0.5	0.114 G	0.68 G	11097-69-1	0.067	0.0178	mg/kg
				Aroclor 1260	0.5	0.114 G	0.68 G	11096-82-5	0.067	0.0178	mg/kg
Full TCL/TAL	Herbicides (GC)	8151A	8151A_S	2,4-D	---	---	---	94-75-7	0.0333	0.0121	mg/kg
				Silvex (2,4,5-TP)	---	---	---	93-72-1	0.0333	0.00347	mg/kg
				2,4,5-T	---	---	---	93-76-5	0.0333	0.00708	mg/kg
Full TCL/TAL	Metals (ICP)	6010D	3050B	Silver	---	237	2483	7440-22-4	2.00	0.164	mg/Kg
				Aluminum	---	72507	941748	7429-90-5	40.0	3.03	mg/Kg
				Arsenic	10	16	16	7440-38-2	3.00	0.626	mg/Kg
				Barium	2000	11247	127382	7440-39-3	40.0	1.52	mg/Kg
				Beryllium	4	35	289	7440-41-7	0.400	0.0440	mg/Kg
				Calcium	---	---	---	7440-70-2	1000	42.7	mg/Kg
				Cadmium	5	6.9	87	7440-43-9	0.800	0.155	mg/Kg
				Cobalt	---	22	291	7440-48-4	10.0	0.500	mg/Kg
				Chromium	100	0.09	1.7	7440-47-3	2.00	0.214	mg/Kg
				Copper	1300	10407	139231	7440-50-8	5.00	0.799	mg/Kg
				Iron	---	51302	686351	7439-89-6	30.0	6.01	mg/Kg
				Potassium	---	---	---	7440-09-7	1000	49.1	mg/Kg
				Magnesium	---	---	---	7439-95-4	1000	59.4	mg/Kg
				Manganese	840	1118	11350	7439-96-5	3.00	0.240	mg/Kg
				Sodium	---	---	---	7440-23-5	1000	55.9	mg/Kg
				Nickel	100	940	9707	7440-02-0	8.00	0.280	mg/Kg
				Lead	15	400	800	7439-92-1	2.00	0.528	mg/Kg
				Antimony	6	26	319	7440-36-0	4.00	0.377	mg/Kg
				Selenium	---	---	---	7782-49-2	4.00	1.23	mg/Kg
				Thallium	2	0.73	196100	7440-28-0	4.00	0.597	mg/Kg
				Vanadium	---	2.8	27	7440-62-2	10.0	0.537	mg/Kg
				Zinc	---	21986	294150	7440-66-6	6.00	0.346	mg/Kg
Full TCL/TAL	Mercury (CVAA)	7471B	7471B_P	Mercury	2	3.1	3.1	7439-97-6	0.0170	0.00800	mg/Kg
Full TCL/TAL	Volatile Organic Compounds by GC/MS	8260D	5035A_F	1,1,1-Trichloroethane	200	---	---	71-55-6	0.001	0.000233	mg/kg

TABLE 3A
Laboratory Reporting Limits, Method Detection Limits, and Regulatory Standards (SOIL)
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St. Johnsbury, Vermont

Analysis Group	Method Description	Method Code	Prep Method	Analyte Description	Vermont Groundwater Quality Standard (1) - Enforcement Action Level (2)	Vermont Residential Soil Standards (VSS) (3)	Vermont Non-Resident Soil Standards (VSS) (3)	CAS Number	RL	MDL	Units
				1,1,2,2-Tetrachloroethane	---	---	---	79-34-5	0.001	0.000214	mg/kg
				1,1,2-Trichloro-1,2,2-trifluoroethane	---	---	---	76-13-1	0.001	0.000301	mg/kg
				1,1,2-Trichloroethane	5	---	---	79-00-5	0.001	0.000178	mg/kg
				1,1-Dichloroethane	70	2.1	13	75-34-3	0.001	0.000206	mg/kg
				1,1-Dichloroethene	7	---	---	75-35-4	0.001	0.000225	mg/kg
				1,2,3-Trichlorobenzene	100	---	---	87-61-6	0.001	0.000181	mg/kg
				1,2,4-Trichlorobenzene	70	---	---	120-82-1	0.001	0.000358	mg/kg
				1,2-Dichloropropane	5	1.5	9.1	78-87-5	0.001	0.000423	mg/kg
				1,3-Dichlorobenzene	---	---	---	541-73-1	0.001	0.000365	mg/kg
				1,4-Dichlorobenzene	75	---	---	106-46-7	0.001	0.000225	mg/kg
				1,4-Dioxane	3 B	2.8	17	123-91-1	0.1	0.00918	mg/kg
				2-Butanone (MEK)	4200	16952	26991	78-93-3	0.005	0.000368	mg/kg
				2-Hexanone	---	---	---	591-78-6	0.005	0.00171	mg/kg
				4-Methyl-2-pentanone (MIBK)	560	---	---	108-10-1	0.005	0.00156	mg/kg
				Acetone	700	40609	100028	67-64-1	0.006	0.00572	mg/kg
				Benzene	5	0.7	4.2	71-43-2	0.001	0.000258	mg/kg
				Bromoform	80 C	---	---	75-25-2	0.001	0.000425	mg/kg
				Bromomethane	10	---	---	74-83-9	0.002	0.001	mg/kg
				Carbon disulfide	---	608	662	75-15-0	0.001	0.000266	mg/kg
				Carbon tetrachloride	5	0.37	2.2	56-23-5	0.001	0.000387	mg/kg
				Chlorobenzene	100	414	726	108-90-7	0.001	0.000177	mg/kg
				Chlorobromomethane	---	---	---	74-97-5	0.001	0.000281	mg/kg
				Chlorodibromomethane	80 C	---	---	124-48-1	0.001	0.000194	mg/kg
				Chloroethane	---	---	---	75-00-3	0.001	0.000522	mg/kg
				Chloroform	80 C	---	---	67-66-3	0.001	0.000971	mg/kg
				Chloromethane	30	---	---	74-87-3	0.001	0.000435	mg/kg
				cis-1,2-Dichloroethene	70	140	1814	156-59-2	0.001	0.000358	mg/kg
				cis-1,3-Dichloropropene	0.5	---	---	10061-01-5	0.001	0.000273	mg/kg
				Cyclohexane	---	---	---	110-82-7	0.001	0.000221	mg/kg
				Dichlorobromomethane	---	---	---	75-27-4	0.001	0.000257	mg/kg
				Dichlorodifluoromethane	1000	---	---	75-71-8	0.001	0.000338	mg/kg
				Ethylbenzene	700	3.7	22	100-41-4	0.001	0.000199	mg/kg
				Ethylene Dibromide	---	---	---	106-93-4	0.001	0.00018	mg/kg
				Isopropylbenzene	---	256	264	98-82-8	0.001	0.000285	mg/kg
				Methyl acetate	---	---	---	79-20-9	0.005	0.0043	mg/kg
				Methyl tert-butyl ether	40	649	4464	1634-04-4	0.001	0.000512	mg/kg
				Methylcyclohexane	---	---	---	108-87-2	0.001	0.000499	mg/kg
				Methylene Chloride	5	---	---	75-09-2	0.002	0.00115	mg/kg
				m-Xylene & p-Xylene	10000	252	257	179601-23-1	0.001	0.000174	mg/kg
				o-Xylene	10000	252	257	95-47-6	0.001	0.000194	mg/kg
				Styrene	100	---	---	100-42-5	0.001	0.000278	mg/kg
				Tetrachloroethene	5	2.4	14	127-18-4	0.001	0.000305	mg/kg
				Toluene	1000	706	798	108-88-3	0.001	0.000234	mg/kg
				trans-1,2-Dichloroethene	100	1402	18137	156-60-5	0.001	0.000246	mg/kg
				trans-1,3-Dichloropropene	0.5	---	---	10061-02-6	0.001	0.000266	mg/kg
				Trichloroethene	5	0.68	6.5	79-01-6	0.001	0.000321	mg/kg
				Trichlorofluoromethane	2100	---	---	75-69-4	0.001	0.000406	mg/kg
				Vinyl chloride	2	0.1	0.59	75-01-4	0.001	0.000546	mg/kg
				1,2-Dichloroethane	5	0.29	1.7	107-06-2	0.001	0.000296	mg/kg
				1,2-Dichlorobenzene	---	---	---	95-50-1	0.001	0.000361	mg/kg
				1,2-Dibromo-3-Chloropropane	---	---	---	96-12-8	0.001	0.00046	mg/kg
Full TCL/TAL	Semivolatile Organic Compounds (GC/M	8270E	3546	1,1'-Biphenyl	---	---	---	92-52-4	0.33	0.0115	mg/kg

TABLE 3A
Laboratory Reporting Limits, Method Detection Limits, and Regulatory Standards (SOIL)
Former True Tempter Site
575 Concord Avenue
St. Johnsbury, Vermont

Analysis Group	Method Description	Method Code	Prep Method	Analyte Description	Vermont Groundwater Quality Standard (1) - Enforcement Action Level (2)	Vermont Residential Soil Standards (VSS) (3)	Vermont Non-Resident Soil Standards (VSS) (3)	CAS Number	RL	MDL	Units
				1,2,4,5-Tetrachlorobenzene	---	---	---	95-94-3	0.33	0.0103	mg/kg
				2,2'-oxybis[1-chloropropane]	---	---	---	108-60-1	0.33	0.0198	mg/kg
				2,3,4,6-Tetrachlorophenol	---	---	---	58-90-2	0.33	0.0224	mg/kg
				2,4,5-Trichlorophenol	---	---	---	95-95-4	0.33	0.0337	mg/kg
				2,4,6-Trichlorophenol	---	---	---	88-06-2	0.133	0.0425	mg/kg
				2,4-Dichlorophenol	---	---	---	120-83-2	0.133	0.0212	mg/kg
				2,4-Dimethylphenol	---	---	---	105-67-9	0.33	0.0395	mg/kg
				2,4-Dinitrophenol	---	---	---	51-28-5	0.266	0.163	mg/kg
				2,4-Dinitrotoluene	---	---	---	121-14-2	0.067	0.0356	mg/kg
				2,6-Dinitrotoluene	---	---	---	606-20-2	0.067	0.0239	mg/kg
				2-Chloronaphthalene	---	---	---	91-58-7	0.33	0.0153	mg/kg
				2-Chlorophenol	---	---	---	95-57-8	0.33	0.0118	mg/kg
				2-Methylnaphthalene	---	---	---	91-57-6	0.33	0.00925	mg/kg
				2-Methylphenol	---	---	---	95-48-7	0.33	0.0124	mg/kg
				2-Nitroaniline	---	---	---	88-74-4	0.33	0.0252	mg/kg
				2-Nitrophenol	---	---	---	88-75-5	0.33	0.0331	mg/kg
				3,3'-Dichlorobenzidine	---	---	---	91-94-1	0.133	0.05	mg/kg
				3-Nitroaniline	---	---	---	99-09-2	0.33	0.0785	mg/kg
				4,6-Dinitro-2-methylphenol	---	---	---	534-52-1	0.266	0.135	mg/kg
				4-Bromophenyl phenyl ether	---	---	---	101-55-3	0.33	0.0131	mg/kg
				4-Chloro-3-methylphenol	---	---	---	59-50-7	0.33	0.0186	mg/kg
				4-Chloroaniline	---	---	---	106-47-8	0.33	0.0587	mg/kg
				4-Chlorophenyl phenyl ether	---	---	---	7005-72-3	0.33	0.0117	mg/kg
				4-Methylphenol	---	---	---	106-44-5	0.33	0.0207	mg/kg
				4-Nitroaniline	---	---	---	100-01-6	0.33	0.038	mg/kg
				4-Nitrophenol	---	---	---	100-02-7	0.67	0.0539	mg/kg
				Acenaphthene	---	---	---	83-32-9	0.33	0.00943	mg/kg
				Acenaphthylene	---	---	---	208-96-8	0.33	0.00946	mg/kg
				Acetophenone	---	---	---	98-86-2	0.33	0.0162	mg/kg
				Anthracene	2100	---	---	120-12-7	0.33	0.0101	mg/kg
				Atrazine	3	---	---	1912-24-9	0.133	0.0195	mg/kg
				Benzaldehyde	---	---	---	100-52-7	0.33	0.0547	mg/kg
				Benzo[a]anthracene	---	---	---	56-55-3	0.033	0.0249	mg/kg
				Benzo[a]pyrene	0.2	0.07	1.54	50-32-8	0.033	0.00881	mg/kg
				Benzo[b]fluoranthene	---	---	---	205-99-2	0.033	0.00856	mg/kg
				Benzo[g,h,i]perylene	---	---	---	191-24-2	0.33	0.00976	mg/kg
				Benzo[k]fluoranthene	---	---	---	207-08-9	0.033	0.00649	mg/kg
				Bis(2-chloroethoxy)methane	---	---	---	111-91-1	0.33	0.0258	mg/kg
				Bis(2-chloroethyl)ether	300	---	---	111-44-4	0.033	0.0115	mg/kg
				Bis(2-ethylhexyl) phthalate	---	20	120	117-81-7	0.33	0.0175	mg/kg
				Butyl benzyl phthalate	---	---	---	85-68-7	0.33	0.0155	mg/kg
				Caprolactam	---	---	---	105-60-2	0.33	0.0515	mg/kg
				Carbazole	---	---	---	86-74-8	0.33	0.0126	mg/kg
				Chrysene	---	---	---	218-01-9	0.33	0.0139	mg/kg
				Dibenz(a,h)anthracene	---	---	---	53-70-3	0.033	0.0143	mg/kg
				Dibenzofuran	---	---	---	132-64-9	0.33	0.011	mg/kg
				Diethyl phthalate	---	---	---	84-66-2	0.33	0.0107	mg/kg
				Dimethyl phthalate	---	---	---	131-11-3	0.33	0.0752	mg/kg
				Di-n-butyl phthalate	---	---	---	84-74-2	0.33	0.0125	mg/kg
				Di-n-octyl phthalate	---	---	---	117-84-0	0.33	0.0175	mg/kg
				Fluoranthene	280	2301	26371	206-44-0	0.33	0.0116	mg/kg
				Fluorene	280	2301	26371	86-73-7	0.33	0.00968	mg/kg
				Hexachlorobenzene	1	0.13	0.69	118-74-1	0.033	0.0157	mg/kg
				Hexachlorobutadiene	1	---	---	87-68-3	0.067	0.00704	mg/kg
				Hexachlorocyclopentadiene	50	---	---	77-47-4	0.33	0.029	mg/kg
				Hexachloroethane	---	---	---	67-72-1	0.033	0.0114	mg/kg
				Indeno[1,2,3-cd]pyrene	---	---	---	193-39-5	0.033	0.0129	mg/kg
				Isophorone	100	---	---	78-59-1	0.133	0.0956	mg/kg
				Naphthalene	20	2.7	16	91-20-3	0.33	0.00572	mg/kg
				Nitrobenzene	---	---	---	98-95-3	0.033	0.0183	mg/kg
				N-Nitrosodi-n-propylamine	---	---	---	621-64-7	0.033	0.024	mg/kg
				N-Nitrosodiphenylamine	---	---	---	86-30-6	0.33	0.0272	mg/kg
				Pentachlorophenol	---	0.48	2.9	87-86-5	0.266	0.0678	mg/kg
				Phenanthrene	---	---	---	85-01-8	0.33	0.0135	mg/kg
				Phenol	2100	---	---	108-95-2	0.33	0.0122	mg/kg
				Pyrene	---	---	---	129-00-0	0.33	0.00823	mg/kg

TABLE 3A
Laboratory Reporting Limits, Method Detection Limits, and Regulatory Standards (SOIL)
Former True Tempter Site
575 Concord Avenue
St. Johnsbury, Vermont

Analysis Group	Method Description	Method Code	Prep Method	Analyte Description	Vermont Groundwater Quality Standard (1) - Enforcement Action Level (2)	Vermont Residential Soil Standards (VSS) (3)	Vermont Non-Resident Soil Standards (VSS) (3)	CAS Number	RL	MDL	Units
				1H,1H,2H,2H-perfluorodecanesulfonic acid (8:2)	---	---	---	39108-34-4	0.002	0.000037	mg/kg
				1H,1H,2H,2H-perfluorooctanesulfonic acid (6:2)	---	---	---	27619-97-2	0.002	0.000057	mg/kg
				N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	---	---	---	2991-50-6	0.002	0.000083	mg/kg
				N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	---	---	---	2355-31-9	0.002	0.00011	mg/kg
				Perfluorobutanesulfonic acid (PFBS)	---	---	---	375-73-5	0.0002	0.000033	mg/kg
				Perfluorobutanoic acid (PFBA)	---	---	---	375-22-4	0.0005	0.00033	mg/kg
				Perfluorodecanesulfonic acid (PFDS)	---	---	---	335-77-3	0.0002	0.000019	mg/kg
				Perfluorodecanoic acid (PFDA)	---	---	---	335-76-2	0.0002	0.000028	mg/kg
				Perfluorododecanoic acid (PFDoA)	---	---	---	307-55-1	0.0002	0.000025	mg/kg
				Perfluoroheptanesulfonic acid (PFHpS)	---	---	---	375-92-8	0.0002	0.000023	mg/kg
				Perfluoroheptanoic acid (PFHpA)	0.02 E	1.22 F	14.36 F	375-85-9	0.0002	0.000039	mg/kg
				Perfluorohexanesulfonic acid (PFHxS)	0.02 E	1.22 F	14.36 F	355-46-4	0.0002	0.000041	mg/kg
				Perfluorohexanoic acid (PFHxA)	---	---	---	307-24-4	0.0002	0.000046	mg/kg
				Perfluorononanoic acid (PFNA)	0.02 E	1.22 F	14.36 F	375-95-1	0.0002	0.000034	mg/kg
				Perfluorooctanesulfonamide (PFOSA)	---	---	---	754-91-6	0.0002	0.000034	mg/kg
				Perfluorooctanesulfonic acid (PFOS)	0.02 E	1.22 F	14.36 F	1763-23-1	0.0002	0.00011	mg/kg
				Perfluorooctanoic acid (PFOA)	0.02 E	1.22 F	14.36 F	335-67-1	0.0002	0.000058	mg/kg
				Perfluoropentanoic acid (PFPeA)	---	---	---	2706-90-3	0.0002	0.000055	mg/kg
				Perfluorotetradecanoic acid (PFTeA)	---	---	---	376-06-7	0.0002	0.000026	mg/kg
				Perfluorotridecanoic acid (PFTriA)	---	---	---	72629-94-8	0.0002	0.000025	mg/kg
				Perfluoroundecanoic acid (PFUnA)	---	---	---	2058-94-8	0.0002	0.000027	mg/kg
Edison Soil	Metals (ICP/MS)	6020B	3050B	Aluminum	---	72507	941748	7429-90-5	20.0	5.49	mg/Kg
				Antimony	6	26	319	7440-36-0	1.00	0.146	mg/Kg
				Arsenic	10	16	16	7440-38-2	1.00	0.103	mg/Kg
				Barium	2000	11247	127382	7440-39-3	2.00	0.145	mg/Kg
				Beryllium	4	35	289	7440-41-7	0.400	0.0570	mg/Kg
				Cadmium	5	6.9	87	7440-43-9	1.00	0.113	mg/Kg
				Calcium	---	---	---	7440-70-2	100	40.7	mg/Kg
				Chromium	100	0.09	1.7	7440-47-3	2.00	0.908	mg/Kg
				Cobalt	---	22	291	7440-48-4	2.00	0.148	mg/Kg
				Copper	1300	10407	139231	7440-50-8	2.00	0.368	mg/Kg
				Iron	---	51302	686351	7439-89-6	60.0	20.2	mg/Kg
				Lead	15	400	800	7439-92-1	0.600	0.200	mg/Kg
				Magnesium	---	---	---	7439-95-4	100	10.2	mg/Kg
				Manganese	840	1118	11350	7439-96-5	4.00	0.403	mg/Kg
				Nickel	100	940	9707	7440-02-0	2.00	0.470	mg/Kg
				Potassium	---	---	---	7440-09-7	100	16.2	mg/Kg
				Selenium	---	---	---	7782-49-2	1.25	0.128	mg/Kg
				Silver	---	237	2483	7440-22-4	0.400	0.0890	mg/Kg
				Sodium	---	---	---	7440-23-5	100	45.7	mg/Kg
				Thallium	2	0.73	196100	7440-28-0	0.400	0.0410	mg/Kg
				Vanadium	---	2.8	27	7440-62-2	2.00	0.206	mg/Kg
				Zinc	---	21986	294150	7440-66-6	8.00	3.05	mg/Kg

Notes:

(3) Vermont Screening Levels, Investigation and Remediation of Contaminated Properties Rule, 2019 update (Appendix A - Soil Standards).

(F) PFAS - Sum of PFHpA, PFHxS, PFNA, PFOS and PFOA not to exceed applicable resident or non-resident values.

(G) Sum of all PCBs

TABLE 3A
Laboratory Reporting Limits, Method Detection Limits, and Regulatory Standards (GROUNDWATER)
Former True Tempter Site
575 Concord Avenue
St. Johnsbury, Vermont

Analysis Group	Method Description	Method Code	Prep Method	Analyte Description	Vermont Groundwater Quality Standard (1) - Enforcement Action Level (2)	CAS Number	RL	MDL	Units
Herbicides	Herbicides (GC)	8151A	8151A_AP	Dalapon	200	75-99-0	1.20	0.170	ug/L
				Dicamba	189	1918-00-9	1.20	0.110	ug/L
				Dichlorprop	140	120-36-5	1.20	0.160	ug/L
				2,4-D	---	94-75-7	1.20	0.130	ug/L
				2,4-DB	---	94-82-6	1.20	0.130	ug/L
				Silvex (2,4,5-TP)	---	93-72-1	1.20	0.110	ug/L
				2,4,5-T	---	93-76-5	1.20	0.120	ug/L
				Dinoseb	7	88-85-7	1.20	0.320	ug/L
				MCPA	10	94-74-6	120	13.7	ug/L
				MCPP	---	93-65-2	120	17.4	ug/L
				Pentachlorophenol	---	87-86-5	0.300	0.0400	ug/L
				Picloram	---	1918-02-1	0.300	0.170	ug/L
Full TCL/TAL	Organochlorine Pesticides (GC)	8081B	3510C_LVI	4,4'-DDD	---	72-54-8	0.0200	0.00600	ug/L
				4,4'-DDE	---	72-55-9	0.0200	0.00200	ug/L
				4,4'-DDT	---	50-29-3	0.0200	0.00400	ug/L
				Aldrin	0.05	309-00-2	0.0200	0.00300	ug/L
				alpha-BHC	---	319-84-6	0.0200	0.00700	ug/L
				beta-BHC	---	319-85-7	0.0200	0.0150	ug/L
				Chlordane (technical)	2	12789-03-6	0.500	0.0550	ug/L
				delta-BHC	---	319-86-8	0.0200	0.00500	ug/L
				Dieldrin	0.02	60-57-1	0.0200	0.00300	ug/L
				Endosulfan I	---	959-98-8	0.0200	0.00200	ug/L
				Endosulfan II	---	33213-65-9	0.0200	0.00400	ug/L
				Endosulfan sulfate	---	1031-07-8	0.0200	0.00600	ug/L
				Endrin	2	72-20-8	0.0200	0.00400	ug/L
				Endrin aldehyde	---	7421-93-4	0.0200	0.00800	ug/L
				Endrin ketone	---	53494-70-5	0.0200	0.00800	ug/L
				gamma-BHC (Lindane)	0.2	58-89-9	0.0200	0.0120	ug/L
				Heptachlor	0.4	76-44-8	0.0200	0.00300	ug/L
				Heptachlor epoxide	0.2	1024-57-3	0.0200	0.00500	ug/L
				Methoxychlor	---	72-43-5	0.0200	0.00400	ug/L
				Toxaphene	---	8001-35-2	0.500	0.110	ug/L
Full TCL/TAL	Polychlorinated Biphenyls (PCBs) by Gas Chromatography	8082A	3510C_LVI	Aroclor 1016	0.5	12674-11-2	0.400	0.119	ug/L
				Aroclor 1221	0.5	11104-28-2	0.400	0.119	ug/L
				Aroclor 1232	0.5	11141-16-5	0.400	0.119	ug/L
				Aroclor 1242	0.5	53469-21-9	0.400	0.119	ug/L
				Aroclor 1248	0.5	12672-29-6	0.400	0.119	ug/L
				Aroclor 1254	0.5	11097-69-1	0.400	0.107	ug/L
				Aroclor 1260	0.5	11096-82-5	0.400	0.107	ug/L
Full TCL/TAL	Herbicides (GC)	8151A	8151A_AP	2,4-D	---	94-75-7	1.20	0.130	ug/L
				Silvex (2,4,5-TP)	---	93-72-1	1.20	0.110	ug/L
				2,4,5-T	---	93-76-5	1.20	0.120	ug/L

TABLE 3A
Laboratory Reporting Limits, Method Detection Limits, and Regulatory Standards (GROUNDWATER)
Former True Tempter Site
575 Concord Avenue
St. Johnsbury, Vermont

Analysis Group	Method Description	Method Code	Prep Method	Analyte Description	Vermont Groundwater Quality Standard (1) - Enforcement Action Level (2)	CAS Number	RL	MDL	Units
Full TCL/TAL	Metals (ICP)	6010D	3010A	Silver	---	7440-22-4	10.0	3.18	ug/L
				Aluminum	---	7429-90-5	200	76.9	ug/L
				Arsenic	10	7440-38-2	15.0	4.95	ug/L
				Barium	2000	7440-39-3	200	28.0	ug/L
				Beryllium	4	7440-41-7	2.00	0.409	ug/L
				Calcium	---	7440-70-2	5000	503	ug/L
				Cadmium	5	7440-43-9	4.00	0.355	ug/L
				Cobalt	---	7440-48-4	50.0	5.73	ug/L
				Chromium	100	7440-47-3	10.0	4.98	ug/L
				Copper	1300	7440-50-8	25.0	7.45	ug/L
				Iron	---	7439-89-6	150	112	ug/L
				Potassium	---	7440-09-7	5000	699	ug/L
				Magnesium	---	7439-95-4	5000	443	ug/L
				Manganese	840	7439-96-5	15.0	1.76	ug/L
				Sodium	---	7440-23-5	5000	736	ug/L
				Nickel	100	7440-02-0	40.0	5.07	ug/L
				Lead	15	7439-92-1	10.0	2.55	ug/L
				Antimony	---	7440-36-0	20.0	4.97	ug/L
				Selenium	50	7782-49-2	20.0	7.01	ug/L
				Thallium	2	7440-28-0	20.0	6.68	ug/L
				Vanadium	---	7440-62-2	50.0	7.18	ug/L
				Zinc	---	7440-66-6	30.0	6.14	ug/L
Full TCL/TAL	Mercury (CVAA)	7470A	7470A_Prep	Mercury	2	7439-97-6	0.200	0.0910	ug/L
Full TCL/TAL	Volatile Organic Compounds by GC/MS	8260D	5030C	1,1,1-Trichloroethane	200	71-55-6	1.00	0.238	ug/L
				1,1,2,2-Tetrachloroethane	---	79-34-5	1.00	0.367	ug/L
				1,1,2-Trichloro-1,2,2-trifluoroethane	---	76-13-1	1.00	0.311	ug/L
				1,1,2-Trichloroethane	5	79-00-5	1.00	0.204	ug/L
				1,1-Dichloroethane	70	75-34-3	1.00	0.264	ug/L
				1,1-Dichloroethene	7	75-35-4	1.00	0.264	ug/L
				1,2,3-Trichlorobenzene	100	87-61-6	1.00	0.357	ug/L
				1,2,4-Trichlorobenzene	70	120-82-1	1.00	0.365	ug/L
				1,2-Dichloropropane	5	78-87-5	1.00	0.353	ug/L
				1,3-Dichlorobenzene	---	541-73-1	1.00	0.342	ug/L
				1,4-Dichlorobenzene	75	106-46-7	1.00	0.334	ug/L
				1,4-Dioxane	3 B	123-91-1	50.0	28.2	ug/L
				2-Butanone (MEK)	4200	78-93-3	5.00	1.85	ug/L
				2-Hexanone	---	591-78-6	5.00	1.14	ug/L
				4-Methyl-2-pentanone (MIBK)	560	108-10-1	5.00	1.30	ug/L
				Acetone	700	67-64-1	5.00	4.42	ug/L
				Benzene	5	71-43-2	1.00	0.203	ug/L
				Bromoform	80 C	75-25-2	1.00	0.536	ug/L
				Bromomethane	10	74-83-9	1.00	0.550	ug/L
				Carbon disulfide	---	75-15-0	1.00	0.821	ug/L

TABLE 3A
Laboratory Reporting Limits, Method Detection Limits, and Regulatory Standards (GROUNDWATER)
Former True Tempter Site
575 Concord Avenue
St. Johnsbury, Vermont

Analysis Group	Method Description	Method Code	Prep Method	Analyte Description	Vermont Groundwater Quality Standard (1) - Enforcement Action Level (2)	CAS Number	RL	MDL	Units
				Carbon tetrachloride	5	56-23-5	1.00	0.208	ug/L
				Chlorobenzene	100	108-90-7	1.00	0.377	ug/L
				Chlorobromomethane	---	74-97-5	1.00	0.412	ug/L
				Chlorodibromomethane	80 C	124-48-1	1.00	0.281	ug/L
				Chloroethane	---	75-00-3	1.00	0.320	ug/L
				Chloroform	80 C	67-66-3	1.00	0.326	ug/L
				Chloromethane	30	74-87-3	1.00	0.402	ug/L
				cis-1,2-Dichloroethene	70	156-59-2	1.00	0.219	ug/L
				cis-1,3-Dichloropropene	0.5	10061-01-5	1.00	0.222	ug/L
				Cyclohexane	---	110-82-7	1.00	0.321	ug/L
				Dichlorobromomethane	---	75-27-4	1.00	0.343	ug/L
				Dichlorodifluoromethane	1000	75-71-8	1.00	0.311	ug/L
				Ethylbenzene	700	100-41-4	1.00	0.298	ug/L
				Ethylene Dibromide	---	106-93-4	1.00	0.498	ug/L
				Isopropylbenzene	---	98-82-8	1.00	0.336	ug/L
				Methyl acetate	---	79-20-9	5.00	0.785	ug/L
				Methyl tert-butyl ether	40	1634-04-4	1.00	0.216	ug/L
				Methylcyclohexane	---	108-87-2	1.00	0.707	ug/L
				Methylene Chloride	5	75-09-2	1.00	0.315	ug/L
				m-Xylene & p-Xylene	10000	179601-23-1	1.00	0.296	ug/L
				o-Xylene	10000	95-47-6	1.00	0.361	ug/L
				Styrene	100	100-42-5	1.00	0.415	ug/L
				Tetrachloroethene	5	127-18-4	1.00	0.249	ug/L
				Toluene	1000	108-88-3	1.00	0.379	ug/L
				trans-1,2-Dichloroethene	100	156-60-5	1.00	0.235	ug/L
				trans-1,3-Dichloropropene	0.5	10061-02-6	1.00	0.223	ug/L
				Trichloroethene	5	79-01-6	1.00	0.314	ug/L
				Trichlorofluoromethane	2100	75-69-4	1.00	0.320	ug/L
				Vinyl chloride	2	75-01-4	1.00	0.171	ug/L
				1,2-Dichloroethane	5	107-06-2	1.00	0.430	ug/L
				1,2-Dichlorobenzene	---	95-50-1	1.00	0.212	ug/L
				1,2-Dibromo-3-Chloropropane	---	96-12-8	1.00	0.376	ug/L
Full TCL/TAL	Semivolatile Organic Compounds (GC/MS)	8270E	3510C_LVI	1,1'-Biphenyl	---	92-52-4	10.0	1.19	ug/L
				1,2,4,5-Tetrachlorobenzene	---	95-94-3	10.0	1.24	ug/L
				2,2'-oxybis[1-chloropropane]	---	108-60-1	10.0	0.629	ug/L
				2,3,4,6-Tetrachlorophenol	---	58-90-2	10.0	0.746	ug/L
				2,4,5-Trichlorophenol	---	95-95-4	10.0	0.880	ug/L
				2,4,6-Trichlorophenol	---	88-06-2	10.0	0.857	ug/L
				2,4-Dichlorophenol	---	120-83-2	10.0	1.07	ug/L
				2,4-Dimethylphenol	---	105-67-9	10.0	0.619	ug/L
				2,4-Dinitrophenol	---	51-28-5	40.0	2.63	ug/L
				2,4-Dinitrotoluene	---	121-14-2	10.0	0.997	ug/L
				2,6-Dinitrotoluene	---	606-20-2	2.00	0.826	ug/L

TABLE 3A
Laboratory Reporting Limits, Method Detection Limits, and Regulatory Standards (GROUNDWATER)
Former True Tempter Site
575 Concord Avenue
St. Johnsbury, Vermont

Analysis Group	Method Description	Method Code	Prep Method	Analyte Description	Vermont Groundwater Quality Standard (1) - Enforcement Action Level (2)	CAS Number	RL	MDL	Units
				2-Chloronaphthalene	---	91-58-7	10.0	1.18	ug/L
				2-Chlorophenol	---	95-57-8	10.0	0.377	ug/L
				2-Methylnaphthalene	---	91-57-6	10.0	0.527	ug/L
				2-Methylphenol	---	95-48-7	10.0	0.671	ug/L
				2-Nitroaniline	---	88-74-4	10.0	0.474	ug/L
				2-Nitrophenol	---	88-75-5	10.0	0.747	ug/L
				3,3'-Dichlorobenzidine	---	91-94-1	10.0	1.43	ug/L
				3-Nitroaniline	---	99-09-2	10.0	1.94	ug/L
				4,6-Dinitro-2-methylphenol	---	534-52-1	20.0	2.99	ug/L
				4-Bromophenyl phenyl ether	---	101-55-3	10.0	0.745	ug/L
				4-Chloro-3-methylphenol	---	59-50-7	10.0	0.575	ug/L
				4-Chloroaniline	---	106-47-8	10.0	1.88	ug/L
				4-Chlorophenyl phenyl ether	---	7005-72-3	10.0	1.28	ug/L
				4-Methylphenol	---	106-44-5	10.0	0.651	ug/L
				4-Nitroaniline	---	100-01-6	10.0	1.22	ug/L
				4-Nitrophenol	---	100-02-7	20.0	3.98	ug/L
				Acenaphthene	---	83-32-9	10.0	1.08	ug/L
				Acenaphthylene	---	208-96-8	10.0	0.823	ug/L
				Acetophenone	---	98-86-2	10.0	2.33	ug/L
				Anthracene	2100	120-12-7	10.0	1.30	ug/L
				Atrazine	3	1912-24-9	2.00	1.35	ug/L
				Benzaldehyde	---	100-52-7	10.0	2.10	ug/L
				Benzo[a]anthracene	---	56-55-3	1.00	0.592	ug/L
				Benzo[a]pyrene	0.2	50-32-8	1.00	0.405	ug/L
				Benzo[b]fluoranthene	---	205-99-2	2.00	0.676	ug/L
				Benzo[g,h,i]perylene	---	191-24-2	10.0	0.702	ug/L
				Benzo[k]fluoranthene	---	207-08-9	1.00	0.674	ug/L
				Bis(2-chloroethoxy)methane	---	111-91-1	10.0	0.589	ug/L
				Bis(2-chloroethyl)ether	300	111-44-4	1.00	0.633	ug/L
				Bis(2-ethylhexyl) phthalate	---	117-81-7	2.00	0.804	ug/L
				Butyl benzyl phthalate	---	85-68-7	10.0	0.854	ug/L
				Caprolactam	---	105-60-2	10.0	2.24	ug/L
				Carbazole	---	86-74-8	10.0	0.679	ug/L
				Chrysene	---	218-01-9	2.00	0.907	ug/L
				Dibenz(a,h)anthracene	---	53-70-3	1.00	0.720	ug/L
				Dibenzofuran	---	132-64-9	10.0	1.10	ug/L
				Diethyl phthalate	---	84-66-2	10.0	0.976	ug/L
				Dimethyl phthalate	---	131-11-3	10.0	0.766	ug/L
				Di-n-butyl phthalate	---	84-74-2	10.0	0.840	ug/L
				Di-n-octyl phthalate	---	117-84-0	10.0	0.749	ug/L
				Fluoranthene	280	206-44-0	10.0	0.842	ug/L
				Fluorene	280	86-73-7	10.0	0.912	ug/L

TABLE 3A
Laboratory Reporting Limits, Method Detection Limits, and Regulatory Standards (GROUNDWATER)
Former True Tempter Site
575 Concord Avenue
St. Johnsbury, Vermont

Analysis Group	Method Description	Method Code	Prep Method	Analyte Description	Vermont Groundwater Quality Standard (1) - Enforcement Action Level (2)	CAS Number	RL	MDL	Units
				Hexachlorobenzene	1	118-74-1	1.00	0.396	ug/L
				Hexachlorobutadiene	1	87-68-3	1.00	0.780	ug/L
				Hexachlorocyclopentadiene	50	77-47-4	10.0	3.64	ug/L
				Hexachloroethane	---	67-72-1	2.00	0.803	ug/L
				Indeno[1,2,3-cd]pyrene	---	193-39-5	2.00	0.939	ug/L
				Isophorone	100	78-59-1	10.0	0.798	ug/L
				Naphthalene	20	91-20-3	2.00	0.541	ug/L
				Nitrobenzene	---	98-95-3	1.00	0.567	ug/L
				N-Nitrosodi-n-propylamine	---	621-64-7	1.00	0.430	ug/L
				N-Nitrosodiphenylamine	---	86-30-6	10.0	0.891	ug/L
				Pentachlorophenol	---	87-86-5	20.0	1.45	ug/L
				Phenanthrene	---	85-01-8	10.0	1.28	ug/L
				Phenol	2100	108-95-2	10.0	0.292	ug/L
				Pyrene	---	129-00-0	10.0	1.64	ug/L
				1H,1H,2H,2H-perfluorodecanesulfonic acid (8:2)	---	39108-34-4	0.002	0.00077	ug/L
				1H,1H,2H,2H-perfluorooctanesulfonic acid (6:2)	---	27619-97-2	0.005	0.0013	ug/L
				N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOS	---	2991-50-6	0.005	0.0016	ug/L
				N-methylperfluorooctanesulfonamidoacetic acid (NMeF(	---	2355-31-9	0.005	0.0019	ug/L
				Perfluorobutanesulfonic acid (PFBS)	---	375-73-5	0.002	0.00062	ug/L
				Perfluorobutanoic acid (PFBA)	---	375-22-4	0.005	0.0012	ug/L
				Perfluorodecanesulfonic acid (PFDS)	---	335-77-3	0.002	0.0004	ug/L
				Perfluorodecanoic acid (PFDA)	---	335-76-2	0.002	0.00046	ug/L
				Perfluorododecanoic acid (PFDoA)	---	307-55-1	0.002	0.00049	ug/L
				Perfluoroheptanesulfonic acid (PFHpS)	---	375-92-8	0.002	0.00041	ug/L
				Perfluoroheptanoic acid (PFHpA)	0.02 E	375-85-9	0.002	0.00054	ug/L
				Perfluorohexanesulfonic acid (PFHxS)	0.02 E	355-46-4	0.002	0.00055	ug/L
				Perfluorohexanoic acid (PFHxA)	---	307-24-4	0.002	0.00065	ug/L
				Perfluorononanoic acid (PFNA)	0.02 E	375-95-1	0.002	0.00049	ug/L
				Perfluorooctanesulfonamide (PFOSA)	---	754-91-6	0.002	0.00092	ug/L
				Perfluorooctanesulfonic acid (PFOS)	0.02 E	1763-23-1	0.002	0.00085	ug/L
				Perfluorooctanoic acid (PFOA)	2100	335-67-1	0.002	0.00076	ug/L
				Perfluoropentanoic acid (PFPeA)	---	2706-90-3	0.002	0.00068	ug/L
				Perfluorotetradecanoic acid (PFTeA)	---	376-06-7	0.002	0.00064	ug/L
				Perfluorotridecanoic acid (PFTriA)	---	72629-94-8	0.002	0.00048	ug/L
				Perfluoroundecanoic acid (PFUnA)	---	2058-94-8	0.002	0.00055	ug/L

TABLE 3A
Laboratory Reporting Limits, Method Detection Limits, and Regulatory Standards (GROUNDWATER)
Former True Tempter Site
575 Concord Avenue
St. Johnsbury, Vermont

Analysis Group	Method Description	Method Code	Prep Method	Analyte Description	Vermont Groundwater Quality Standard (1) - Enforcement Action Level (2)	CAS Number	RL	MDL	Units
Edison Water	Metals (ICP/MS)	6020B	3005A	Aluminum	---	7429-90-5	40.0	11.7	ug/L
				Antimony	6	7440-36-0	2.00	0.475	ug/L
				Arsenic	10	7440-38-2	2.00	1.15	ug/L
				Barium	2000	7440-39-3	4.00	0.925	ug/L
				Beryllium	4	7440-41-7	0.800	0.124	ug/L
				Cadmium	---	7440-43-9	2.00	0.375	ug/L
				Calcium	---	7440-70-2	500	31.7	ug/L
				Chromium	100	7440-47-3	4.00	1.65	ug/L
				Cobalt	---	7440-48-4	4.00	0.412	ug/L
				Copper	1300	7440-50-8	4.00	1.97	ug/L
				Iron	---	7439-89-6	120	18.4	ug/L
				Lead	15	7439-92-1	1.20	0.417	ug/L
				Magnesium	---	7439-95-4	200	21.8	ug/L
				Manganese	840	7439-96-5	8.00	0.839	ug/L
				Nickel	100	7440-02-0	4.00	1.39	ug/L
				Potassium	---	7440-09-7	200	83.3	ug/L
				Selenium	50	7782-49-2	2.50	0.432	ug/L
				Silver	---	7440-22-4	2.00	1.30	ug/L
				Sodium	---	7440-23-5	500	180	ug/L
				Thallium	2	7440-28-0	0.800	0.191	ug/L
				Vanadium	---	7440-62-2	4.00	1.00	ug/L
				Zinc	---	7440-66-6	16.0	4.22	ug/L

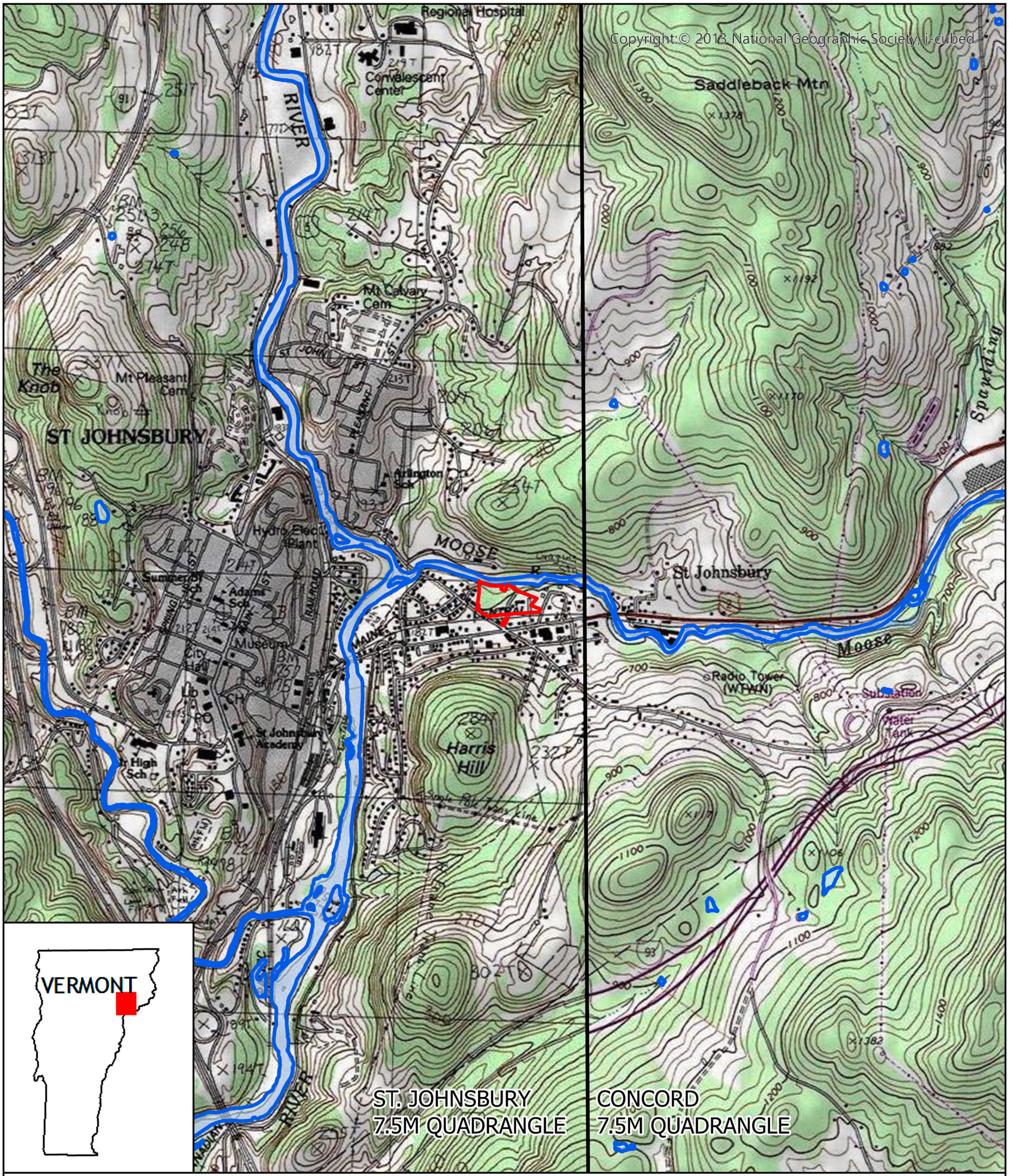
Notes:
(1) Vermont Groundwater Quality Standards, Chapter 12 of the Environmental Protection Rules: Groundwater Protection Rule, 2019 update. Appendix One, Table 1 (Primary Groundwater Quality Standards)
(2) Enforcement Action Level is the value at which reaching or exceeding action under Section 12-804 of Vermont Groundwater Quality Standars, Chapter 12 of the Environmental Protection Rules: Groundwater Protection Rule, 2019
(B) New Interim Enforcement Standard, VTDEC Interim Groundwater Quality Standards, revised March 4, 2016.
(C) Total Trihalomethanes: comprised of bromodichloromethane, bromoform, chloroform, and dibromochloromethane.
(E) Groundwater Enforcement Standard of 0.02 ug/L for any combination of PFOA, PFOS, PFHxS, PFHpA, and PFNA.

TABLE 3B
Regulated Building Materials
Laboratory Reporting Limits, Method Detection Limits, and Regulatory Standards
Former True Tempter Site
575 Concord Avenue
St. Johnsbury, Vermont

Parameter	Laboratory Method	Project Action Limit				MDL	RL
		Asbestos Containing Material (VRAC, V.S.A Title 18, Chapter 26)	EPA and HUD Lead Based Paint	PCB Hazardous Bulk Remediation Waste (40 CFR Part 761.3)	PCB Non-Hazardous Bulk Remediation Waste (40 CFR 761.61(a)(5)(v)(A))		
Asbestos							
Asbestos	**PLM**	>1 % asbestos by weight or area	NA	NA	NA	NA	NA
Lead			**mg/cm^2**				
Lead	**XRF (B)**	NA	≥1	NA	NA	NA	NA
PCBs							
Units				**mg/Kg**	**mg/Kg**	**mg/Kg**	**mg/Kg**
Aroclor 1016	8082A	NA	NA	NV	NV	A	1
Aroclor 1221	8082A	NA	NA	NV	NV	A	1
Aroclor 1232	8082A	NA	NA	NV	NV	A	1
Aroclor 1242	8082A	NA	NA	NV	NV	A	1
Aroclor 1248	8082A	NA	NA	NV	NV	A	1
Aroclor 1254	8082A	NA	NA	NV	NV	A	1
Aroclor 1260	8082A	NA	NA	NV	NV	A	1
Aroclor-1262	8082A	NA	NA	NV	NV	A	1
Aroclor-1268	8082A	NA	NA	NV	NV	A	1
Total PCBs (sum of Aroclors)				≥50	>1 but <50		

Notes:
EPA = United Stated Environmental Protection Agency
HUD = Housing and Urban Development
MDL = Method Detection Limit
PLM = Polarize Light Microscopy
RL = Reporting Limit
NV = No Value
VRAC = Vermont Regulations for Asbestos Control
(A) Method Detection Limit is equal to the Reporting Limit. Reporting Limit may vary based on sample mass used.
(B) Performance Characteristic Sheet for the XRF is included in **Appendix B.**

Figures



Approximate Site Boundary

0 1,000 2,000 4,000 US Feet

N

CREATION DATE:	PROJECT NO:		FIGURE 1 SITE LOCATION MAP
OCTOBER 23, 2023	13733-223544_3.C.04A		
MONTROSE ENVIRONMENTAL	DRAWN BY: RJL	APPRV'D BY: KI	
	CHEK'D BY: AP	REVISION: 0	FORMER TRUE TEMPER SITE - 575 CONCORD AVENUE ST. JOHNSBURY, VERMONT

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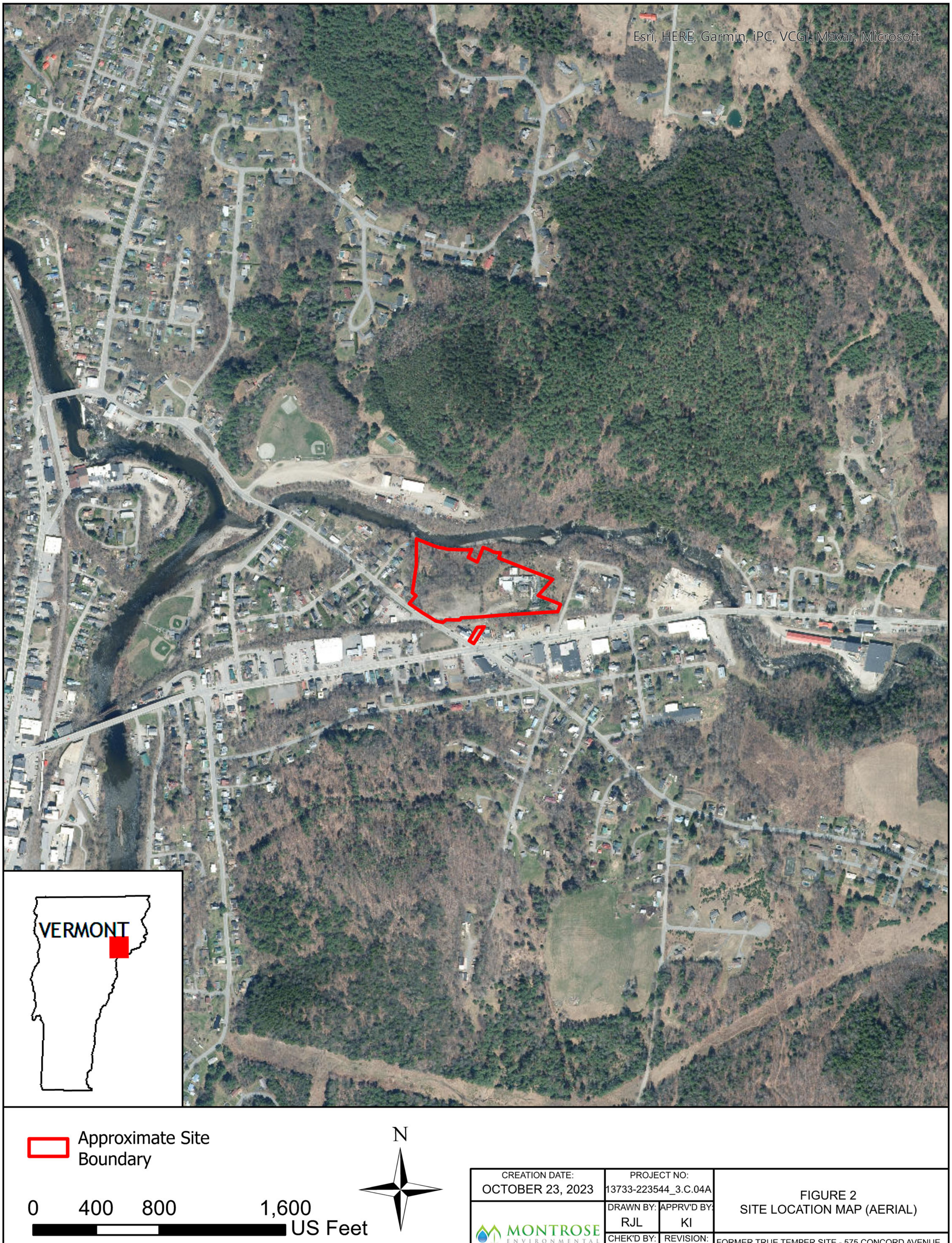

CREATION DATE:	PROJECT NO:	
OCTOBER 23, 2023	13733-223544_3.C.04A	FIGURE 2 SITE LOCATION MAP (AERIAL)
MONTROSE ENVIRONMENTAL	DRAWN BY: RJL / APPRV'D BY: KI	
	CHEK'D BY: AP / REVISION: 0	FORMER TRUE TEMPER SITE - 575 CONCORD AVENUE ST. JOHNSBURY, VERMONT

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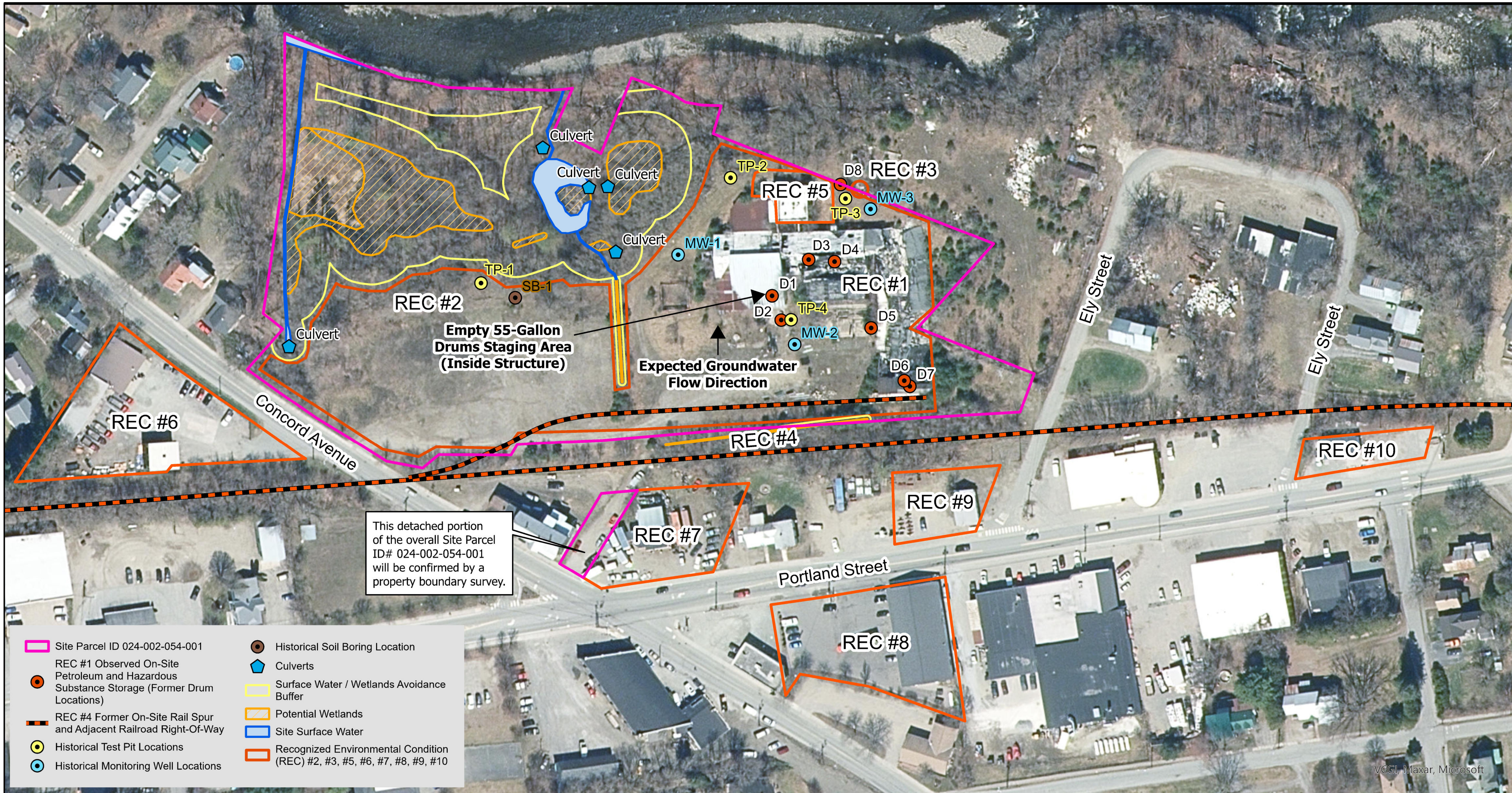

NOTES:
Historical Test Pit, Monitoring Well, and Soil Boring Locations are estimated from narrative descriptions provided in The Johnson Company's 1990 ESA.

REC #1: Observed On-Site Petroleum and Hazardous Substance Storage
REC #2: Evidence of On-Site Filling
REC #3: Adjacent Junkyard with Debris Encroachment - 34 Ely Street
REC #4: Former On-Site Rail Spur and Adjacent Railroad Right-Of-Way
REC #5: Evidence of On-Site Disposal of Boiler Ash
REC #6: Upgradient Former Bulk Fuel Storage Depot
535 Concord Avenue
REC #7: Upgradient Former Gas Station / Auto Repair Facility
599 Portland Street
REC #8: Upgradient Former Dry Cleaner and Filling Station - 642-648 Portland Street
REC #9: Upgradient Former Gas Station
67 Portland Street
REC #10: Upgradient Former Gas/Service Station
709 Portland Street

0 60 120 240
US Feet

N

CREATION DATE: NOVEMBER 30, 2023	PROJECT NO: 13733-223544_3.C.04A		FIGURE 3 RECOGNIZED ENVIRONMENTAL CONDITIONS (RECs)
MONTROSE ENVIRONMENTAL	DRAWN BY: RJL	APPRV'D BY: KI	
	CHEK'D BY: AP	REVISION: 0	FORMER TRUE TEMPER - 575 CONCORDE AVENUE ST. JOHNSBURY, VERMONT

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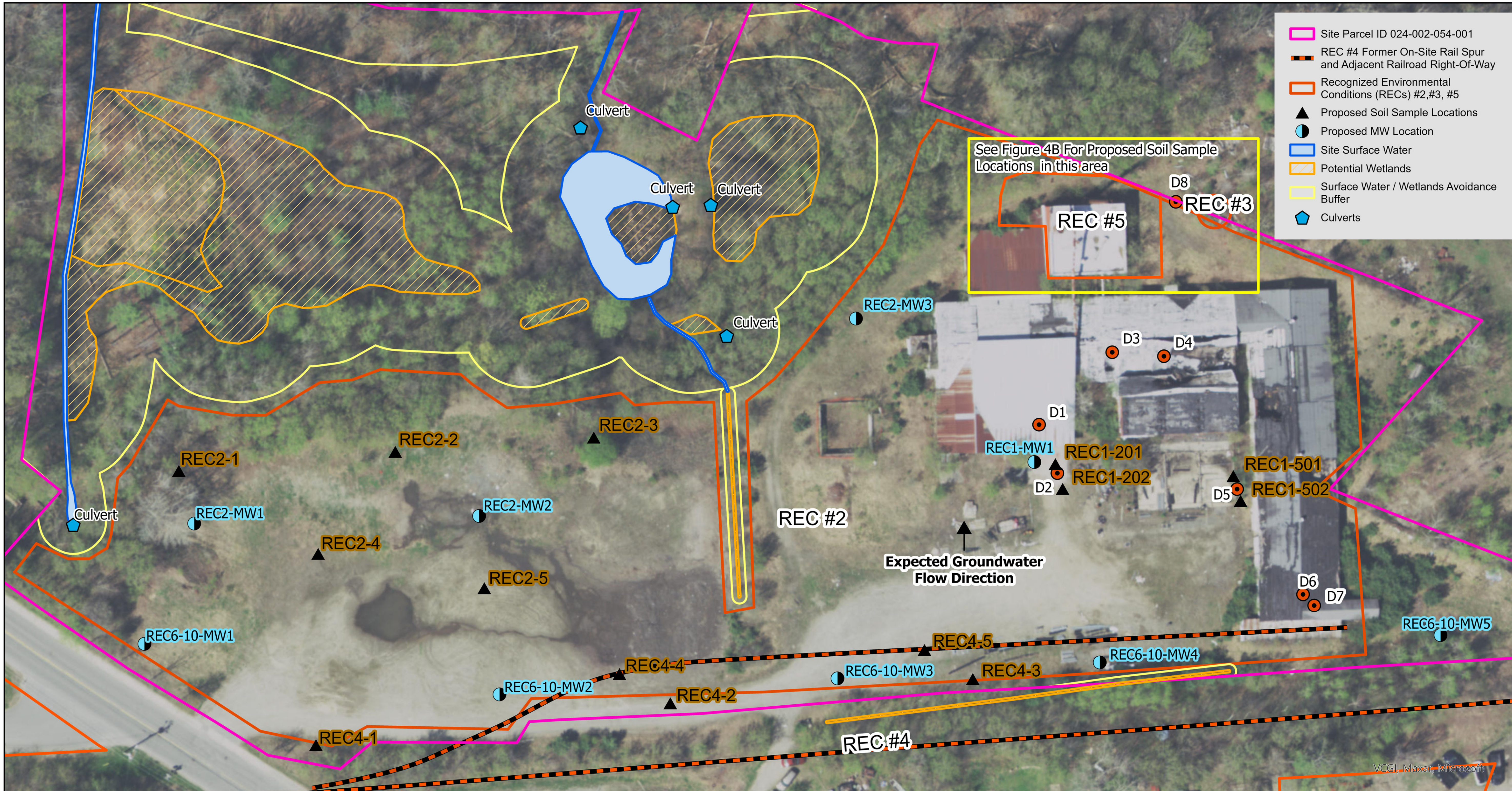

NOTES:
REC #1: Observed On-Site Petroleum and Hazardous Substance Storage
REC #2: Evidence of On-Site Filling
REC #3: Adjacent Junkyard with Debris Encroachment - 34 Ely Street (Site J)
REC #4: Former On-Site Rail Spur and Adjacent Railroad Right-Of-Way
REC #5: Evidence of On-Site Disposal of Boiler Ash
REC # 6-10: Not Shown: Potential Groundwater Impacts from Off-Site Sources
PROPSOED SAMPLE LOCATIONS ARE TO BE DETERMINED BASED ON FIELD CONDITIONS AND THE RESULTS OF GEOPHYSCIAL AND TEST PIT INVESTIGATIONS

CREATION DATE: NOVEMBER 30, 2023	PROJECT NO: 13733-223544_3.C.04A		FIGURE 4A PROPOSED SAMPLE LOCATIONS
MONTROSE ENVIRONMENTAL	DRAWN BY: RJL	APPRV'D BY: KI	
	CHEK'D BY: AP	REVISION: 0	FORMER TRUE TEMPER - 575 CONCORDE AVENUE ST. JOHNSBURY, VERMONT

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NOTES:
REC #1: Observed On-Site Petroleum and Hazardous Substance Storage (Partially Depicted)
REC #2: Evidence of On-Site Filling (Partially Depicted)
REC #3: Adjacent Junkyard with Debris Encroachment - 34 Ely Street
REC #4: Former On-Site Rail Spur and Adjacent Railroad Right-Of-Way (Not Depicted)
REC #5: Evidence of On-Site Disposal of Boiler Ash
REC # 6-10: Not Shown: Potential Groundwater Impacts from Off-Site Sources
PROPSOED SAMPLE LOCATIONS ARE TO BE DETERMINED BASED ON FIELD CONDITIONS AND THE RESULTS OF GEOPHYSCIAL AND TEST PIT INVESTIGATIONS

0 10 20 40 US Feet

N

CREATION DATE:	PROJECT NO:		FIGURE 4B
NOVEMBER 30, 2023	13733-223544_3.C.04A		PROPOSED SAMPLE LOCATIONS
MONTROSE ENVIRONMENTAL	DRAWN BY: RJL	APPRV'D BY: KI	
	CHEK'D BY: AP	REVISION: 0	FORMER TRUE TEMPER - 575 CONCORDE AVENUE ST. JOHNSBURY, VERMONT

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Appendix A

Site Specific (QAPP QA#24013)
Worksheet #9 PROJECT PLANNING SESSION SUMMARY AND SCOPPING MEETINGS

Worksheet #9: PROJECT PLANNING SESSION SUMMARY AND SCOPING MEETINGS

Project Scoping/Planning Session Partcipants Sheet

Project Name	Brownfields Assessment Grant (Cooperative Agreement No. 4B-00A01260)		**Site Name**	Former True Temper Site	
Projected Date(s) of Sampling	Within 60 days of Phase II ESA Workplan Approval or as Weather Permits (January-March 2023)		**Site Location**	575 Concord Avenue, St. Jonhsburn, VT	
Program Manager	Andrea Pedersen				
Date of Session	TBD, will occur at least two weeks prior to field mobilization activities				
Scoping/Planning Session Purpose:	TBD, typically a kick-off meeting to discuss site work and schedule				
Name	**Title**	**Affiliation**	**Phone #**	**E-Mail Address**	**Project Role**
TBD	Brownfields Project Manager	VTDEC	TBD	TBD	VTDEC Site Manager
Christine Beling	Brownfields Project Manager	EPA Region 1	617-918-1792	beling.christine@epa.gov	EPA Site Manager
Andrea Pedersen	Senior Environmental Professional III	Montrose Environmental Solutions, Inc.	425-308-1727	anpedersen@montrose-env.com	Grantee Program Manager
Ana Mora	Corporate Safety Director	Montrose Environmental Solutions, Inc.	816-206-0791	anamora@montrose-env.com	Health and Safety Officer
Lydia Work	Principal Chemist / Director of Operations	Montrose Environmental Solutions, Inc.	304-552-1442	lwork@montrose-env.com	Quality Assurance Manager
Adam Doubleday	Senior Scientist	Montrose Environmental Solutions, Inc.	610-639-2749	adoubleday@montrose-env.com	Field Team Leader
Robin Hunter	Senior Biologist	Montrose Environmental Solutions, Inc.	203-848-9977	rohunter@montrose-env.com	Aquatic Resource Assessment Team Leader
Angela Rossi	Site Owner	Rossi Realty	970-376-4269	angela@rossirealtygroup.com	Site Owner
Comments/Decisions: *Discuss schedule and anticipated scope of work*					
Action Items: *TBD*					

Notes:

EPA: U.S. Environmental Protection Agency

VTDEC: Vermont Department of Environmental Conservation

Appendix B

RBM Strategy, Additional Documentation:
1-Eastern Analytical SOPs and
2- Lead-Based Paint Survey Field Instrument (Heuresis Model pb200i) Performance Characteristic Sheet

Standard Operating Procedure

QA45600_00_8081B_8082A_608.3

Method 8081B, 8082A and 608.3 Pesticides and PCB Analysis

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EASTERN ANALYTICAL, INC.
25 Chenell Drive
Concord, NH. 03301

Position	Role/Task	Signature	Date
Dept Mgr	Auth/Review	[signature]	8.3.18
Technical Director	Reviewed	[signature]	8.3.18
QA Officer	Validated	[signature]	8.3.18

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1 Scope and Application

1.1 This standard operating procedure (SOP) covers the steps required to perform the analysis of Organochlorine Pesticides and PCB Aroclors in aqueous and solid samples. This is a summary SOP for internal use by EAI. The procedures outlined in EPA Method 608.3, SW-846 Method 8081B and 8082A are followed with the addition of laboratory specific procedures as described below.

1.2 This method is restricted to the use by or under the supervision of an analyst experienced in the use of a gas chromatograph. Each analyst must demonstrate the ability to generate acceptable results with this method.

1.3 A list of target analytes and reporting limits are as follows:

Compound Name	CAS#	Aqueous ug/L	Soil mg/Kg	Oil mg/kg
Aldrin	309-00-2	0.05	0.005	
alpha-BHC	319-84-6	0.05	0.005	
beta-BHC	319-85-7	0.05	0.005	
Lindane (gamma-BHC)	58-89-9	0.05	0.005	
delta-BHC	319-86-8	0.05	0.005	
Technical Chlordane	57-74-9	0.1	0.02	
4,4'-DDT	50-29-3	0.05	0.005	
alpha-Chlordane	5103-71-9	0.05	0.005	
gamma-Chlordane	5103-74-2	0.05	0.005	
4,4'-DDE	72-55-9	0.05	0.005	
4,4'-DDD	72-54-8	0.05	0.005	
Dieldrin	60-57-1	0.05	0.005	
Endosulfan I	959-98-8	0.05	0.005	
Endosulfan II	33213-65-9	0.05	0.005	
Endosulfan Sulfate	1031-07-8	0.05	0.005	
Endrin	72-20-8	0.05	0.005	
Endrin Aldehyde	7421-93-4	0.05	0.005	
Endrin Ketone	53494-70-5	0.05	0.005	
Heptachlor	76-44-8	0.05	0.005	
Heptachlor Epoxide	1024-57-3	0.05	0.005	
Methoxychlor	72-43-5	0.05	0.005	
Toxaphene	8001-35-2	0.5	0.05	
PCB-1016	12674-11-2	0.2	0.02	1.0
PCB-1221	11104-28-2	0.2	0.02	1.0
PCB-1232	11141-16-5	0.2	0.02	1.0
PCB-1242	53469-21-9	0.2	0.02	1.0
PCB-1248	12672-29-6	0.2	0.02	1.0
PCB-1254	11097-69-1	0.2	0.02	1.0
PCB-1260	110996-82-5	0.2	0.02	1.0
PCB-1262	37324-23-5	0.2	0.02	1.0
PCB-1268	11100-14-4	0.2	0.02	1.0

1.4 Method performance: Laboratory specific method performance is documented with MDL/LOQ and IDC/CDC studies. A MDL and IDC study are performed at method startup while MDL/LOQ and CDC studies are performed annually. This data is retained for a minimum of 10 years. Current data for MDLs/LOQs and IDCs can be found in the QC folder on the EAI LIMS. Method performance may also be found in the referenced methods.

1.5 Definitions: All applicable definitions can be found in the EAI QA/QC Manual.

2 Summary of Method

2.1 Samples are serially extracted with a solvent employing one of the following organic extraction and sample prep methods:

2.1.1 EPA Method 3510, Aqueous by Separatory Funnel Liquid-Liquid Extraction

2.1.2 EPA Method 3540, Solids by Soxhlet Extraction

2.1.3 EPA Method 3545, Solids by Pressurized Fluid Extraction

2.1.4 EPA Method 3580, Non-Aqueous Phase Liquid by Waste Dilution

2.2 Sample clean-up procedures are employed if necessary. Refer to EPA 608.3 and SW-846 Method 3600C for cleanup procedures.

2.3 The solvent extract is then analyzed by gas chromatography with an electron capture detector (GC/ECD). Identification and confirmation of target compounds are determined on a dual column analysis system. The data is continuously collected and stored on a computer system with the appropriate software.

3 Sample Preservation, Containers, and Storage

3.1 Aqueous samples are collected unpreserved in 1L amber glass containers. Soil samples are collected unpreserved in 4 oz. amber glass containers.

3.2 Aqueous samples must be extracted within 7 days of sample collection. Solid samples must be extracted within 14 day of sample collection. Extracts must be analyzed within 40 days of extraction.

3.3 Samples are stored in the Extractions sample refrigerator at 4 ± 2°C.

3.4 Extracts are stored in the Extractions extract freezer at -15 ± 5°C.

4 Health and Safety

4.1 The toxicity of reagents and target analytes used in this method are not precisely defined. Exposure to these chemicals must be reduced to the lowest possible level. This may be done with the use of personal protective equipment such as: latex or nitrile gloves, safety glasses and lab coats. Standards must be prepared in a fume hood, when applicable.

4.2 The MSDS sheets for all chemicals in-house are kept on file and may be used as a reference to answer specific questions.

4.3 Reference EPA Method 608.3 and SW-846 Method 8081B and 8082A for specific compounds known or suspected to be a carcinogen.

5 Interferences

5.1 All blanks, samples and spikes must be evaluated for interferences. Determine if the source of the interference is from the sampling, handling and preparation, or from the instrument.

5.2 Samples collected in plastic may produce phthalate contamination. Prevent the samples and solvent extracts from making contact with latex gloves and other plastic surfaces.

5.3 Sample extract contamination via carryover may occur whenever high-concentration samples are analyzed. Whenever an unusually highly concentrated sample is encountered, it should be followed by the analysis of solvent to check for cross-contamination with no samples analyzed until a clean solvent blank has been run.

6 Apparatus and Materials

6.1 Agilent 7890A Gas Chromatograph w/ µECD and Chemstation software version G1701EA
6.2 Agilent 7693 autosampler
6.3 Stx-CLPesticides I - 30 meters, 0.25 mm ID, and 0.25 um df
6.4 Stx-CLPesticides II - 30 meters, 0.25 mm ID, and 0.20 um df
6.5 Siltek guard column
6.6 10uL Agilent auto sampler syringe
6.7 11mm Thermolite septa
6.8 4mm gooseneck splitless liner
6.9 Viton fluorocarbon o-rings
6.10 Gold-plated inlet seal
6.11 Silanized glass wool
6.12 Glass wool puller/inserter
6.13 Teflon/NSC silicone 11mm crimp seals
6.14 Target vial 12x32mm
6.15 Graphite ferrules for GC inlet, (1/16” x 0.8mm)
6.16 Hamilton gas-tight syringes – various sizes as needed, from 10uL to 1mL.
6.17 Gases , Ultra High Purity, (99.999%)
6.17.1 UHP Helium
6.17.2 UHP Nitrogen

7 Reagents and Standards

7.1 Hexane - pesticide grade
7.2 Primary Source Stocks
7.2.1 Pesticides stock (includes surrogates), 200ug/mL, Absolute #92348
7.2.2 Technical Chlordane stock, 1,000ug/mL, Restek #32021
7.2.3 Toxaphene stock, 1,000ug/mL, Restek #32005
7.2.4 Surrogate Mix, 200ug/mL, Restek #32000
7.2.5 DDT/Endrin Breakdown Check Mix, 100ug/mL, Restek #32093
7.2.6 Aroclor 1016 stock, 1,000ug/mL, Restek #32006
7.2.7 Aroclor 1221 stock, 100ug/mL, Accustandard #C-221S-H
7.2.8 Aroclor 1232 stock, 100ug/mL, Accustandard #C-232S-H
7.2.9 Aroclor 1242 stock, 100ug/mL, Accustandard #C-242S-H
7.2.10 Aroclor 1248 stock, 100ug/mL, Accustandard #C-248S-H
7.2.11 Aroclor 1254 stock, 100ug/mL, Accustandard #C-254S-H
7.2.12 Aroclor 1260 stock, 1,000ug/mL, Restek #32012
7.2.13 Aroclor 1262 stock, 100ug/mL, Accustandard #C-262S-H
7.2.14 Aroclor 1268 stock, 100ug/mL, Accustandard #C-268S-H
7.3 2nd Source Stocks
7.3.1 Pesticides stock, 200ug/mL, Restek #32291
7.3.2 Technical Chlordane stock, 1,000ug/mL, Supelco #48065-U
7.3.3 Toxaphene stock, 1,000ug/mL, Supelco #4-8103
7.3.4 Aroclor 1016 stock, 100ug/mL, Accustandard #C-216S-H
7.3.5 Aroclor 1221 stock, 1,000ug/mL, Restek #32007

7.3.6 Aroclor 1232 stock, 1,000ug/mL, Restek #32008
7.3.7 Aroclor 1242 stock, 1,000ug/mL, Restek #32009
7.3.8 Aroclor 1248 stock, 1,000ug/mL, Restek #32010
7.3.9 Aroclor 1254 stock, 1,000ug/mL, Restek #32011
7.3.10 Aroclor 1260 stock, 100ug/mL, Accustandard #C-260S-H
7.3.11 Aroclor 1262 stock, 1,000ug/mL, Restek #32409
7.3.12 Aroclor 1268 stock, 1,000ug/mL, Restek #32410

7.4 Pesticides multi-point calibration, Primary Source

Pesticides/Surrogate Calibration (ug/ml)		Pesticides Stock			Final Volume Hexane
2.0 (Intermediate)	=	100 uL			10mL
0.005	=	25uL	of 2.0 ug/mL	Intermediate	10 mL
0.01	=	50uL	of 2.0 ug/mL	Intermediate	10 mL
0.025	=	125uL	of 2.0 ug/mL	Intermediate	10 mL
0.05	=	250uL	of 2.0 ug/mL	Intermediate	10 mL
0.1	=	500uL	of 2.0 ug/mL	Intermediate	10 mL
0.15	=	750uL	of 2.0 ug/mL	Intermediate	10 mL
0.25	=	1250uL	of 2.0 ug/mL	Intermediate	10 mL

7.5 Pesticides ICV, 2nd Source

Pesticides/Surrogate ICV (ug/ml)		Pesticides Stock	Final Volume Hexane
0.1	=	5uL	10mL

7.6 Technical Chlordane or Toxaphene multi-point calibration, Primary Source
7.6.1 The 1.0ug/mL calibration point may also be used as a singlepoint calibration.

Chlordane or Toxaphene Calibration (ug/ml)		Chlordane or Toxaphene Stock			Final Volume Hexane
1.0	=	10 uL			10mL
0.1	=	100uL	of 1.0	singlepoint	1 mL
0.5	=	500uL	of 1.0	singlepoint	1 mL

7.7 Technical Chlordane/Toxaphene ICV, 2nd Source

Chlordane or Toxaphene ICV (ug/ml)		Chlordane or Toxaphene Stock	Final Volume Hexane
0.5	=	5uL	10mL

7.8 Aroclor 1016/1260 multi-point calibration, Primary Source

PCB/Surrogate Calibration (ug/ml)		Aroclor 1016 Stock	Aroclor 1260 Stock	Surrogate Mix Stock	Final Volume Hexane
10/2 (Intermediate)	=	100 uL	100 uL	100 uL	10mL
0.025/0.005	=	25uL	of 10/2 ug/mL	Intermediate	10mL
0.04/0.008	=	40uL	of 10/2 ug/mL	Intermediate	10mL
0.1/0.02	=	100uL	of 10/2 ug/mL	Intermediate	10mL
0.25/0.05	=	250uL	of 10/2 ug/mL	Intermediate	10mL
0.5/0.1	=	500uL	of 10/2 ug/mL	Intermediate	10mL
0.75/0.15	=	750uL	of 10/2 ug/mL	Intermediate	10mL
1/0.2	=	1000uL	of 10/2 ug/mL	Intermediate	10mL

7.9 Aroclor 1016/1260 ICV, 2nd Source

PCB ICV (ug/ml)		Aroclor 1016 Stock	Aroclor 1260 Stock	Final Volume Hexane
0.5	=	50uL	50uL	10mL

7.10 Single Aroclor multi-point calibration, Primary Source

7.10.1 The 1.0 calibration point may also be used as a singlepoint calibration.

Single Aroclor Calibration (ug/ml)		Single Aroclor Stock			Final Volume Hexane
1.0	=	100 uL			10mL
0.1	=	100uL	of 1.0	singlepoint	1 mL
0.5	=	500uL	of 1.0	singlepoint	1 mL

7.11 Single Aroclor ICV, 2nd Source

Single Aroclor ICV (ug/ml)		Single Aroclor Stock	Final Volume Hexane
0.5	=	5 uL	10mL

7.12 DDT/Endrin Breakdown Check Standard

DDT/Endrin (ug/ml)		DDT/Endrin Mix Stock	Surrogate Stock	Final Volume Hexane
0.25	=	25 uL	12.5 uL	10mL

8 Procedure

8.1 Perform routine daily maintenance prior to instrument analysis. Daily maintenance may include changing the septum, inlet liner, gold seal, clipping the front end of the guard column, and filling the syringe rinse vials. To reduce inlet and column oxidation due to exposure to air, it is recommended to lower the inlet and GC oven temperature to below 100^0C.

8.2 Non-routine maintenance is performed on an as needed basis. This includes but is not limited to column replacement, injection port cleaning, or other troubleshooting activities. Record non-routine maintenance activities in the GC/ECD maintenance log.

8.3 GC/ECD acquisition conditions:

8.3.1 See PEST.M and PCB.M on the instrument control panel for sample acquisition parameters.

8.4 DDT/Endrin Breakdown Check

8.4.1 A standard containing DDT and Endrin is analyzed at the beginning of each pesticide analytical sequence. DDT breakdown is evaluated by comparing the total combined response of DDD and DDE to the total combined response of DDT, DDD, and DDE. Endrin breakdown is evaluated by comparing the total combined response of Endrin Aldehyde and Endrin Ketone to the total combined response of Endrin, Endrin Aldehyde, and Endrin Ketone. DDT and Endrin breakdown should be ≤15% for EPA 8081B and ≤20% for EPA 608.3. Analysis of standards or sample extracts may not begin until an acceptable breakdown check has been analyzed.

8.5 Calibration (ICAL)

8.5.1 An ICAL is analyzed when a calibration verification does not pass acceptance criteria or whenever major instrument changes or maintenance is performed, such as new column installation.

8.5.2 Analyze a multipoint calibration on each column at a minimum of 5 points (6 points for quadratic regression). For Aroclors other than PCB 1016 and 1260, a singlepoint calibration is analyzed. Begin analysis with the least concentrated standard and progress to the highest.

8.5.3 For individual pesticide analytes, integrate each peak in each calibration point.

8.5.4 For technical chlordane and toxaphene, establish the retention time elution range of the pattern and integrate the corresponding area of the pattern in each calibration point.

8.5.5 For PCBs, select 5 representative peaks within each Aroclor and integrate each peak in each calibration point.

8.5.6 Update the quantitation method in Enviroquant and establish the response factor or regression for each peak or pattern area.

8.6 Calibration Evaluation

8.6.1 If the percent relative standard deviation (%RSD) of the response factor is ≤20%, linearity through the origin may be assumed and the average response factor may be used instead of a calibration curve.

8.6.2 Alternatively, a linear or quadratic calibration curve may be used if the % RSD criterion is not satisfied or they produce a better fit.

8.6.2.1 Linear regression: To use linear regression, the calibration must include a minimum of 5 calibration points. The regression coefficient "r^2" must be ≥0.990 ("r" ≥0.995).

8.6.2.2 Quadratic regression: To use quadratic regression, the calibration must include a minimum of

6 calibration points. The regression coefficient "r^2" must be ≥0.990 ("r" ≥0.995).

8.6.3 When a curve is established using linear or quadratic regression, requantitate the calibration standard for each analyte at the reporting limit. The recalculation should be within 30% of the true standard concentration. If not, the reporting limit must be raised to the value of the next calibration point that exhibits acceptable recoveries.

8.7 Independent Calibration Verification (ICV) is performed after each calibration at a midpoint concentration. A percent recovery of ±20% is considered valid.

8.8 Calibration Verification (CV)

8.8.1 A CV is performed daily before each analytical batch with a midpoint standard from the calibration curve.

8.8.2 The CV is analyzed at the beginning of the analytical sequence, every 20 injections, and at the end of the sequence.

8.8.3 Evaluate the CV by determining the % recovery for each analyte. See Appendix A for acceptance limits.

8.8.4 If the CV does not pass acceptance criteria, evaluate the sample for the presence of target analytes. If the CV fails high and the sample is non-detect, the data may be reported. If the CV fails high and the samples contain target analytes, the samples must be re-analyzed in a valid window. If the CV fails low, regardless if analytes are present or not, the samples must be re-analyzed in a valid window.

8.9 Quality Control Samples

8.9.1 Method Blank: a blank is analyzed once per batch or every 20 samples.

8.9.2 Single Component Laboratory Control Sample (LCS): a single component pesticide LCS is analyzed once per batch or every 20 samples. A single component pesticide LCS Duplicate is also analyzed if insufficient volume exists for an MS/MSD.

8.9.3 Multi-Component Laboratory Control Sample (LCS): a multi-component PCB LCS is analyzed if target analytes include PCBs.

8.9.4 Single component pesticide LCSs and multi-component PCB LCSs may be analyzed on a rotating batch basis, however, both LCSs must occur at least once per 20 samples.

8.9.5 Matrix Spike (MS) and Matrix Spike Duplicate (MSD): a single component MS and MSD is analyzed on 5% of the samples from each discharge being monitored. If insufficient sample volume is provided, then an MS/MSD may be analyzed on any sample in the extraction batch with sufficient volume.

8.9.6 Method blanks, laboratory control samples, and matrix spikes are subjected to exactly the same analytical procedure as employed on field samples.

8.10 Data Reduction

8.10.1 Upon successful completion of an analytical batch, create a quantitation report for each sample. The report contains the data from both the primary and secondary columns.

8.10.1.1 The area response for each analyte is quantitated against the calibration curve and the on-column concentration is calculated by the software.

8.10.1.2 Save any manual integration in QEdit. Additional guidance can be found in the SOP for Manual Integration.

8.10.1.3 Results determined to be below the lowest calibration standard are considered less than the reportable limit.

8.10.1.4 A reportable individual pesticide hit must have a concentration above the reporting limit, occur within the established retention time window, and be confirmed by the secondary column.

8.10.1.5 A reportable PCB, toxaphene, or chlordane hit must have a concentration above the reporting limit, match the pattern of known standards (typically those used for calibration), and be confirmed by the secondary column.

8.10.1.6 Results determined above the highest calibration are diluted and reanalyzed.

8.10.1.7 Print the quantitation report. After inspecting and accepting the data, date and initial the report.

8.10.2 Instrument results for individual pesticides are in the units of ng/ml. Instrument results for PCBs, chlordane and toxaphene are in the units of ug/ml. The values are entered in the LIMS database, applied to known default parameter conversion values and extraction sample/extract values to derive the final reportable concentrations. Surrogate results are expressed as a percent (%).

8.10.3 For Massachusetts Presumptive Certainty projects, report the higher concentration value of the dual column analysis.

9 Quality Control

9.1 The objectives of the quality control program are to demonstrate that the analytical results obtained meet the quality needs of a project, and to provide the documentation necessary to adequately support the results. There are several components to a quality control program which contribute to the demonstration that a procedure is in control.

9.2 Method Detection Limits (MDL): At method startup or major procedural/instrument modification, annually or as required, a method detection limit study is performed to document a statistical Method Detection Limit, as described in 40 CFR Pt. 136 App. B, Revision 2.

9.3 Limit of Quantitation (LOQ): Annually or as required, a low level standard will be taken through the entire method and evaluated against calculated or method criteria to determine the ability of the method to see concentrations at the lowest reporting level. Typical acceptance limits are 10% wider than those used to evaluate an LCS.

9.4 Initial Demonstration of Capability (IDC): Performed at method startup, after major instrument or procedural modification, and when there is any change in personnel to document that the analyst is capable of generating accurate and precise results. Use the IDC to document precision and accuracy of all new employees. The IDC is a compilation of four LCS samples containing all the compounds to be analyzed. Acceptance criteria is found in Appendix A.

9.5 Stock solution and standard expiration: Purchased stock solutions and prepared standards expire according to the manufacturer's expiration date or one year from preparation date, whichever comes first.

9.6 Retention times: Retention times are established when an initial calibration is analyzed. Laboratory retention time windows are defined by calculating ±3 standard deviations of three retention time measurements over a 72 hour period. If the calculated retention time window is less than 0.01 minutes, then use 0.01 minutes as the window.

9.7 Method Blank

9.7.1 A blank matrix is prepared with every matrix batch of samples to demonstrate the freedom from background contamination. This sample is subject to all reagents, glassware, and procedures as a field sample.

9.7.2 An acceptable blank must have analyte concentrations below the reporting limit. For all analytes, the reporting limit is at or above the first calibration point. If required, estimated blank concentrations may be reported to the MDL.

9.7.3 If Blank concentrations exceed limits, the following procedure is followed.

9.7.3.1 Investigate and document the source of contamination.

9.7.3.2 Initiate and document the steps required to minimize or eliminate the problem.

9.7.3.3 Evaluate the data impact.

9.7.3.3.1 If impacted target analytes are not detected in the field samples, the data may be reported and the blank contamination and reasons for data acceptance are documented internally.

9.7.3.3.2 If the impacted target analytes are detected in the field samples above the reporting limit and greater than ten times the blank level, the results may be reported without additional action.

9.7.3.3.3 If the impacted target analytes are detected in the field samples above the reporting limit but less than ten times the blank level, the samples and QC may first be re-injected to determine if the contamination was instrument related. If the blank still exceeds the limit then the impacted samples should be re-extracted and re-analyzed if sample volume permits.

9.7.3.4 If sample volumes are not sufficient for re-extraction or a clean blank cannot be achieved then the deviation must be noted on the final report and the data qualified. Blank contamination must be included in the QC narrative.

9.8 Lab Control Sample (LCS)

9.8.1 The LCS consists of reagent water or a blank matrix spiked with known analytes at a known concentration. The purpose of the LCS is to monitor the efficiency of sample preparation and analytical procedure. The LCS also provides helpful information necessary to ascertain whether a matrix spike recovery failure is a result of matrix interference or another procedural problem. In the event that adequate sample volumes are not provided for matrix spikes an LCS Duplicate is prepared. Percent recovery and percent RSD are calculated and compared to specific acceptance limits.

9.8.2 The formula for % Recovery is as follows:

$$\% \text{ Recovery} = \frac{SC - UC}{EV} \times 100$$

Where:
SC = Concentration in the spiked sample
UC = Concentration in the unspiked sample
EV = Expected value

9.8.3 The formula for RPD is as follows:

$$RPD = \frac{|R_1 - R_2|}{\left(\frac{R_1 + R_2}{2}\right)} \times 100$$

Where:
R_1 = Results of Sample #1
R_2 = Results of Sample #2

9.8.4 Acceptance criteria is presented in Appendix A. If the percent recovery of a compound exceeds the upper limit criteria, re-extraction is not necessary as long as the sample was non-detect for the compound in question. Note all other exceedances in the laboratory narrative.

9.9 Matrix Spike/Matrix Spike Duplicate (MS/MSD)

9.9.1 A matrix spike consists of a field sample spiked with a known concentration of single component analytes. The matrix spike is used to demonstrate that the field sample matrix has no effect on accurate quantitation.

9.9.2 An MS/MSD should be performed on 5% of the samples from each discharge being monitored. If insufficient sample volume is provided, then an MS/MSD may be analyzed on any sample in the extraction batch with sufficient volume.

9.9.3 Acceptance criteria is presented in Appendix A. If the matrix spike exceeds limits, determine procedural control by reviewing results of the laboratory control sample. If the LCS is in control it may be determined that the procedure is in control. Unless other supporting data can be found, reanalysis of the customer sample may be necessary to demonstrate that the problem is reproducible and thus related to the specific sample matrix.

9.9.4 In the event that the investigation shows the failure is matrix specific, and thus the analytical results generated could be impacted, deviations are documented in a case narrative.

9.10 Surrogates

9.10.1 Surrogates are added to each field and QC sample associated with each batch. Surrogates are used to monitor the prep procedure used, fractionation efficiency, and to verify matrix interference/effects.

9.10.2 Acceptance criteria is presented in Appendix A. If a surrogate recovery is below acceptance limit, re-extraction should be performed, if sample volume and hold time permit. If not, re-inject the extract to confirm the results. Re-extraction or re-analysis is not necessary as long percent recovery exceeds the upper limit criteria and the sample was non-detect for the associated compounds. Re-extraction is also not required if obvious matrix interference is present. Note exceedances in the laboratory narrative.

9.11 Initial Calibration

9.11.1 Initial calibrations are analyzed when a CV to begin an analytical sequence does not meet acceptance criteria or when major instrument maintenance or repairs are performed (i.e. new column installation, new injection port).

9.11.2 Initial calibrations consist of at least 5 points for linear regression and at least 6 points for quadratic regression.

9.11.3 If the percent relative standard deviation (%RSD) of the response factor is ≤20%, linearity through the origin may be assumed and the average response factor may be used instead of a calibration curve.

9.11.4 Alternatively, a linear or quadratic calibration curve may be used if the %RSD criteria is not satisfied or they produce a better fit. Linear or quadratic regressions (not forced through origin) are accepted if the regression coefficient "r^2" is ≥0.990 ("r" ≥0.995).

9.11.5 When a curve is established using linear or quadratic regression, requantitate the calibration standard for each analyte at the reporting limit to determine a valid calculation. The recalculation should be within 30% of the true standard concentration. If not, the reporting limit must be raised to the value of the next calibration point that exhibits acceptable recoveries.

9.12 Independent Calibration Verification (ICV):

9.12.1 An ICV is analyzed after each calibration at a midpoint concentration. The percent recovery of all target analytes must be ≤ 20%.

9.13 Calibration verification (CV):

9.13.1 CV is performed daily before each analytical batch with a midpoint standard from the calibration curve.

9.13.2 The CV is analyzed at the beginning of the analytical sequence, every 20 injections, and at the end of the sequence.

9.13.3 Acceptance criteria is presented in Appendix A. If the CV does not pass acceptance criteria, evaluate the samples for the presence of analytes. If the CV fails high and the samples are non-detect, the data may be reported. If the CV fails high and the samples contain target analytes, the samples must be re-analyzed in a valid window. If the CV fails low, regardless if analytes are present or not, the samples should be re-analyzed unless the failures are due to sample matrix. Note exceedances in the case narrative.

10 Corrective Actions

10.1 The corrective actions outlined in the referenced method(s) are followed.

10.2 The corrective actions outlined in the referenced EAI QA/QC Manual are followed.

10.3 The multipoint calibration is reanalyzed if the daily CV fails the % recovery criteria.

10.4 Samples are reanalyzed at a dilution if an analyte's measured concentration exceeds the calibration range.

10.5 Extraction Blank contamination above acceptance limits is investigated and rectified. If blank contamination impacts data quality of related extraction batch samples, the affected samples should be re-extracted.

11 Safety, Pollution Prevention and Waste Management

11.1 The safety procedures outlined in the EAI Safety Manual are followed.

11.2 Reagents and chemicals should be purchased and/or prepared in volumes consistent with laboratory requirements to minimize the volume disposed.

11.3 The waste generated from the analysis is handled as described in the EAI Lab Safety Manual.

11.4 See SOP QA0000*current revision Waste Disposal for specifics on the disposal reagent wastes.

11.5 Target vials are place in the appropriate waste drum in the waste room after 40 days.

11.6 EAI uses the services of a subcontractor for the transportation and disposal of any wastes deemed to be hazardous. In addition, EAI uses a subcontractor for the disposal of non-hazardous soil and solid samples.

12 References

12.1 EPA 8081B
12.2 EPA 8082A
12.3 EPA 608.3
12.4 EAI Lab Safety Manual* current revision
12.5 EAI QA/QC Manual * current revision
12.6 TNI Standards 2009
12.7 SOP QA0000 Waste Disposal* current revision
12.8 EAI QA667001_ManualIntegration* current revision
12.9 EAI QA664003_MDL* current revision
12.10 EAI QA 665001_DOC* current revision

APPENDIX A

Calibration Verification, Laboratory Control Sample, and Matrix Spike Acceptance Criteria

Name	EPA 608.3 CV %	EPA 608.3 IDC %	EPA 608.3 LCS/MS %	EPA 608.3 RPD	EPA 8081/82 CV %	EPA 8081/82 LCS/IDC %	EPA 8081/82 MS %	EPA 8081/82 RPD aqueous/soil
alpha-BHC	69-125	49-130	37-140	36	80-120	40-140	30-150	20 / 30
gamma-BHC	75-125	43-130	32-140	39	80-120	40-140	30-150	20 / 30
beta-BHC	75-125	39-130	17-147	44	80-120	40-140	30-150	20 / 30
delta-BHC	75-125	51-130	19-140	52	80-120	40-140	30-150	20 / 30
Heptachlor	75-125	43-130	34-140	43	80-120	40-140	30-150	20 / 30
Aldrin	75-125	54-130	42-140	35	80-120	40-140	30-150	20 / 30
Heptachlor Epoxide	75-125	57-132	37-142	26	80-120	40-140	30-150	20 / 30
gamma-Chlordane	75-125	55-130	45-140	35	80-120	40-140	30-150	20 / 30
alpha-Chlordane	73-125	55-130	45-140	35	80-120	40-140	30-150	20 / 30
4,4'-DDE	75-125	54-130	30-145	35	80-120	40-140	30-150	20 / 30
Endosulfan I	75-125	57-141	45-153	28	80-120	40-140	30-150	20 / 30
Dieldrin	48-125	58-130	36-146	49	80-120	40-140	30-150	20 / 30
Endrin	5-125	51-130	30-147	48	80-120	40-140	30-150	20 / 30
4,4'-DDD	75-125	48-130	31-141	39	80-120	40-140	30-150	20 / 30
Endosulfan II	75-125	22-171	1-202	53	80-120	40-140	30-150	20 / 30
4,4'-DDT	75-125	46-137	25-160	42	80-120	40-140	30-150	20 / 30
Endrin Aldehyde	75-125	40-140	40-140	35	80-120	40-140	30-150	20 / 30
Methoxychlor	75-125	40-140	40-140	35	80-120	40-140	30-150	20 / 30
Endosulfan Sulfate	70-125	38-132	26-144	38	80-120	40-140	30-150	20 / 30
Endrin Ketone	75-125	40-140	40-140	35	80-120	40-140	30-150	20 / 30
Chlordane	75-125	55-130	45-140	35	80-120	40-140	30-150	20 / 30
Toxaphene	68-134	56-130	41-140	41	80-120	40-140	30-150	20 / 30
PCB-1016	75-125	61-103	50-140	36	80-120	40-140	40-140	20 / 30
PCB-1221	75-125	44-150	15-178	48	80-120	40-140	40-140	20 / 30
PCB-1232	75-125	28-197	10-215	25	80-120	40-140	40-140	20 / 30
PCB-1242	75-125	50-139	39-150	29	80-120	40-140	40-140	20 / 30
PCB-1248	75-125	58-140	38-158	35	80-120	40-140	40-140	20 / 30
PCB-1254	75-125	44-130	29-140	45	80-120	40-140	40-140	20 / 30
PCB-1260	75-125	37-130	8-140	38	80-120	40-140	40-140	20 / 30
PCB-1262	75-125	40-140	40-140	20	80-120	40-140	40-140	20 / 30
PCB-1268	75-125	40-140	40-140	20	80-120	40-140	40-140	20 / 30
TCMX (surrogate)	75-125	30-150	30-150		80-120	30-150	30-150	
DCB (surrogate)	75-125	30-150	30-150		80-120	30-150	30-150	

ORIGINAL

Standard Operating Procedure

QA3540C_07_Soxhlet

Soxhlet Extraction

Date Effective	Replaces SOP
1/29/2015	QA3540C_06_Soxhlet

EASTERN ANALYTICAL, INC.
25 Chenell Drive
Concord, NH. 03301

Position	Role/Task	Signature	Date
Dept Mgr	Auth/Review	[signature]	2-20-15
Technical Director	Reviewed	[signature]	2-20-15
QA Officer	Validated	Kathleen A Keeley	02-20-15

Section/Page	Modification	Date/Initials	Validated (date/initials)

1 Scope and Application

1.1 This standard operating procedure (SOP) covers the steps required to isolate organic compounds from soil samples using Soxhlet extraction. It also describes concentration techniques suitable for preparing the extract for GC analysis.
1.2 This is a summary SOP for internal use by Eastern Analytical, Inc. (EAI). The procedures outlined in EPA Method 3540C are followed with the addition of laboratory specific modified procedures as specified below.
1.3 This method is restricted for use by, or under, trained analysts. Each analyst must demonstrate the ability to generate acceptable results with this method.
1.4 A list of target analytes and reporting limits are found in the associated analytical methods.
1.5 All applicable definitions can be found in the EAI QA Manual.

2 Summary of Method

2.1 A measured mass of soil sample is dried with sodium sulfate and extracted with methylene chloride employing the soxhlet technique. Extracts are concentrated to a specified final volume and may be solvent exchanged and submitted for extract "clean-up" before analysis.

3 Sample Preservation, Containers and Storage

3.1 Once logged into EAI's database, samples are stored in the appropriate refrigerator at 4 ± 2°C.
3.2 Samples must be collected in pre-cleaned glass containers.
3.3 All soil samples are extracted within 14 days from sample collection. All sample extracts are analyzed within 40 days of sample extraction. The samples are stored in the designated Extractions Laboratory storage refrigerator at 4 ± 2°C. Sample extracts are stored in the designated Extractions Laboratory storage freezer at –15 ºC ±5 ºC, protected from the light, in vials with PTFE-lined caps.
3.4 The sample collection, preservation and handling requirements are found in the referenced EPA Method and/or the EAI QA/QC Manual.

4 Health and Safety

4.1 The toxicity of reagents and target analytes used in this method are not precisely defined. Exposure to these chemicals must be reduced to the lowest possible level. This may be done with the use of personal protective equipment such as: latex or nitrile gloves, safety glasses and lab coats. Standards must be prepared in a fume hood, when applicable. Solvent use should be restricted to a hood whenever possible.
4.2 The MSDS sheets for all chemicals in-house are kept on file and may be used as a reference to answer specific questions.
4.3 Reference the appropriate analytical method for specific compounds known or suspected to be a carcinogen.

5 Interferences

5.1 Solvents, reagents, glassware and other sample hardware may yield artifacts and/or interference to sample analysis. All materials must be demonstrated to be free from interference under analytical conditions by measuring method blanks.
5.2 Sodium Sulfate is thermally purified by baking at 400°C for 4 hours.

5.3 The presence of water in the sample extracts can cause instrumental analysis interferences.
5.4 Samples should not be collected in plastic due to possible phthalate contamination. All contact with plastic materials, such as Tygon tubing, must be avoided.
5.5 Refer to EPA Method 3540C for specific and any other known interferences.

6 Apparatus and Materials

6.1 Soxhlet Extractor, Organomation Associates, Inc., ROT-X-TRACT-S, Solid-Liquid Extractor, capable of maintaining a water bath temperature of 85°C
6.2 Soxhlet extractor glassware
6.3 Allihn condensers
6.4 Water chiller and circulator, capable of maintaining a water temperature of 15°C
6.5 Balance, Top loading, capacity: 4,000 grams, readability: 0.01 grams
6.6 TurboVap® II concentrator
6.7 TurboVap® glass concentrator tubes, 200mL capacity
6.8 Beakers, 250 ml
6.9 Extraction filters, fluted, 24 cm, VWR #28333-087
6.10 Round bottom flask, 250 ml, 24/40
6.11 Disposable pipettes
6.12 Graduated cylinder, 250ml
6.13 Boiling chips, Chemware Ultra-Pure PTFE
6.14 Amber 12mL screw top vial with PFTE lined cap
6.15 Amber 2mL target vial 12x32mm
6.16 11mm crimp seals, PFTE lined
6.17 Gas-tight syringes; 1,000uL, 500uL, 250uL, 100uL, and 25uL
6.18 Spatula stainless steel
6.19 Volumetric flasks, Class A, 10mL, 25mL, 50mL, and 100mL
6.20 Liquid Nitrogen (99.7%), low pressure delivery

7 Reagents

7.1 All preparations are assigned a unique lot number, title and date of preparation. The information is recorded in the EAI LIMS system. Certificates of analysis are kept on file in the Extraction Laboratory.
7.2 Solvents
  7.2.1 Methylene chloride: pesticide residue analysis and spectrophotometry grade
  7.2.2 Hexane: pesticide residue analysis and spectrophotometry grade
  7.2.3 Acetone: pesticide residue analysis and spectrophotometry grade
  7.2.4 Methanol: purge and trap grade
7.3 Sodium sulfate (Na_2SO_4), anhydrous, mesh 12-60. Purify by baking at 400°C for 4 hours.
7.4 Surrogate standard solutions
  7.4.1 Acid, Base/Neutrals Surrogate
    7.4.1.1 Acid Surrogates Mix, 2000ug/mL, ECS #ECS-Z-003
    7.4.1.2 Base/Neutral Surrogates Mix, 1000ug/mL, ECS #ECS-Z-002
  7.4.2 PAH 8270, TPH 8100, DRO 8015, MATEPH Surrogate
    7.4.2.1 P-Terphenyl-d14, 5000ug/ml, Absolute #90714
  7.4.3 Extractable Petroleum Hydrocarbons (EPH) Surrogates

7.4.3.1 EPH Extraction Surrogate, 40ug/ml, Ultra Scientific #ISM-581X. Used as received.
7.4.3.2 EPH Fractionation Surrogate, 40ug/ml, Ultra Scientific #ISM-651X. Used as received.

7.4.4 Pesticide/PCB Surrogate
7.4.4.1 Pesticide/PCB Surrogate, 200ug/ml, Restek #32000

7.5 Matrix Spike Standard Solutions

7.5.1 Acid, Base/Neutrals Spike and Benzidines Spike
7.5.1.1 Semivolatiles Mega Mix, 1000ug/mL, Restek #31850
7.5.1.2 Phenols Mix, 2000ug/mL, ECS #ECS-N-006
7.5.1.3 A-Terpineol, 2000ug/mL, ECS #ECS-N-TERP
7.5.1.4 Benzoic acid, 2000ug/mL, Restek #31879
7.5.1.5 Benzidines Mix at 2000ug/mL, Restek #31030

7.5.2 PAH 8270, TPH 8100, DRO 8015
7.5.2.1 Aromatics Mix, 2000ug/ml, Absolute #51073
7.5.2.2 Composite #2 Fuel Oil, 50,000ug/ml, Ultra Scientific #RGO-616

7.5.3 EPH, MATEPH Spike
7.5.3.1 EPH Matrix Spike, 200ug/ml, Absolute #51044

7.5.4 Pesticide Spike
7.5.4.1 Pesticide Mix, 200ug/ml, Restek #32291

7.5.5 PCB Spike
7.5.5.1 Aroclor 1016, 1000ug/ml, Supelco #4-8097
7.5.5.2 Aroclor 1260, 1000ug/ml, Supelco #4-8056

7.6 Surrogate and Spike Preparation

Surrogates	Volume of Stock	Final Volume (solvent)	Spike Conc. (ug/mL)	Volume spiked per sample
ABN	5mL Acid surr 5mL Base surr	50mL (methanol)	200 100	250uL
PAH/TPH/DRO/ MATEPH	2mL PTP	100mL (methanol)	100	250uL
EPH (Extraction)	used as rec'd	-------	40	1mL
EPH (Fractionation)	used as rec'd	-------	40	1mL
PEST/PCB	1mL TCX,DCB	100mL (methanol)	2	250uL

Matrix Spikes	Volume of Stock	Final Volume (solvent)	Spike Conc. (ug/mL)	Volume spiked per sample
ABN (no Benzidine)	2mL Megamix	40mL (methanol)	50	500uL
	2mL Benzoic acid		100	
	1mL Phenols Mix		50	
	1mL a-Terpineol		50	
ABN (Benzidines)	1mL Benzidines	40mL (methanol)	50	500uL
PAH/TPH/DRO	2.5mL PAH mix	50mL (acetone)	100	250uL
	3mL #2 FO		3000	
EPH/MATEPH	20mL EPH MS	100mL (acetone)	40	1mL
PEST	250uL Pesticides	25mL (methanol)	2	250uL
PCB	400uL ea. PCB	50mL (methanol)	8	250uL

8 Procedure

8.1 Solvent rinse and label the appropriate quantity of beakers, spatulas, round bottom flasks, thimbles and soxhlet glassware.

8.2 Turn on the soxhlet water bath and set to 85°C.

8.3 Turn on the water circulator cooler and set to 15°C.

8.4 Label Quality Control (QC) samples as follows: BLNKS (date, analysis), LCSaS (date, analysis), LCSDS (date, analysis). For example, the first ABN Blank prepped on 2/3/2012, would have an ID of "BLNKS020312ABN1."

8.5 Record the chemical ID number or lot number of all standards and reagents used during the extraction in the Extractions Logbook.

8.6 Weigh 15g sodium sulfate into the Blank, LCS and LCSD designated beakers for all analyses.

8.7 Discard any large rocks, decant water, and weigh approximately 15g homogenized client field samples to each designated beaker for all analyses. Record the actual weight in the corresponding Extractions Logbook.

8.8 Weigh sample mass equivalent of sodium sulfate into the samples. Mix until free-flowing. Do not exceed 30 grams total weight or the sample may not fit into the fluted filter. If percent dry-weight is to be determined, refer to EAI SOP QA-66100.

8.9 Measure 190mL of methylene chloride into each 250mL round bottom flask.

8.10 Add 2-3 Boiling Stones into each round bottom flask.

8.11 Connect the round bottom flask to the soxhlet evaporator and clamp together with a joint clip.

8.12 Transfer the sample into a fluted filter and place into the soxhlet extractor.
8.13 Add the appropriate surrogate and/or spike solution to all QC samples and field samples.
8.14 Place each extractor/flask on the water bath circulator and record the start time and date in the Extractions Logbook.
8.15 Extract samples for 16-24 hours. Record stop time and date in the Extractions Logbook.
8.16 Remove the flask from the water bath and cool to room temperature. Leave the extractor connected to the water chiller while cooling.
8.17 When cool, separate the extractor from the flask and pour any remaining solvent in the extractor into a rinsed turbo tube. Discard the sample.
8.18 Pour the solvent in the flask into the turbo tube.
8.19 Rinse the flask three times, pouring the rinseate into the turbo tube.
8.20 Concentrate the extract in the Zymark TurboVap workstation at 20 psi Nitrogen pressure at a water bath temperature of 35°C.
8.21 ABN, TPH, DRO: Concentrate the extract to just above the 1mL mark on the turbo tube. Rinse the bottom third of the turbo tube with the extract. When the volume is at the 1mL mark, transfer the extract to a 2mL target vial.
8.22 EPH and Pesticides/PCB: Hexane Exchange
 8.22.1 Concentrate the extract to 5-7mL.
 8.22.2 Add 100mL hexane to the turbo tube and swirl until adequately mixed.
 8.22.3 Pesticides/PCB: Continue concentration and bring to a final volume of approximately 4mL. Transfer the extract to a 12mL amber vial. Rinse the turbo with approximately 0.5mL of hexane and transfer to the vial. Bring the extract to a 5mL final volume.
 8.22.4 EPH: Continue concentration to a volume of 5-7mL. Transfer the extract to a 10mL volumetric flask. Add 1mL of fractionation surrogate. Rinse the turbo with approximately 1mL of hexane and transfer to the flask. Bring the extract to volume and transfer to a 12mL amber vial.

9 Quality Control

9.1 The objectives of the quality control program are to demonstrate that the analytical results obtained meet the quality needs of a project, and to provide the documentation necessary to adequately support the results. There are several components to a quality control program which contribute to the demonstration that a procedure is in control.
9.2 Method Detection Limits (MDL): At method startup or major procedural/instrument modification, a method detection limit study must be performed to document a statistical Method Detection Limit, as described in 40 CFR Pt. 136 App. B. A minimum of seven replicates should be analyzed and used to calculate a theoretical minimum concentration that can be measured at a 99% confidence level that the result is greater than zero.
9.3 Limit of Quantitation (LOQ): Annually, after the initial MDL study has been completed, a low level standard will be taken through the entire method and evaluated against calculated or method criteria to determine the ability of the method to see concentrations at the lowest calibration level. Typical acceptance limits are 10% wider than those used to evaluate an LCS.
9.4 Initial Demonstration of Capability (IDC): At method startup, major procedural/instrument modification, or when there is any change in personnel, an initial demonstration of capability must be performed to document that the analyst is capable of generating accurate and precise

results. Use the IDC to document precision and accuracy of all new employees. The IDC is a compilation of four LCS samples containing all the compounds to be analyzed. The average recovery for each analyte is evaluated against LCS acceptance criteria.

9.5 Method Blank: A blank is analyzed with every batch of 20 samples to demonstrate the extraction and analytical process is free from background contamination. This sample is subject to all reagents, glassware, and procedures as field samples.

9.6 LCS/LCS Duplicate: An LCS/LCS duplicate is analyzed with every batch of 20 samples. The LCS consists of a clean matrix spiked with known analytes at a known concentration. The purpose of the LCS is to monitor the efficiency of the sample preparation and analytical procedures. The LCS also provides helpful information necessary to ascertain whether a matrix spike recovery failure is the result of matrix interference or another procedural problem.

9.7 Matrix Spike/Matrix Spike Duplicate: A matrix spike/matrix spike duplicate is analyzed upon request for project specific quality control. A matrix spike consists of a field sample spiked with known analytes at a known concentration. The matrix spike is used to demonstrate that the field sample matrix has no effect on accurate quantitation.

9.8 Surrogates: Surrogate is added to each field and QC sample associated with each batch. Surrogates are used to monitor extraction and analytical procedures, and to identify matrix interferences and effects.

10 Corrective Actions

10.1 The corrective actions outlined in the referenced EAI QA/QC Manual are followed.

10.2 Describe specific corrective actions taken in the Extraction Logbook.

11 Safety, Pollution Prevention and Waste Management

11.1 The safety procedures outlined in the EAI Safety Manual are followed.

11.2 When possible, steps are taken to reduce waste generated from the analysis.

11.3 The waste generated from the analysis is handled as described in the EAI Lab Safety Manual.

12 References

12.1 EPA SW-846, 3rd Edition, with Update IV-A and IV-B, February 2007
12.2 EPA Method 3540C
12.3 EPA Method 8015C
12.4 EPA Method 8100
12.5 EPA Method 8081B
12.6 EPA Method 8082A
12.7 EPA Method 8270D
12.8 MA EPH, May 2004, Rev 1.1
12.9 EAI QA/QC manual, 2010
12.10 TNI Standards, 2009
12.11 NELAC Standards, 2003

Performance Characteristic Sheet

EFFECTIVE DATE: **December 1, 2015**

MANUFACTURER AND MODEL:

Make: ***Heuresis***
Models: ***Model Pb200i***
Source: ***^{57}Co, 5 mCi (nominal – new source)***

FIELD OPERATION GUIDANCE

OPERATING PARAMETERS:

Action Level mode

XRF CALIBRATION CHECK LIMITS:

0.8 to 1.2 mg/cm^2 (inclusive)

SUBSTRATE CORRECTION:

Not applicable

INCONCLUSIVE RANGE OR THRESHOLD:

ACTION LEVEL MODE READING DESCRIPTION	SUBSTRATE	THRESHOLD (mg/cm^2)
Results not corrected for substrate bias on any substrate	Brick	1.0
	Concrete	1.0
	Drywall	1.0
	Metal	1.0
	Plaster	1.0
	Wood	1.0

BACKGROUND INFORMATION

EVALUATION DATA SOURCE AND DATE:

This sheet is supplemental information to be used in conjunction with Chapter 7 of the HUD *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing* ("HUD Guidelines"). Performance parameters shown on this sheet are calculated using test results on building components in the HUD archive. Testing was conducted on 146 test samples in November 2015, with two separate instruments running software version 2.1-2 in Action Level test mode. The actual source strength of each instrument on the day of testing was approximately 2.0 mCi; source ages were approximately one year.

OPERATING PARAMETERS

Performance parameters shown in this sheet are applicable only when properly operating the instrument using the manufacturer's instructions and procedures described in Chapter 7 of the HUD Guidelines.

XRF CALIBRATION CHECK:

The calibration of the XRF instrument should be checked using the paint film nearest 1.0 mg/cm^2 in the NIST Standard Reference Material (SRM) used (e.g., for NIST SRM 2579, use the 1.02 mg/cm^2 film).

If the average (rounded to 1 decimal place) of three readings is outside the acceptable calibration check range, follow the manufacturer's instructions to bring the instrument into control before XRF testing proceeds.

SUBSTRATE CORRECTION VALUE COMPUTATION:

Chapter 7 of the HUD Guidelines provides guidance on correcting XRF results for substrate bias. Supplemental guidance for using the paint film nearest 1.0 mg/cm^2 for substrate correction is provided:

XRF results are corrected for substrate bias by subtracting from each XRF result a correction value determined separately in each house for single-family housing or in each development for multifamily housing, for each substrate. The correction value is an average of XRF readings taken over the NIST SRM paint film nearest to 1.0 mg/cm^2 at test locations that have been scraped bare of their paint covering. Compute the correction values as follows:

> Using the same XRF instrument, take three readings on a bare substrate area covered with the NIST SRM paint film nearest 1 mg/cm^2. Repeat this procedure by taking three more readings on a second bare substrate area of the same substrate covered with the NIST SRM.
>
> Compute the correction value for each substrate type where XRF readings indicate substrate correction is needed by computing the average of all six readings as shown below.
>
> For each substrate type (the 1.02 mg/cm^2 NIST SRM is shown in this example; use the actual lead loading of the NIST SRM used for substrate correction):
>
> Correction value = (1st + 2nd + 3rd + 4th + 5th + 6th *Reading*)/6 - 1.02 mg/cm^2
>
> Repeat this procedure for each substrate requiring substrate correction in the house or housing development.

EVALUATING THE QUALITY OF XRF TESTING:

Randomly select ten testing combinations for retesting from each house or from two randomly selected units in multifamily housing.

Conduct XRF re-testing at the ten testing combinations selected for retesting.

Determine if the XRF testing in the units or house passed or failed the test by applying the steps below. Compute the Retest Tolerance Limit by the following steps:

Determine XRF results for the original and retest XRF readings. Do not correct the original or retest results for substrate bias. In single-family and multi-family housing, a result is defined as a single reading. Therefore, there will be ten original and ten retest XRF results for each house or for the two selected units.

Calculate the average of the original XRF result and the retest XRF result for each testing combination.

Square the average for each testing combination.

Add the ten squared averages together. Call this quantity C.

Multiply the number C by 0.0072. Call this quantity D.

Add the number 0.032 to D. Call this quantity E.

Take the square root of E. Call this quantity F.

Multiply F by 1.645. The result is the Retest Tolerance Limit.

Compute the average of all ten original XRF readings.

Compute the average of all ten re-test XRF readings.

Find the absolute difference of the two averages.

If the difference is less than the Retest Tolerance Limit, the inspection has passed the retest. If the difference of the overall averages equals or exceeds the Retest Tolerance Limit, this procedure should be repeated with ten new testing combinations. If the difference of the overall averages is equal to or greater than the Retest Tolerance Limit a second time, then the inspection should be considered deficient.

Use of this procedure is estimated to produce a spurious result approximately 1% of the time. That is, results of this procedure will call for further examination when no examination is warranted in approximately 1 out of 100 dwelling units tested.

TESTING TIMES:

In the Action Level paint test mode, the instrument takes the longest time to complete readings close to the Federal standard of 1.0 mg/cm^2. The table below shows the mean and standard deviation of actual reading times by reading level for paint samples during the November 2015 archive testing. The tested instruments reported readings to one decimal place. No significant differences in reading times by substrate were observed. These times apply only to instruments with the same source strength as those tested (2.0 mCi). Instruments with stronger sources will have shorter reading times and those with weaker sources, longer reading times, than those in the table.

Mean and Standard Deviation of Reading Times in Action Level Mode by Reading Level		
Reading (mg/cm^2)	**Mean Reading Time (seconds)**	**Standard Deviation (seconds)**
< 0.7	3.48	0.47
0.7	7.29	1.92
0.8	13.95	1.78
0.9 – 1.2	15.25	0.66
1.3 – 1.4	6.08	2.50
≥ 1.5	3.32	0.05

CLASSIFICATION OF RESULTS:

XRF results are classified as **positive** if they are **greater than or equal** to the stated threshold for the instrument (1.0 mg/cm^2), and *negative* if they are *less than* the threshold.

DOCUMENTATION:

A report titled *Methodology for XRF Performance Characteristic Sheets* (EPA 747-R-95-008) provides an explanation of the statistical methodology used to construct the data in the sheets, and provides empirical results from using the recommended inconclusive ranges or thresholds for specific XRF instruments. The report may be downloaded at http://www2.epa.gov/lead/methodology-xrf-performance-characteristic-sheets-epa-747-r-95-008-september-1997.

This XRF Performance Characteristic Sheet (PCS) was developed by QuanTech, Inc., under a contract with the XRF manufacturer.

Appendix C

Aquatic Resource Assessment Report

AQUATIC RESOURCES ASSESSMENT

FORMER TRUE TEMPER SITE, 575 CONCORD AVENUE, ST. JOHNSBURY, VERMONT

Prepared for:

NORTHEASTERN VERMONT DEVELOPMENT ASSOCIATION

36 Eastern Avenue, Suite 1

St. Johnsbury, VT 05819

Contact: David Snedeker, Executive Director

Prepared by: **MONTROSE ENVIRONMENTAL SOLUTIONS, INC.**

Version 1

November 2023

2 New Pasture Road, Unit 5
Newburyport, MA 01950
Robin Hunter
rohunter@montrose-env.com
www.montrose-env.com

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TABLE OF CONTENTS

FIGURES

TABLES

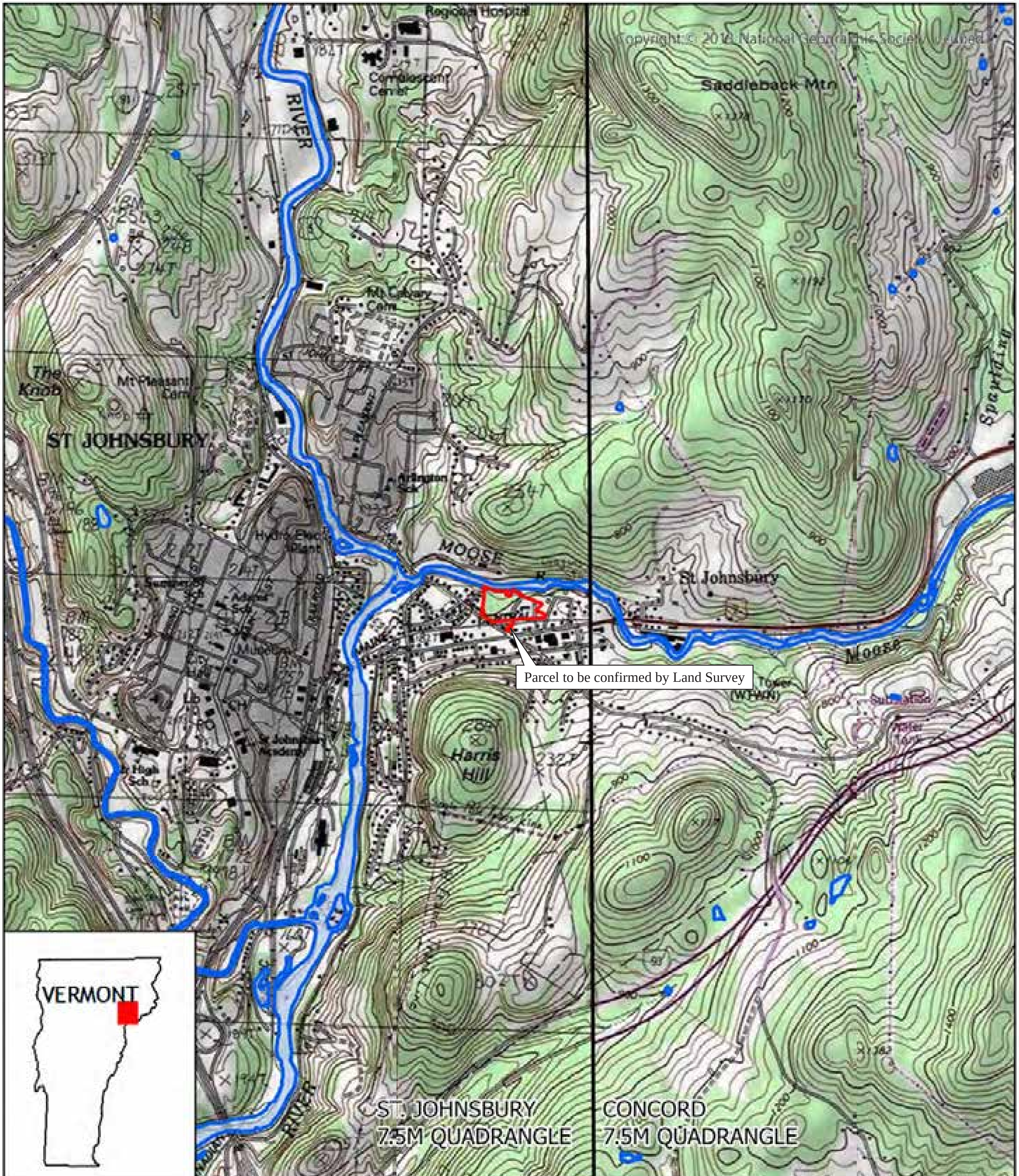
APPENDICES

Acronyms and Abbreviations

msl	mean sea level
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Service
NWI	National Wetland Inventory
OHWM	ordinary high water mark
USDA	U.S. Department of Agriculture
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
°F	degrees Fahrenheit

1.0 INTRODUCTION

Montrose Environmental (Montrose) is preparing a Phase II Environmental Site Assessment (ESA) Work Plan for a 7.7-acre parcel (parcel) located at 575 Concord Avenue, St. Johnsbury, VT (**Figures 1 and 2**). This report presents the methods and results of an aquatic resources assessment conducted within the parcel. This assessment was conducted to identify and describe aquatic resources within the parcel. This information will support the planning of the Phase II ESA. Methods used in this assessment were informed by the U.S. Army Corps of Engineers' (USACE's) 1987 *Wetland Delineation Manual* and the 2012 *Northcentral and Northeast Regional Supplement*; however, this report does not constitute an aquatic resource (preliminary jurisdictional or jurisdictional) delineation for submittal to the USACE, as the results of this assessment are informational only and intended for planning purposes.



Site Parcel

0 1,000 2,000 4,000 US Feet

N

CREATION DATE:	PROJECT NO:	
OCTOBER 23, 2023	13733-223544_3.C.04A	FIGURE 1 SITE LOCATION MAP
MONTROSE	DRAWN BY: RJL / APPRV'D BY: KI	
	CHEK'D BY: AP / REVISION: 0	FORMER TRUE TEMPER SITE - 575 CONCORD AVENUE ST. JOHNSBURY, VERMONT

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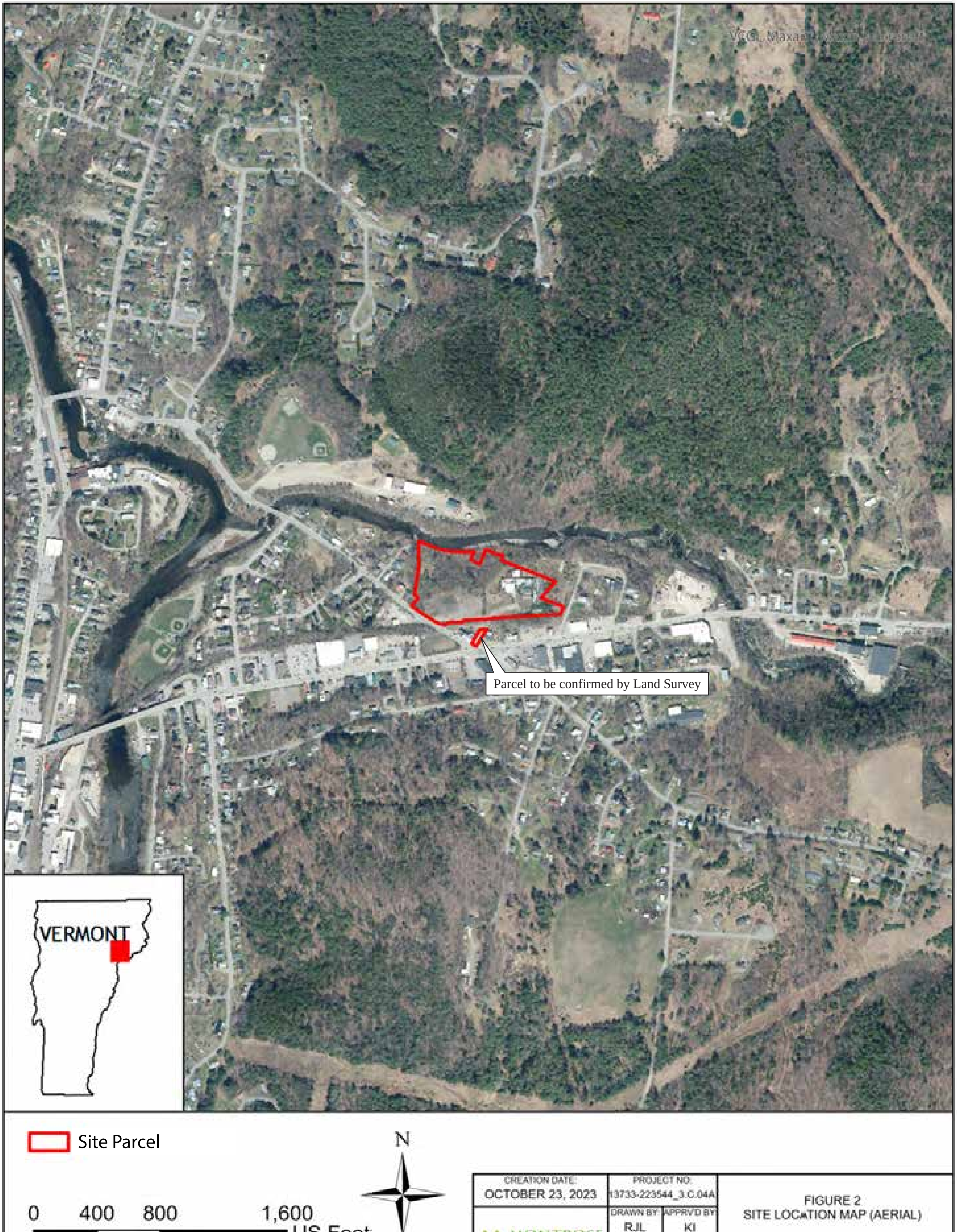

CREATION DATE:	PROJECT NO:		
OCTOBER 23, 2023	13733-223544_3.C.04A		FIGURE 2 SITE LOCaTION MAP (AERIAL)
MONTROSE	DRAWN BY: RJL	APPRV'D BY: KI	
	CHEK'D BY: AP	REVISION: 0	FORMER TRUE TEMPER SITE - 575 CONCORD AVENUE ST. JOHNSBURY, VERMONT

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2.0 LOCATION AND SETTING

The parcel is located along the Moose River in St. Johnsbury, Vermont (Figures 1 and 2). The parcel includes portions of the Moose River, potential wetlands, and ditches potentially subject to USACE jurisdiction. Site photographs are provided in **Appendix A**.

2.1 Land Forms and Topography

The site generally slopes towards the northwest in the direction of the Moose River. The southeastern portion of the parcel is largely flat. There is a steep transition to the floodplain terrace located in the northwestern portion of the parcel and another transition into the active channel of the Moose River. Elevations in the parcel range from approximately 570 to 610 feet above mean sea level (msl).

2.2 Climate

St. Johnsbury has a climate characterized by cold, snowy winters and warm, humid summers. Average temperatures range from a low of 9 degrees Fahrenheit (°F) in January to a high of 81°F in July (National Oceanic and Atmospheric Administration [NOAA] 2023). Average annual precipitation is approximately 40 inches, with precipitation throughout the year (NOAA, 2023).

2.3 Hydrology

The parcel includes several surface water features, including a perennial stream, two intermittent streams, two ditches, two ponded areas, and wetlands. The parcel is located along the south bank of the Moose River. The Moose River flows into the Passumpsic River approximately 0.25 miles downstream of the parcel. The Passumpsic River is a tributary of the Connecticut River, which is defined by USACE as navigable water (USACE, 2006).

2.4 Soils

Two types are present within the parcel. These soil mapping units are listed in **Table 1. Figure 3** shows soils mapped in the parcel (NRCS 2023a). Podunk fine sandy loam, 0 to 3 percent slopes, occasionally flooded is found in the parcel within the floodplain of the Moose River and is included on the U.S. Department of Agriculture (USDA) and NRCS (Natural Resources Conservation Service) list of hydric soils (NRCS, 2023b).

Table 1. NRCS Soil Types Mapped in the Parcel

Map Unit Symbol	Map Unit Name	Map Unit Details	Hydric Soil
31A	Podunk fine sandy loam	0 to 3 percent slopes, occasionally flooded	Yes
104B	Urban land-Adams-Nicholville complex	0 to 8 percent slopes	No

Source: NRCS 2023a, 2023b

2.5 National Wetlands Inventory

Classifications of features mapped in the parcel by the National Wetlands Inventory (NWI) are provided in **Figure 4** (U.S. Fish and Wildlife Service [USFWS] 2023). No surface waters are mapped in the parcel by the NWI, but the Moose River is mapped just north of the parcel.

2.6 Land Use

The parcel was formerly used as a True Temper tool manufacturing facility. The surrounding land use is primarily commercial and light industrial, with scattered residential areas.

2.7 Aquatic Features and Terrestrial Vegetation

This section describes aquatic features and terrestrial vegetation communities present within the parcel. Vegetation within the parcel was noted during field surveys. Botanical nomenclature follows *The Flora of North America* (Flora of North America Editorial Committee 1993), except where synonyms are used by USACE (2023).

2.7.1 Riverine

Riverine habitat within the parcel includes the Moose River as well as two small streams.

2.7.2 Pond

Two ponded areas are present within the north-central portion of the parcel, separated by a berm. The deeper pond is located to the west of the shallower pond. The two ponded areas are hydrologically connected by a 6-inch-diameter culvert. The deeper pond also contains some freshwater marsh habitat, as described below. The banks of both ponds were dominated by glossy false buckthorn (*Frangula alnus*). The shallower ponded area has been categorized as a freshwater marsh; see below.

2.7.3 Freshwater Marsh

Freshwater marsh is present in a portion of the deeper pond and is dominated by cattail (*Typha sp.*)**.** The herbaceous layer of the shallower ponded area is dominated by the non-native species creeping Jenny (*Lysimachia nummularia*).

2.7.4 Wet Meadow

A wet meadow is present in the northwestern portion of the parcel. Dominant species include sedges (*Carex* spp.), common rush (*Juncus effusus*), and several wetland grasses. Forbs including turtlehead (*Chelone* sp.), marsh marigold (*Caltha palustris*), and Joe-Pye weed (*Eutrochium* sp.) are also present. Shrubs are present in low numbers, including red osier dogwood (*Cornus alba*) and willow (*Salix* sp.). Horsetails (*Equisetum* spp.) were locally abundant in some areas of the meadow.

2.7.5 Floodplain Forest

The floodplain of the Moose River in the northwestern portion of the parcel supports a mixed floodplain forest. Common tree species include butternut (*Juglans cinerea*), willow (*Salix* sp.), maples (*Acer* spp.), and box elder (*Acer negundo*). Common understory species include sensitive fern (*Onoclea sensibilis*), glossy false buckthorn, creeping Jenny, and Japanese knotweed (*Reynoutria japonica*).

Site Parcel

Soils

Podunk fine sandy loam, 0 to 3 percent slopes, occasionally flooded

Urban land-Adams-Nicholville complex, 0 to 8 percent slopes

Water

0 60 120 US Feet

N

CREATION DATE: OCTOBER 31, 2023	PROJECT NO: 13733-223544_3.C.04A		FIGURE 3 SOILS
MONTROSE ENVIRONMENTAL	DRAWN BY: RH	APPRV'D BY:	
	CHEK'D BY:	REVISION: 0	FORMER TRUE TEMPER - 575 CONCORDE AVENUE ST. JOHNSBURY, VERMONT

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Site Parcel
Riverine

0 60 120
US Feet

N

CREATION DATE:	PROJECT NO:		FIGURE 4
OCTOBER 31, 2023	13733-223544_3.C.04A		NATIONAL WETLANDS INVENTORY
MONTROSE ENVIRONMENTAL	DRAWN BY: RH	APPRV'D BY:	
	CHEK'D BY:	REVISION: 0	FORMER TRUE TEMPER - 575 CONCORDE AVENUE ST. JOHNSBURY, VERMONT

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2.7.6 Floodplain Wetland

Floodplain wetlands are found in the Moose River floodplain. The vegetation found within the floodplain wetlands is similar to species found in the floodplain forest described above. These areas supported surface water or saturated soils during the site visit.

2.7.7 Wetland Ditch

Wetland ditches are artificial channels that have been excavated for the purpose of conveying water but have remained unmaintained or unmanaged for a duration sufficient to support a dominance of wetland plant species. Wetland ditches in and near the parcel are dominated by species such as horsetail, glossy false buckthorn, and box elder.

2.7.8 Ruderal

Ruderal vegetation is characterized by non-native forbs and grasses in a disturbed habitat, typically along the edges of development or areas with frequent anthropogenic (human-caused) impacts. Within the parcel, successional processes are occurring in the ruderal habitat, and some trees, including white pine (*Pinus strobus*) and red pine (*Pinus resinosa*), are colonizing these areas. In the parcel, ruderal habitat is present in the vicinity of the buildings.

3.0 METHODS

The aquatic resource assessment was informed by the methods described in the 1987 Corps of Engineers Wetland Delineation Manual (USACE 1987) and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcental and Northeast Region (Version 2.0) (USACE, 2012).

3.1 Background Information

The following information was reviewed prior to conducting the assessment:

- NRCS Soil Survey Data (NRCS, 2023a),
- NRCS National Hydric Soils List (NRCS, 2023b), and
- U.S. Fish and Wildlife Service NWI data (USFWS, 2023).

3.2 Field Surveys

Field surveys were conducted on October 23, 2023, by Professional Wetland Scientist (PWS# 3582) Robin Hunter of Montrose Environmental. The surveyor searched the parcel for evidence of wetland indicators such as hydrophytic vegetation, ponding, or saturated conditions. Evidence of the ordinary high-water mark (OHWM) (e.g., presence of bed/banks, scour lines, changes in vegetative cover, changes in soil texture, presence of leaf litter, and debris deposits) was mapped along channels and ponds. The OHWM was used to determine the extent of potential non-wetland waters in the U.S.

The locations of wetland boundaries and OHWM were mapped using the ESRI Field Maps application on an Apple iPad. GPS data were imported into ESRI ArcGIS Pro 3.1.3 software for developing aquatic resource maps. Georeferenced, high-resolution aerial photographs and elevation data were also used in ArcGIS Pro to interpret boundaries of potential waters and wetlands in conjunction with field-collected data. Field notes were collected on maps, hard-copy map sheets, and as comments on the iPad.

3.3 Limitations of Survey

This survey was constrained by the survey timing in late October, when many of the herbaceous species lacked diagnostic features and when many trees had lost their leaves, making vegetation identification more challenging.

4.0 AQUATIC RESOURCES ASSESSMENT RESULTS

This section presents the results of the aquatic resources assessment, which are summarized in **Table 2**. **Figure 5** depicts the spatial extent of aquatic resources in the parcel.

Table 2. Summary of Potential Wetlands and Other Waters of the U.S. in the Parcel

Feature Type	Acres	Square Feet
Wetlands		
Floodplain Wetland	0.355	15,449
Freshwater Marsh	0.124	5,404
Wet Meadow	0.177	7,718
Wetland Ditch	0.012	5,32
Wetlands Total	**0.668**	**29,103**
Other Waters of the U.S.		
Riverine Perennial	0.033	1,468
Riverine Intermittent	0.085	3,713
Other Waters of the U.S. Total	0.118	5,181
Total	0.786	34,284

4.1 Potential Wetlands and Other Waters of the U.S.

4.1.1 Potential Wetlands

A total of 0.668 acres of potential wetlands were mapped within the parcel (Table 3, Figure 5). Potential wetlands within the parcel are described in more detail below.

Freshwater Marsh

A total of 0.124 acres of freshwater marsh was mapped in the parcel, including features WET-4 and WET-5 (Figure 5). The upland-wetland boundary was typically mapped based on the change from hydrophytic vegetation to upland vegetation or, in the case of freshwater marsh adjacent to other wetlands or waters, the change to a different vegetation type or open waters. Dominant species in freshwater marsh included cattail and creeping Jenny.

Floodplain Wetland

Floodplain wetlands were the most abundant wetland type within the parcel. A total of 0.355 acres of floodplain wetlands were mapped in the parcel, including features WET-2, WET-3, and WET-6 (Figure 5). Floodplain wetlands included species such as willow, maples, box elder, sensitive fern, glossy false buckthorn, and creeping Jenny. These features exhibited surface inundation or soil saturation during the survey.

Wetland Ditch

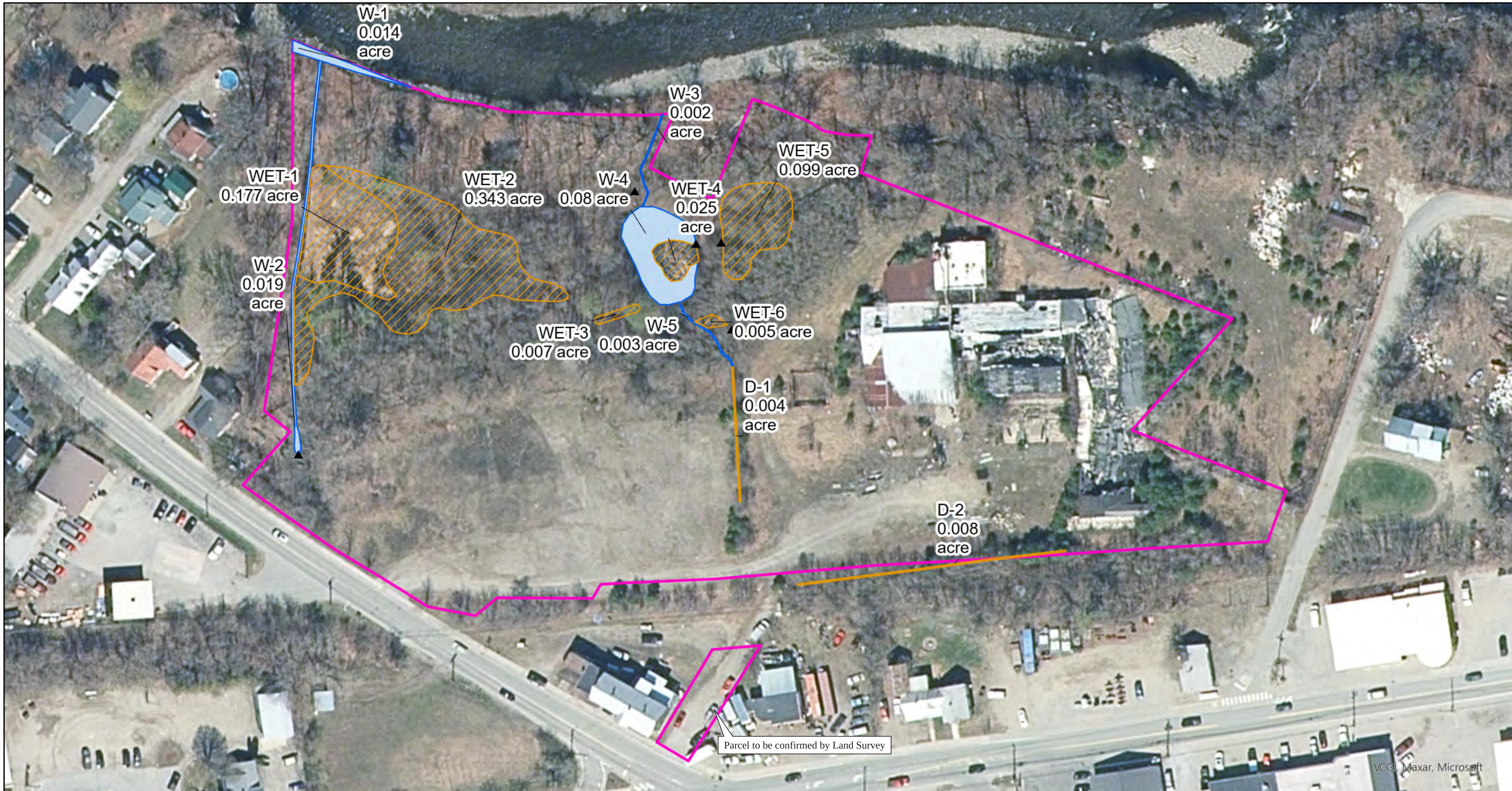
Wetland ditches mapped within the parcel totaled 0.012 acre and include features D-1 and D-2 (Figure 5). These features have been excavated in the past to convey water and currently contain wetland vegetation.

Wet Meadow

A total of 0.177 acres of wet meadow was mapped in the parcel (Figure 5, feature WET-1). The wet meadow supported a diverse assemblage of herbaceous hydrophytic vegetation, including sedges, rushes, and wetland grasses.

Table 3: Aquatic Resources in the Parcel

Aquatic Resource Classification			Location (Decimal Degrees)	Aquatic Resource Size (acre)
Aquatic Resource Code	Type	Cowardin Code		
Potential Wetlands				
WET-1	Wet Meadow	PEM	44.422516, -72.005383	0.177
WET-2	Floodplain Wetland	PFO	44.422434, -72.00511	0.343
WET-3	Floodplain Wetland	PFO	44.422313, -72.004432	0.007
WET-4	Freshwater Marsh	PEM	44.422453, -72.004227	0.025
WET-5	Freshwater Marsh	PEM	44.422539, -72.003951	0.099
WET-6	Floodplain Wetland	PFO	44.422292, -72.004102	0.005
D-1	Wetland Ditch	PSS	44.422008, -72.004017	0.004
D-2	Wetland Ditch	PSS	44.421669, -72.003333	0.008
			Total Potential Wetlands:	**0.668**
Potential Non-Wetland Waters				
W-1	Riverine perennial	R3	44.422957, -72.005424	0.014
W-2	Riverine perennial	R3	44.422609, -72.005524	0.019
W-3	Riverine intermittent	R4SB	44.422742, -72.004309	0.002
W-4	Pond	PUB	44.422494, -72.00435	0.080
W-5	Riverine intermittent	R4	44.422272, -72.00412	0.003
			Total Potential Non-Wetland Waters:	**0.118**
			Total	**0.786**



CREATION DATE: OCTOBER 31, 2023	PROJECT NO: 13733-223544_3.C.04A		FIGURE 5 AQUATIC RESOURCES
MONTROSE ENVIRONMENTAL	DRAWN BY: RH	APPRV'D BY:	
	CHEK'D BY:	REVISION: 0	FORMER TRUE TEMPER - 575 CONCORDE AVENUE ST. JOHNSBURY, VERMONT

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4.1.2 Potential Non-wetland Waters

A total of 0.118 acres of non-wetland waters were mapped within the parcel (Figure 5). These include perennial and intermittent riverine features and a pond, as described in detail below.

Perennial Riverine

A small portion of the Moose River and an unnamed tributary are perennial riverine features within the parcel (0.033 acre) (Figure 5, features W-1 and W-2). Indicators of OHWMs used in the assessment of these features include a break in bank slope, the presence of recent wrack (i.e., drift deposits) and debris, the presence of natural scour lines, and changes in vegetation cover and maturity.

Intermittent Riverine

A total of 0.005 acres of intermittently flowing potential non-wetland waters in the U.S. were mapped (Figure 5, features W-3 and W-5). These features drain into and out of the deeper ponded area (feature W-4, described below). The water source for feature W-5 appeared to include both wetland ditch D-1 and a cracked pipe crossing the feature. These features were mapped based on the following ordinary high-water indicators: break in bank slope, change in vegetation cover, and maturity.

Pond

One pond (0.080 acre) was present in a ponded, non-riverine portion of the parcel (feature W-4) (Figure 5).

5.0 AVOIDANCE RECOMMENDATIONS

The following avoidance buffers are recommended around aquatic resources present within the parcel to avoid adverse impacts on the features:

- Wetland ditches: 5 feet from the edge of the channel.
- Moose River: 50 feet from the top of the bank.
- Intermittent or perennial riverine features other than the Moose River: 25 feet from the top of the bank.
- Pond, freshwater wetland, wet meadow, and floodplain wetland: 50 feet from the edge of the pond or wetland.

Ground disturbance and vegetation clearing should be avoided within these buffers. Drilling of shallow soil borings and/or monitoring wells within the buffer areas using portable drilling equipment outside of the wetlands and waters may occur, as long as substantial ground disturbance does not occur. Collection of surface water and sediment samples within the buffers is permissible. **Figure 6** depicts the recommended avoidance buffers.

Site Parcel
Culverts
Recommended Avoidance Buffers
Waters
Wetland

0 60 120 US Feet

N

CREATION DATE: NOVEMBER 3, 2023	PROJECT NO: 13733-223544_3.C.04A		FIGURE 6 Recommended Buffers
MONTROSE ENVIRONMENTAL	DRAWN BY: RH	APPRV'D BY:	
	CHEK'D BY:	REVISION: 0	FORMER TRUE TEMPER - 575 CONCORDE AVENUE ST. JOHNSBURY, VERMONT

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6.0 SUMMARY

An aquatic resource assessment was conducted on the 7.7-acre parcel located at 575 Concord Avenue, St. Johnsbury, VT (Figure 1). Tables 2 and 3 provide a summary of the aquatic resources in the parcel. A total of 0.118 acres of potential non-wetland waters and 0.668 acres of potential wetlands were mapped within the parcel.

7.0 REFERENCES

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Appendix A – Site Photographs

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Appendix A. Site Photographs

Photo No. 1	**Date:** 10/23/23	**Description:** Moose River (W-1), looking west.	
Photo No. 2	**Date:** 10/23/23	**Description:** Pond W-4 and wetland WET-4, facing southeast.	

Photo No. 3	Date: 10/23/23	
Description: WET-5, facing southwest.		
Photo No. 4	**Date:** 10/23/23	
Description: Intermittent creek W-5 and wetland WET-6, facing northwest.		

Appendix A. Site Photographs

Photo No. 5	Date: 10/23/23	
Description: Culvert outfall and stream W-2. Facing southwest.		
Photo No. 6	**Date:** 10/23/23	
Description: Wet meadow WET-1 in foreground, WET-2 in background. Facing north.		