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REMEDIAL INVESTIGATION WORK PLAN

Former Mele Site
1904 Erie Street
City of Utica, Oneida County, New York

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1.0 INTRODUCTION

HRP has prepared this Remedial Investigation (RI) Work Plan (WP) for the Former Mele Site, located at 1904 Erie Street in the City of Utica, Oneida County, New York (hereinafter referred to as the Site). The Site was previously identified at 1712 Erie Street in Utica, as documented in earlier environmental assessments. The scope of work for the RI portion of this Work Plan incorporates the findings of previous subsurface investigations conducted at the property between 2016 and 2025.

1.1 Purpose and Objectives

This Remedial Investigation (RI) Work Plan outlines the proposed scope of work for the RI, including all proposed field activities, laboratory analyses, and data quality assurance/quality control (QA/QC) evaluations associated with the RI at the Former Mele Site.

The purpose of the RI is to characterize on-site environmental media and work to define the nature and extent of the suspected on-site source(s) of soil, soil vapor, and groundwater contamination associated with the Former Mele Site. In accordance with DER-10 *Technical Guidance for Site Investigation and Remediation (May 2010),* the primary objectives of the RI are to:

- Delineate the linear and vertical extent of contaminants in all media at or emanating from the Site.
- Determine the surface and subsurface characteristics of the Site, including topography, geology, and hydrogeology, including depth to groundwater and groundwater flow gradients.
- Identify the sources of contamination, the migration pathways, and actual or potential receptors of contaminants in soil, bedrock, groundwater, utilities or structures at the Site.
- Determine all actual and potential adverse impacts to fish and wildlife resources using the Fish and Wildlife Resource Impact Analysis (FWRIA) Decision Key included in DER-10 Appendix 3c.
- Collect and evaluate data necessary to evaluate the actual and potential threats to public health and the environment; and
- Collect the data necessary to evaluate releases to environmental media and develop remedial alternative(s) to address identified releases.

1.2 Site Description and Background Information

The Former Mele Site, located at 1904 Erie Street, City of Utica, Oneida County, New York, (**Figure 1**) is the focus of this investigation. The Site consists of a 5.33-acre property which currently consists of a vacant urban lot (**Figure 2**).

The Site is unoccupied and zoned for urban mixed-use land. The area surrounding the Site consists of a combination of commercial, residential, industrial, and vacant land properties. At present, the areas surrounding the property (within 500 feet) include:

- **North:** Vacant land and commercial businesses to the north, northwest, and northeast, with public service properties to the northeast. The Mohawk River Valley is located north of the Site.
- **South:** Industrial, residential, commercial, and vacant properties to the south, southwest, and southeast, along with recreational and public service land to the southwest.
- **East:** Vacant land and commercial properties.
- **West:** Commercial and industrial properties.

The Site is currently vacant and is served by a municipal water supply and sanitary sewer system. No records of septic systems at the Site have been identified in the available records.

According to a representative of the Site owner and historic Sanborn maps, the Site was previously developed as a manufacturing facility in the southeast portion of the Site that was used as a knitting mill in the late 1800's. The site structures also included a storage and packing building, an engine room, and a wash house, as well as multiple coal storage buildings in the northern part of the Site. The western portion of the site was mostly unoccupied and was used as a lumber storage yard and adjoined a former harbor along the Erie Canal. The mill building was further expanded by 1925 to cover the entirety of the eastern portion of the site, including a larger spinning mill, additional storage buildings, an additional engine house, and multiple cisterns, filling in much of the former lumber yard along and adjoining the western portion of the property. The Erie Canal was also filled in by 1925. By 1953 the property was transitioned into Mele Manufacturing, a jewelry box manufacturer with no apparent changes to the buildings during this time. In 2004 the property was mostly unoccupied, however City records indicate that the property contained an indoor auto yard and storage business, however the specific location of these operations on the Site is unknown. By 2006, all buildings on Site were demolished. The location of the former buildings on the Site are depicted on **Figure 2**. The City of Utica subsequently acquired the property through foreclosure on July 30, 2009. The Site is currently vacant land with no on-site structures.

1.3 Previous Investigations

In the preparation of this work plan, HRP reviewed the following previous environmental investigations conducted at the Site:

- *Phase I Environmental Site Assessment* (Phase I ESA) prepared by GHD Consulting Engineers (GHD) and dated April 2012
- *Limited Phase II Environmental Site Assessment* (Phase II ESA) prepared by AECC Environmental Consulting (AECC) and dated December 2016.
- *Supplemental Subsurface Investigation* (SSI) prepared by AECC and dated December 2017
- *Phase II Environmental Site Assessment* (Phase II ESA) prepared by HRP Associates, Inc (HRP) and dated November 2025

Soil headspace screening conducted during the Phase II ESA identified an elevated photoionization detector (PID) reading of 65.9 parts per million (ppm) in soils collected from 10 to 15 feet below grade (ft bg) at boring HRP-SB-5/HRP-MW-5, located in the central portion of the Site in the approximate area of former manufacturing structures. PID headspace screening of soil from the other eight borings did not exceed 0.5 ppm and exhibited no odors or staining.

Groundwater sampling performed as part of the Phase II ESA revealed elevated concentrations of volatile organic compounds (VOCs), specifically trichloroethylene (TCE), in five of the seven groundwater samples collected. The highest TCE concentration, 522,000 micrograms per liter (µg/L), was detected in the sample from HRP-MW-5. Elevated TCE concentrations, ranging from 5.64 to 607 µg/L, were also detected in groundwater samples from four other monitoring wells located in the eastern portion of the Site, adjacent to and within the former Mele Manufacturing building footprint. Cis-1,2-dichloroethylene (cis-1,2-DCE) was detected in three groundwater samples at concentrations ranging from 23.4 to 1,740 µg/L. Several additional chlorinated volatile organic compounds (CVOCs) were detected at elevated concentrations in monitoring well HRP-MW-5. Soil boring and monitoring well locations from current and prior investigations are depicted on **Figure 3**. Groundwater analytical results from Phase II ESA investigations are depicted on **Figure 4**.

Based on the information derived from the Limited Phase II ESA and the Supplemental Phase II ESA Subsurface Investigations, the following conclusions are provided:

- Chlorinated volatile organic solvents are present in soil and groundwater on the eastern side of the Site with very low concentrations in groundwater in the southern central site area. A temporary well installed on the western portion of the Site did not indicate chlorinated solvent contamination and no migration onto the site from the upgradient or southern side of the site was indicated through sampling at on-site upgradient locations. The presence of soil and groundwater contamination will require remediation to comply with NYSDEC soil and groundwater quality standards.
- Polycylcic aromatic hydrocarbons (PAHs) and metals soil contamination is primarily present in the northern portion of the Site (the area at grade with Oriskany Street) and is likely related to the placement of poor-quality urban fill materials in the past. PAH and metals concentrations identified in groundwater in these site areas may be biased high due to the turbidity of the groundwater samples which were collected as grab samples from temporary monitoring wells during the 2016/2017 Phase II ESA investigations.
- Due to the high concentrations of chlorinated solvents in groundwater, vapor intrusion is a concern for future structures erected on the Site.

1.4 Site Geology and Hydrogeology

The Site lies at approximately 430 feet above mean sea level, is relatively flat topographically and dips downward along the northern edge near Oriskany Street. Regional topography slopes moderately upward south of the site and gradually downward to the north towards the Mohawk River, which is present approximately 900 feet north of the Site.

Surficial geology at the Site is mapped as outwash sand and gravel (coarse to fine) associated with proglacial fluvial deposition of variable thicknesses (2-20 meters) (Caldwell et al., 1986). Bedrock geology at the Site is mapped as Utica Shale belonging to the Lorraine, Trenton, and Black River Groups (Rickard et al., 1970). According to the United States Department of Agriculture (USDA)

Natural Resources Conservation Service (NRCS) Web Soil Survey, 100% of the Site area is mapped as Urban Land.

Soil boring logs from the Phase II ESA indicated shallow subsurface soils generally consisted of urban fill from 0 to 10 ft bg, grading to fine-coarse sands, silts, and clay which overlay thick, dense, and highly compacted glacial till, consisting of sand and gravel within a silt and clay matrix. Native materials were observed below fill at approximate depths ranging between 3 and 20 ft bg, where explorations were terminated. Bedrock was not encountered in any identified site investigations, during which borings were advanced to a maximum depth of 20 ft bg.

During Phase II ESA, groundwater was encountered at depths of between 4 and 10 ft bg in temporary and permanent monitoring wells installed on-Site. Groundwater contour maps prepared from site Phase II ESA investigations indicate that groundwater flows to the north/northwest across the Site.

1.5 Areas of Concern

Based on investigations conducted to date, the primary contaminants of concern at the Site are chlorinated volatile organic compounds (CVOCs), principally trichloroethene (TCE) and cis-1,2-dichloroethene (cis-1,2-DCE) in groundwater. As documented in the Phase II ESA, TCE was detected in groundwater samples at concentrations exceeding the NYSDEC TOGS 1.1.1 Class GA groundwater quality standard of 5 µg/L by as much as six orders of magnitude in some samples. The Phase II ESA results indicate that a source area of CVOC contamination is present in soil within the footprint of the former manufacturing building on the eastern half of the Site.

Based on the findings of the Phase II ESA investigations, the following Areas of Concern (AOCs), were identified and require further investigation to fully characterize the nature and extent of the contamination and to evaluate potential exposure pathways.

- The vertical and horizontal extent of contamination in soil, groundwater, and soil vapor has not been fully characterized
- TCE and associated breakdown compounds exceed groundwater quality standards and have not been fully characterized, including the extent of contamination and potential fate and transport of site contaminants.
- The full range and type of soil and groundwater contaminants have not been determined. Additional analyses should include 1,4-dioxane, the full Target Analyte List (TAL) of metals, polychlorinated biphenyls (PCBs), herbicides, pesticides, and per- and polyfluoroalkyl substances (PFAS).

2.0 REMEDIAL INVESTIGATION (RI) SCOPE OF WORK

This scope of work has been developed to collect data necessary to evaluate each project objective outlined in **Section 1.1.** The following sections detail the specific activities that will be performed in support of the Remedial Investigation (RI) at the Former Mele Site.

2.1 Preliminary Activities

As part of the scope of work, the following documents have been prepared:

- Project-Specific Work Plan (this document)
- Site-Specific Health and Safety Plan (HASP) (included as **Appendix A**),
- Community Air Monitoring Plan (CAMP) (included as **Appendix B**)
- Generic Quality Assurance Project Plan (QAPP).

The site-specific elements are provided below.

2.1.1 Work Plan

This RI Work Plan identifies the components of the Remedial Investigation and describes the tasks to be performed, including the specific methods and procedures for field sampling. A proposed project schedule is provided in Section 4.1.

2.1.2 Health and Safety Plan

A Site-Specific Health and Safety Plan is provided in **Appendix A**. The Site-Specific HASP provides guidance to maximize health and safety of on-site workers during RI work-specific tasks including media sampling, installation of wells, surveying and other field related activities. The generic HASP has guidelines for health and safety supervision, air monitoring, medical monitoring, personal protective equipment (PPE), site controls, safe work practices, and decontamination procedures.

2.1.3 Community Air Monitoring Plan

To protect receptors surrounding the Site, HRP has developed and will implement a Community Air Monitoring Plan (CAMP), included as **Appendix B**. The CAMP requires real-time monitoring of volatile organic compounds (VOCs) and dust during all intrusive activities that disturb site soils.

2.1.4 Quality Assurance Project Plan

A Site-Specific Quality Assurance Project Plan (QAPP) has been prepared and is included in **Section 3.0**.

All laboratory analyses will be performed by a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP)-certified laboratory, approved for all categories of Contract Laboratory Protocol (CLP) and Solid and Hazardous Waste analytical testing. A Data

Usability Summary Report (DUSR) will be included in the Remedial Investigation Report (RIR) for each round of analytical work. Category B deliverables will be retained in project files and made available for full data validation by a qualified, independent third party.

2.2 Investigation, Environmental Sampling, and Implementation

The RI will include the components described below and consist of subsurface characterization. The RI will involve characterizing and sampling of the subsurface soil and groundwater to meet project objectives. The number and type of samples to be collected is discussed below and summarized on **Table 1**. Field investigation tasks for the Former Mele Site will be completed in the following sequence:

1. Underground Utility Identification and Clearance using Ground-Penetrating Radar (GPR)
2. Subsurface Soil Investigation (vertical profile soil boring installation, soil screening, sampling, and analysis
3. Groundwater Characterization (installation of supplemental monitoring wells, sampling and analysis of additional groundwater samples, and resampling of existing wells)
4. Soil Gas Characterization (soil gas sampling point installation and sampling of subsurface soil gas)
5. Characterization and Disposal of Investigation-Derived Waste (IDW)
6. Analytical Data Quality Evaluation
7. Base Map Development and a Site Survey

2.2.1 Underground Utility Clearance and Ground Penetrating Radar (GPR)

Prior to implementing any intrusive activities, a utility locating/clearance survey will be conducted. HRP will rely upon multiple lines of evidence to ensure, to the maximum extent practicable, that subsurface features are identified prior to commencement of intrusive work.

HRP will mark sampling locations prior to installation and contact public utility clearance services to mark out the utilities prior to the survey. The drilling contractor will request utility mark outs through NYS Code Rule 753/Dig Safe System. The dig safe system is limited to public rights-of-way and will only identify utilities entering private property rather than utilities present on-site.

HRP will utilize a qualified subcontractor to conduct a ground penetrating radar (GPR) survey to attempt to locate any privately underground structures or utilities within the Site property boundaries to ensure boring areas are clear of obstruction and identify any other potential AOCs.

GPR is a non-destructive and non-intrusive geophysical exploration technique that uses radar waves to detect subsurface objects, such as tanks, drums, and piping. The GPR is also capable of detecting discontinuities in the subsurface materials indicative of excavated and backfilled areas, such as those associated with possible underground storage tanks. The objective of performing this survey is not only to make subsurface investigation as safe as possible for the field staff while protecting utilities, but also to identify possible sources and migration pathways (utility corridors, etc.). All anomalies identified during the GPR survey will be marked out in the field.

If, based on the GPR survey, it is determined that a boring location is near an underground utility or another subsurface anomaly, the boring location may be moved or the upper five ft of the boring location will be cleared by non-mechanical means, such as a hand-digging method.

2.2.2 Subsurface Soil Investigation

To assess the nature of subsurface soil at the Site, the unconsolidated soils will be evaluated at representative locations. It is anticipated that any soil cuttings will be containerized and labelled in 55-gallon drum(s) for proper disposal, if any evidence of contamination is noted during the investigation. Further discussion of investigation derived waste is included in **Section 2.2.7**. These proposed testing locations are provided in **Figure 5**; exact locations may vary based on the results from the GPR survey. Additional borings may be installed as necessary to delineate CVOC contamination if plume boundaries are not adequately characterized within the proposed investigation area.

Proposed sample locations were selected based on Phase II ESA results to delineate CVOC contamination both laterally and vertically in soil and groundwater. Previous sampling identified a source area of CVOC contamination at boring HRP-SB-5, located in the eastern portion of the Site within the footprint of former manufacturing buildings. Previous investigation boring locations and analytical results are depicted in **Figure 3.**

2.2.2.1. Advancement of Exploratory Soil Borings

Approximately 21 temporary soil borings are proposed within a 50-foot grid around the identified CVOC source area and will be advanced using hollow-stem auger and/or direct push methods. Each of the locations will be installed to a maximum depth of 20 ft bg, or until a well-defined boundary of the CVOC impacts in soil is encountered. Installation depths may be adjusted based on field observations, including where staining, odors, or elevated gas chromatograph (GC) screening levels are noted. The proposed soil borings are intended to delineate both horizontal and vertical changes in CVOC soil contamination concentrations vertically and laterally around the previously identified source area located at HRP-SB-5/HRP-MW-5. The proposed vertical profile soil boring locations are depicted on **Figure 5**. Approximately three of the soil borings will be completed as monitoring wells (discussed below in **Section 2.2.4.1**). Depth to bedrock at the Site is unknown. During previous investigations, bedrock was not encountered in borings installed to a maximum completion depth of 20 ft bg. Borings will only be advanced to the point at which CVOC contamination is no longer identified with field screening and end of boring samples will be collected for CVOC lab analysis to confirm vertical contamination depths.

A total of seven soil samples (four regular samples and three QA/QC samples) taken from four temporary soil borings will be analyzed for the following parameters:

- 1,4-Dioxane by EPA Method 5030
- TAL Metals by EPA Method 6010C
- TCL PCBs by EPA Method 8082.
- TCL Chlorinated Herbicides and Pesticides by EPA Method 8081B; and

- PFAS by modified EPA Method 1633A.

All samples will be submitted under chain of custody to a NYSDOH ELAP and NYSDEC approved laboratory. Duplicate and matrix/matrix spike duplicates will be collected at a frequency of one per 20 samples. The sample totals and laboratory analyses are summarized on **Table 1**.

2.2.2.2. Soil Boring Installation and Sampling

Approximately three permanent soil borings will be advanced using hollow-stem auger and/or direct push methods. These will be installed for the purpose of installing permanent monitoring wells to delineate the lateral and vertical extent of CVOC impacts at the Site. Each of the locations will be installed to a maximum depth of 20 ft bg, or until a well-defined limit of CVOC contamination is established or bedrock is encountered. Installation depths may be adjusted based on field observations, including staining, odors, and GC screening concentrations.

During soil boring installation continuous depth soil samples will be collected with a split-spoon sampler in 2-foot intervals (in borings where the hollow stem auger method is used), or with a macro core sampler in 5-foot intervals (where the direct push method is used). Soil samples will be field screened for volatile organic vapors using a Frog-5000 portable gas chromatograph (GC), by Defiant Technologies, Inc. An operations manual for this instrument is included in **Appendix C**. Evidence of CVOC contamination and screening concentrations will be noted and used as criteria for selection of soil samples for laboratory analysis. Continuous depth interval soil samples will be collected from the proposed 21 soil borings. Samples collected for laboratory analysis will be biased to the depth of the water table (approximately 6-10 ft bg), the highest concentrations of contamination, based on GC screening and the depth at which VOC concentrations suggest the is the depth of the bottom of the impacted soil. Soil samples retained for laboratory analysis will also be biased based on field observations (staining, odors, and elevated GC readings). At least one soil sample from each soil boring will be submitted for laboratory analysis (EPA Method 8260) to demonstrate vertical and horizontal limit of the CVOC plume area, based on the field screening results.

2.2.2.3. Soil Sample Collection and Handling Procedures

Nitrile gloves will be always worn by personnel collecting and handling the samples. All non-disposable equipment and tooling used for sampling will be properly decontaminated between sampling locations and intervals. Decontamination procedures are described in **Section 2.2.6**. Soil samples will be collected using clean laboratory-supplied, appropriate containers (as listed in **Table 2**) and will be preserved on ice in coolers during field sampling activities. Target samples will then be submitted for laboratory analysis, and contingency samples will be stored at proper temperatures, as listed in **Table 2**, pending follow-up analysis as necessary. Duplicate and matrix/matrix spike duplicates will be collected at a frequency of a minimum of one duplicate per 20 samples. Field blanks and trip blanks will be included with laboratory samples as specified by the EPA analysis method.

Protocols for the collection and analysis of groundwater samples for per- and polyfluoroalkyl substances (PFAS) will be in accordance with the NYSDEC *Sampling, Analysis, and Assessment of PFAS Under NYSDEC's Part 375 Remedial Programs, April 2023*.

2.2.3 Groundwater Characterization

Groundwater sampling and analysis conducted during previous investigations indicate that the highest concentrations of CVOCs were detected in groundwater collected from monitoring well HRP-MW-5, located within the footprint of former manufacturing buildings. The impacted CVOC plume has been generally characterized, and the plume extent and concentration gradient are depicted on **Figure 4.**

Groundwater characterization proposed for this RI will consist of sampling the existing monitoring wells near and close to the source area, including HRP-MW-5, HRP-MW-7, and HRP-MW-8. The installation of at least three additional monitoring wells will be installed based on observations taken in-field and based on previous investigation data. Three proposed monitoring well locations are pre-selected to supplement the delineation of the CVOC groundwater plume by complimenting the existing network of monitoring wells. The locations of existing and proposed monitoring wells are presented on **Figure 5**. Procedures for monitoring well installation, development, sampling, and instantaneous change in head testing are described in the sections below.

2.2.3.1. Sampling of Existing Monitoring Wells

Groundwater samples will be collected from each of the existing wells described above in accordance with EPA low-flow groundwater sampling procedures and will be submitted to an ELAP certified testing laboratory for analysis of TCL VOCs +10 by EPA Method 8260.

Groundwater samples will be sent to the testing laboratory under chain of custody procedures and analyzed for TCL VOCs +10. Duplicate and matrix/matrix spike duplicates, and field blanks will be collected at a frequency of one per 20 samples. Trip blanks will be submitted at a frequency of one per cooler per day if analysis for VOCs is included in the sampling set within the cooler. The sample laboratory analyses are summarized on **Table 1**.

2.2.3.2. Installation of Proposed Monitoring Wells

An estimated three monitoring wells will be installed to an approximate depth of 20 ft bg co-located with the soil borings described in **Section 2.2.2.2**, but depths may vary due to GC screening results. The wells will be installed within the source area, for the purpose of supplementing the data available within the source area. Proposed supplemental monitoring well locations are depicted on **Figure 5**.

A hollow-stem auger drilling rig will be advanced through the overburden materials and used to set the monitoring wells. The wells will be designed and installed such that the well screen will intersect the observed water table elevation. Monitoring wells are to be constructed of 2-inch diameter, Schedule 40 PVC solid well pipe riser and a ten-foot PVC 10-slot screen. Depending on the location of the well, it will be finished with either a 4-foot stick-up protective casing, or a flush mounted protective cover. All equipment will be appropriately decontaminated between sampling locations, as described in **Section 2.2.6**. Based on well location, any soil cuttings will be containerized as discussed in **Section 2.2.7**.

2.2.3.3. Development of Proposed Monitoring Wells

Each newly installed well will be developed a minimum of 24 hours after completion by pumping and surging until the field parameters stabilize for a minimum of three consecutive readings of 10 percent variability or less. The field parameters include temperature, pH, dissolved oxygen (DO), oxidation/reduction potential (ORP), and specific conductance will be measured and recorded. In addition, the turbidity of the groundwater will be monitored to achieve a reading of 50 Nephelometric Turbidity Units (NTUs) or less, if possible, during the field parameter readings.

All purge water obtained during well development and sampling will be containerized and disposed of in accordance with NYSDEC DER-10. If impacts are observed, the contaminated groundwater will be segregated and handled as described in **Section 2.2.7**. All sampling equipment will be appropriately decontaminated between sampling locations or disposed of after a one-time use as described in **Section 2.2.6**.

2.2.4 Groundwater Sampling

2.2.4.1. Sampling of New and Existing Monitoring Wells

Groundwater samples will be collected from each of the existing and newly installed monitoring wells as a part of this investigation. Depth to groundwater measurements will be collected from all existing and newly installed monitoring wells to the nearest 0.01 feet of depth, as measured from the surveyed points (the survey is discussed in **Section 2.2.9**) prior to sampling activities, and the data will be recorded and used to develop a groundwater contour map to determine the direction of groundwater flow and the hydraulic gradient on the Site. Until deemed unnecessary, in addition to measuring the groundwater level, the wells will be checked for both light and dense non-aqueous phase liquids (LNAPLs and DNAPLs) using an interface probe.

Groundwater samples will be collected from each of the monitoring wells at the Site a minimum of seven days after well development has been completed. All groundwater samples will be collected in accordance with EPA low-flow groundwater sampling procedures and will be submitted to an ELAP certified laboratory for analysis of TCL VOCs +10 by EPA Method 8260. The sample laboratory analyses are summarized on **Table 1**.

2.2.4.2. Groundwater Sample Evaluation

Groundwater samples will be submitted to an ELAP certified environmental laboratory under chain of custody procedures and analyzed for TCL VOCs +10. A total of four groundwater samples will be collected and analyzed for the following characterization parameters:

- TCL SVOCs+20 via EPA Method 8270.
- TCL PCBs by EPA Method 8082.
- Organochloride pesticides by EPA Method 8081B.
- PFAS by EPA Method 1633A; and
- 1,4-dioxane by EPA Method 8270 SIM.
- Total Cyanide by EPA Method 9012B
- TAL Metals by EPA Method 6010D

Samples analyzed for these additional analyses will be collected from monitoring wells within the source area. Duplicate and matrix/matrix spike duplicates, and field blanks will be collected at a frequency of a minimum of one per 20 samples. Trip blanks will be submitted at a frequency of one per cooler per day if analysis for VOCs is included in the sampling set within the cooler. The sample laboratory analyses are summarized on **Table 1**.

Protocols for the collection and analysis of water samples for PFAS will be in accordance with the NYSDEC *Sampling, Analysis, and Assessment of PFAS Under NYSDEC's Part 375 Remedial Programs, April 2023*.

The sample totals and laboratory analyses are summarized on **Table 1.**

2.2.4.3. Instantaneous Change in Head Testing

To evaluate hydraulic conductivity and permeability at selected well locations, instantaneous change-in-head testing (commonly referred to as "slug testing") will be conducted at three monitoring wells across the Site.

At each monitoring well both a falling head (slug-in) test and a rising head (slug-out) test will be performed by submerging and withdrawing a mechanical slug, constructed of Schedule 40 PVC pipe. During each test, water level measurements will be recorded automatically using a pressure transducer data logger programmed to record water levels at intervals of less than one second. Manual water level measurements will also be recorded using an electronic water level tape. Water level readings will be recorded until water level has recovered to within a minimum of 60% of its original level. The mechanical slug, water level tape, and data logger will be appropriately decontaminated between sampling locations, as described in **Section 2.2.6**.

2.2.5 Soil Vapor Sampling

To delineate soil vapor impacts on the Site, an estimated five soil vapor sampling points will be installed/utilized for the collection of soil vapor samples. The two upgradient previously installed monitoring wells, if still dry during the investigation, may be utilized as vapor sampling points (HRP-MW-9 and HRP-MW-4, on the south portion of the Site). Two downgradient soil vapor points will be installed based on locations of receptors and site investigation data to help assess the downgradient soil vapor quality conditions at the Site. An additional soil vapor point will be installed adjacent to the source area near HRP-MW-5. Proposed soil vapor point sampling locations are shown in **Figure 5**. Additional locations may be added based on observations of on-site conditions and screening results from the GC and additional SV monitoring points may be installed along the south side of the site if the previously dry monitoring wells are not deemed suitable as soil gas monitoring points..

Soil vapor points will be installed by advancing a six-inch stainless-steel screen and tubing (nylon, Teflon, or Teflon-lined) to a depth of 10 ft bg into the vadose zone, or no deeper than one foot above the observed groundwater table interface. The annular space around the tubing will be backfilled with a #0 filter sand pack. A minimum six-inch-thick time releasing bentonite (TR-30) seal will be installed to ground surface above the sand pack. Bentonite will be hydrated with potable or distilled water during placement. Each soil vapor point will be finished at the ground surface with a locking road box.

Soil vapor sampling will occur at a minimum of 24 hours after installation of the soil vapor sampling points. All soil vapor sampling will be conducted in accordance with NYSDOH's *Guidance for Evaluating Soil Vapor Intrusion in the State of New York, October 2006.*

Prior to sampling a leak test will be performed using a tracer gas with a minimum of three (3) tubing volumes of air purged from the vapor point. Following purging, soil vapor will be screened for VOCs using a calibrated PID. One (1) soil vapor sample will be collected from each point using a six (6)-liter summa canister fitted with a two (2) hour timed regulator and analyzed for VOCs via EPA Method TO-15.

Up to seven air samples (five soil vapor, one outdoor ambient air, one duplicate soil vapor), will be submitted to an ELAP certified environmental laboratory and analyzed for VOCs via EPA Method TO-15. One outdoor air sample will be collected per day of sampling. Duplicate soil vapor samples will be collected at a frequency of not less than one per 20 soil vapor samples. Sample locations are summarized in **Table 1** and laboratory QA/QC details are summarized on **Table 2**.

2.2.6 Decontamination Procedures

Non-dedicated sampling equipment (i.e., submersible pumps, water level indicators, etc.) will be subject to decontamination procedures prior to each sample collected to reduce the potential for cross-contamination, as described in the Generic Field Activities Plan on file with NYSDEC. The decontamination procedures will include the use of a scrub wash with a solution consisting of Alconox® detergent and potable water followed by a rinse with DI water. The decontaminated equipment will be stored in clean environments (i.e., the manufacturer's storage case). Liquinox® will not be used for decontamination since Liquinox® may contain a small amount of 1,4-dioxane. Decontamination fluids will be properly labeled and securely stored in a designated waste-container staging area.

2.2.7 Disposal of Investigation Derived Waste

Investigative derived waste (IDW) that is generated from the subsurface characterization, monitoring well installation and the development of monitoring wells shall be handled in accordance with NYSDEC DER-10. All containers will be labeled and stored in accordance with applicable NYSDEC regulations.

Soil shall be handled and disposed of in accordance with DER-10. If off-site disposal of IDW is required, it will be disposed of or treated according to applicable local, state, and federal regulations. Soils from the RI may be disposed within the parent boreholes, provided the hole will not be used for the installation of a monitoring well (cuttings may be used to backfill holes resulting from soil sampling), if the borehole did not penetrate an aquitard nor an aquiclude and backfilling the hole with cuttings will not create a significant path for vertical movement of contaminants. To the extent possible soil cuttings should be backfilled in order to preserve natural stratigraphy (i.e., the last soils removed from the borehole will be the first soils returned to the borehole). Soil additives (bentonite) may be added to the cuttings to reduce permeability. Six inches of cohesive, compacted soil will be placed over the area of the hole.

All soil cuttings and spoils which are not disposed of in their original boreholes will be containerized on-site as IDW. Each container will be labeled with the soil boring IDs and depths of soils stored.

Purge water generated during the development of the monitoring wells will require off-site disposal based on the previous Site data. Decontamination fluids will be containerized separately from other RI derived waste, and any decontamination fluids that do not exhibit evidence of contamination will be containerized separately from those exhibiting evidence of contamination.

2.2.8 Analytical Data Quality Evaluation

This RI Work Plan and the associated QAPP (**Section 3.0**) detail the data quality objectives and analytical requirements of this investigation.

The analytical laboratory will maintain NYSDOH ELAP certification in all categories of USEPA Contract Laboratory Program (CLP) and Solid and Hazardous Waste analytical testing for the duration of the project.

The selected ELAP certified environmental laboratory will supply all required data deliverables (USEPA CLP and NYSDEC ASP deliverable format) to enable the data to be validated. All environmental data will be submitted electronically in a specified format named 'NYSDEC' in accordance with the data submission procedures outlined on the NYSDEC's web site (http://www.dec.ny.gov/chemical/62440.html).

Upon receipt of the sample data, the validation contractor will quantitatively and qualitatively validate the laboratory data. The validation of the analytical data will be performed according to the protocols and QC requirements of the analytical methods, the *National Functional Guidelines for Organic Data Review, January 2017* and the *National Functional Guidelines for Inorganic Data Review January 2017*, and the reviewer's professional judgment.

2.2.9 Base Map Development and Site Survey

The subject property and surrounding areas will be surveyed by a New York State licensed land surveyor. The field survey will include establishing project horizontal control and the collection of planimetric features for the development of 2D mapping. Subsequently, a base map of the Site will be developed using Computer Aided-Design (CAD) software that will be utilized to place all sampling locations from current, and to the extent possible, previous site investigations. The sample locations will be placed on the base map by geo-referencing previous figures into the local CAD coordinate system and will include all monitoring wells and soil borings.

Upon completion of the investigation field work, a survey will be conducted to properly locate all sampling points such as monitoring wells, soil borings, and any other sample locations. The elevations of all monitoring well casings will be established to within an accuracy of plus or minus 0.01 feet, based on a local vertical benchmark. A notch will be etched in all interior casings, or a permanent black mark, to provide a reference point for all future groundwater elevation measurements.

2.3 Remedial Investigation Report

2.3.1 Electronic Data Delivery

In addition to appropriate data summary tables and boring logs included in the report, all environmental data will be submitted electronically in a specified Electronic Data Deliverable (EDD) format named in accordance with the data submission procedures outlined on the NYSDEC's web site (http://www.dec.ny.gov/chemical/62440.html).

2.3.2 Remedial Investigation Report

A Remedial Investigation Report (RIR) will be prepared following completion of the field activities. The RIR will provide a description of the field activities, present data collected during field characterization, present a physical description of the Site including geology and hydrogeology, and provide an analysis and interpretation of the available data in the context of existing Site conditions. The report will include tabulated laboratory analytical results, Site maps and a discussion of contaminant concentrations, including a comparison to NYSDEC Standards, Criteria and Guidelines as described in Section 3.14 of DER-10 and in accordance with New York State Department of Health guidelines for human health exposure assessment as described in Appendix 3b of DER-10 to support each conclusion of the RI.

The RIR will also provide a data validation/usability evaluation, identification and location of contaminants, assessment of potential contaminant migration pathways, assessed potential for impacts on human health and environmental receptors, and conclusions regarding the significance of the findings. The proposed work will provide information regarding the delineation and extent of contamination at the Site.

The submitted report will include the report text, appropriate tables, figures, photographs, data summary tables, and boring logs in a PDF format.

2.3.3 Feasibility Study and Alternative Analysis

Following the RI, an alternatives analysis (AA) and feasibility study (FS) will be conducted to evaluate remediation alternatives deemed appropriate for Site mitigation. A draft version of the report will be submitted to NYSDEC to review and comment within 60 days after HRP receives approval of the final RIR. A final version of the FS will be submitted within two weeks after the DEC PM's comments on the draft report are received by HRP. The AA/FS report will include the required information and elements described in Sections 4.4(b) and (c) of DER 10.

3.0 QUALITY ASSURANCE PROJECT PLAN

A Quality Assurance Project Plan (QAPP) has been prepared as a section of this RIWP to accompany the field activities outlined in this WP. The purpose of the QAPP is to specify QA/QC procedures for the collection, analysis, and evaluation of data that will be legally and scientifically defensible.

3.1 Site-Specific Sampling

Soil and groundwater samples will be collected during this RI. Sampling procedures are detailed in the QAPP section of the WP. Matrix types, and analytical details are summarized in **Table 1**. Proposed sample locations are depicted on **Figure 5**.

3.1.1 PFAS Sampling

Sampling for PFAS in groundwater will occur at the Site during the planned activities covered in this Work Plan. Specific requirements for field sampling procedures including precautions to be taken, pump and equipment types, decontamination procedures. During soil and groundwater sampling, PFAS samples will be collected and placed in appropriate laboratory provided containers prior to sampling for other parameters. Only regular ice will be used in the transport of samples being analyzed for PFAS.

The PFAS compounds will be analyzed by methods based on EPA Method 1633A. Specific PFAS compounds to be analyzed include:

Group	Chemical Name	Abbreviation	CAS Number
Perfluoroalkyl sulfonates	Perfluorobutanesulfonic acid	PFBS	375-73-5
	Perfluorohexanesulfonic acid	PFHxS	355-46-4
	Perfluoroheptanesulfonic acid	PFHpS	375-92-8
	Perfluorooctanesulfonic acid	PFOS	1763-23-1
	Perfluorodecanesulfonic acid	PFDS	335-77-3
Perfluoroalkyl carboxylates	Perfluorobutanoic acid	PFBA	375-22-4
	Perfluoropentanoic acid	PFPeA	2706-90-3
	Perfluorohexanoic acid	PFHxA	307-24-4
	Perfluoroheptanoic acid	PFHpA	375-85-9
	Perfluorooctanoic acid	PFOA	335-67-1
	Perfluorononanoic acid	PFNA	375-95-1
	Perfluorodecanoic acid	PFDA	335-76-2
	Perfluoroundecanoic acid	PFUA/PFUdA	2058-94-8
	Perfluorododecanoic acid	PFDoA	307-55-1
	Perfluorotridecanoic acid	PFTriA/PFTrDA	72629-94-8
	Perfluorotetradecanoic acid	PFTA/PFTeDA	376-06-7

Group	Chemical Name	Abbreviation	CAS Number
Fluorinated Telomer Sulfonates	6:2 Fluorotelomer sulfonate	6:2 FTS	27619-97-2
	8:2 Fluorotelomer sulfonate	8:2 FTS	39108-34-4
Perfluorooctane-sulfonamides	Perflurorooctanesulfonamide	FOSA	754-91-6
Perfluorooctane-sulfonamidoacetic acids	N-methyl perfluorooctanesulfonamidoacetic acid	N-MeFOSAA	2355-31-9
	N-ethyl perfluorooctanesulfonamidoacetic acid	N-EtFOSAA	2991-50-6

The minimum method achievable Reporting Limits for PFAS will be less than or equal to 0.5 μg/kg (micrograms per kilogram or part per billion [ppb]) for soil samples and less than or equal to 2 ng/l (nanograms per liter or part per trillion [ppt]) for aqueous samples.

The laboratory Minimum Detection Limits as provided by an ELAP certified environmental laboratory for the PFAS compounds to be analyzed are as follows:

Analyte Description	MDL Aqueous	Units Aqueous
M2-6:2 FTS		ng/l
M2-8:2 FTS		ng/l
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	1.50	ng/l
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	1.70	ng/l
Perfluorobutanesulfonic acid (PFBS)	0.490	ng/l
Perfluorobutanoic acid (PFBA)	1.00	ng/l
Perfluorodecanesulfonic acid (PFDS)	0.900	ng/l
Perfluorodecanoic acid (PFDA)	0.770	ng/l
Perfluorododecanoic acid (PFDoA)	0.590	ng/l
Perfluoroheptanesulfonic acid (PFHpS)	0.950	ng/l
Perfluoroheptanoic acid (PFHpA)	0.910	ng/l
Perfluorohexanesulfonic acid (PFHxS)	0.800	ng/l
Perfluorohexanoic acid (PFHxA)	0.760	ng/l
Perfluorononanoic acid (PFNA)	0.270	ng/l
Perfluorooctanesulfonamide (PFOSA)	10.0	ng/l
Perfluorooctanesulfonic acid (PFOS)	0.610	ng/l
Perfluorooctanoic acid (PFOA)	0.810	ng/l
Perfluoropentanoic acid (PFPeA)	0.630	ng/l
Perfluorotetradecanoic acid (PFTeA)	0.920	ng/l
Perfluorotridecanoic acid (PFTriA)	0.600	ng/l

Analyte Description	MDL Aqueous	Units Aqueous
Perfluoroundecanoic acid (PFUnA)	0.780	ng/l

3.1.2 1,4-Dioxane Sampling

Sampling for 1,4-dioxane will occur at the Site during the planned activities covered in this Work Plan. Specific requirements for field sampling procedures include precautions to be taken, pump and equipment types, detailed decontamination procedures, and a prohibition on using Liquinox.

The minimum method achievable Reporting Limits for 1,4-dioxane will be less than or equal to 0.1 mg/kg (milligram per kilogram or part per million [ppm]) for soil samples and less than or equal to 0.35 µg/l (microgram per liter or ppb) for aqueous samples.

Laboratory provided specifics for 1,4-dioxane sampling MDLs and RLs is as follows:

Method	Analyte	Matrix	MDL	RL
8270D SIM	1,4-Dioxane	Water	0.1 µg/l	0.2 µg/l

3.2 Data Quality Assessment and Usability

Data quality objectives for the Former Mele Manufacturing Site are focused on the characterization of releases of hazardous substances impacting environmental media at the Site.

To achieve these objectives, QA/QC measures will be implemented throughout the RI investigation to provide input as to the validity and usability of data generated through soil and groundwater. The procedures for data QA/QC management includes field documentation; sample handling, custody, and shipping; instrument calibration and maintenance; auditing; data reduction, validation, and reporting; corrective action requirements; and QA reporting specific to the analyses performed by the laboratory. **Table 2** lists the sample containers, preservation, and holding time requirements for the parameters specific to this Site. This table will be referenced by field personnel.

For all data generated during the RI, a Category B Data package and data user summary report (DUSR) will be prepared to provide a thorough evaluation of analytical data utilizing third-party data validation. Upon receipt of the sample data, the data validator will quantitatively and qualitatively validate the laboratory data. The validation of the analytical data will be performed according to the protocols and QC requirements of the analytical methods, the CLP National Functional Guidelines for Organic and Inorganic Data Review (February 1994), the USEPA Region II CLP Data Review SOP, and the reviewer's professional judgment.

4.0 PROJECT MANAGEMENT

HRP has the responsibility of the overall management of this project and will respond to any NYSDEC requests. A proposed project schedule, key milestones, key project personnel, and project-specific subcontractors follow.

4.1 Project Schedule and Key Milestones

The proposed project schedule for this work assignment is outlined below. Key milestones are identified to monitor work progress. The following milestones are proposed for this project:

Milestone	Description	Estimated Start Date
1	GPR survey and utility clearance	April 2026
2	Installation and sampling of vertical profile points	April 2026
3	Installation and sampling of monitoring wells	May 2026
4	Installation and sampling of soil vapor points	May 2026
5	Removal of investigation-derived waste	June 2026
6	Completion of data validation	July 2026
7	IRM installation of soil cap	July 2026
8	RIR submission	August 2026
9	AA/FS submission	September 2026

The first phase of the RI field work will be the underground utility clearance using GPR (Milestone 1). This will be scheduled prior to any intrusive activities on-site (Milestones 2 through 4). The remaining RI field work, including installation and sampling of vertical profile soil borings, monitoring wells, and soil vapor points (Milestones 2 through 4), will commence following completion of the GPR survey and clearance of proposed investigation locations. Soil and groundwater samples will be submitted for laboratory analysis within 24 hours of field collection, and laboratory results can generally be expected within 10 days of submission. Any investigation-derived waste generated from the Site during the RI will be scheduled for removal within one month of the completion of Milestone 3, sampling of the monitoring wells. The timeframe of pickup and removal of this waste (Milestone 5) will be determined by the waste disposal contractor upon scheduling. Data validation (Milestone 6) will begin upon receipt of the first set of laboratory results and will continue to be submitted for validation as the results are received from the laboratory. Data validation is expected within a four-week timeframe. The IRM will be submitted, based on the site owner’s discretion, outlining the covering of surface soils at the Site with a paved concrete cap, which will be defined based on development plans for the Site. The RIR (Milestone 8) will be submitted as a draft report within 60 days after HRP receives the last round of analytical data from the laboratory. A second draft RIR will be submitted, if needed, within two weeks after the data validation company has reviewed the final analysis submitted for the investigation.

4.2 Key Project Personnel

A list of the project personnel of the prime consultant and subcontractors responsible for performance of the investigation has been submitted to the NYSDEC for approval. Primary project staff are listed in the table below. Resumes for key project personnel are included in **Appendix D**.

Personnel	**Company**	**Title for this Work Assignment**	**Responsibility**
Tom Seguljic PG, PE (Principal & Regional Sales Manager)	HRP Associates, Inc.	Project Manager	Overall management of the WA. Approval of HASP and responsible for overall health and safety issues with the WA
Kim L. Baines, QEP (Senior Project Manager)	HRP Associates, Inc.	Project Manager/Health and Safety Manager	Responsible for QA/QC and management of field work
Field personnel will be established based on schedule and budget, and will be added once applicable	HRP Associates, Inc.	Field Manager, field staff and Site Health & Safety Officer	Responsible for the on-site sampling and investigative tasks

Subcontractors for this project will be determined based on budget and schedule availability. The following activities will be designated for subcontracting:

- Land Surveying
- GPR / Geophysics and Utility Location
- Drilling
- Laboratory
- Data Validation
- Company to dispose of any investigation-derived waste (contingent upon analytical results)

5.0 REFERENCES

- Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, October 22, 1993, Revised June 1998, ERRATA Sheet dated January 1999, Addendum dated February 2023, Division of Water Technical and Operational Guidance Series, New York State Department of Environmental Conservation.
- Cadwell, D.H. (editor), 1987, Surficial geologic map of New York, Hudson-Mohawk sheet, scale 1:250,000, New York State Museum Map and Chart Series No. 40, 1 sheet
- New York State Department of Environmental Conservation, Info Locator.
- New York State Department of Environmental Conservation, Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) Under NYSDEC's Part 375 Remedial Programs, October 2020.
- New York State Department of Environmental Conservation, Division of Environmental Remediation, DER-10 Technical Guidance for Site Investigation and Remediation, May 2010.
- Rickard, L. V., Fisher, D. W., and Isachsen, Y. W. (eds.). (1970). Geologic Map of New York; Hudson-Mohawk Sheet, scale 1:250,000, Map and Chart Series No. 15. Albany, NY: New York State Museum and Science Service
- Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey.
- Standard Practice for Environmental Site Assessments: Phase II Environmental Site Assessment Process, January 8, 2020, American Society for Testing and Materials (ASTM)
- United States Environmental Protection Agency, Office of Superfund Remediation and Technology Innovation, National Functional Guidelines for Inorganic Data Review, January 2017.

FIGURES

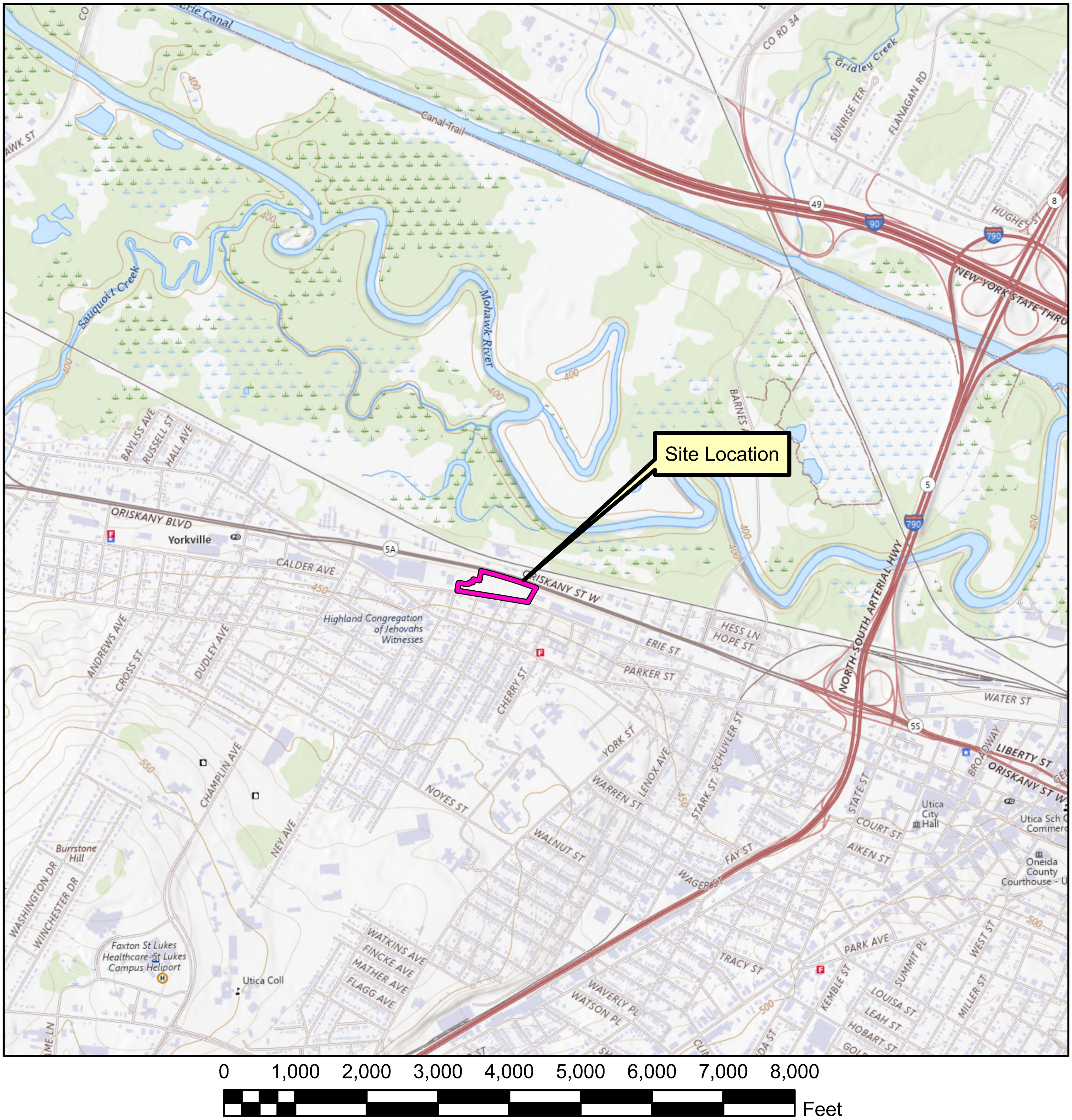

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Figure 1
Site Location
Former Mele Site
1904 Erie Street
Utica, New York
HRP # MOH1002.P2
Scale 1" = 2,000'

USGS Quadrangle Information
Quad ID: 43075-A3
Name: Utica West, New York
Date Rev: 2013
Date Pub: 2016

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ONE FAIRCHILD SQUARE
SUITE 110
CLIFTON PARK, NY 12065
(518) 877-7101
HRPASSOCIATES.COM

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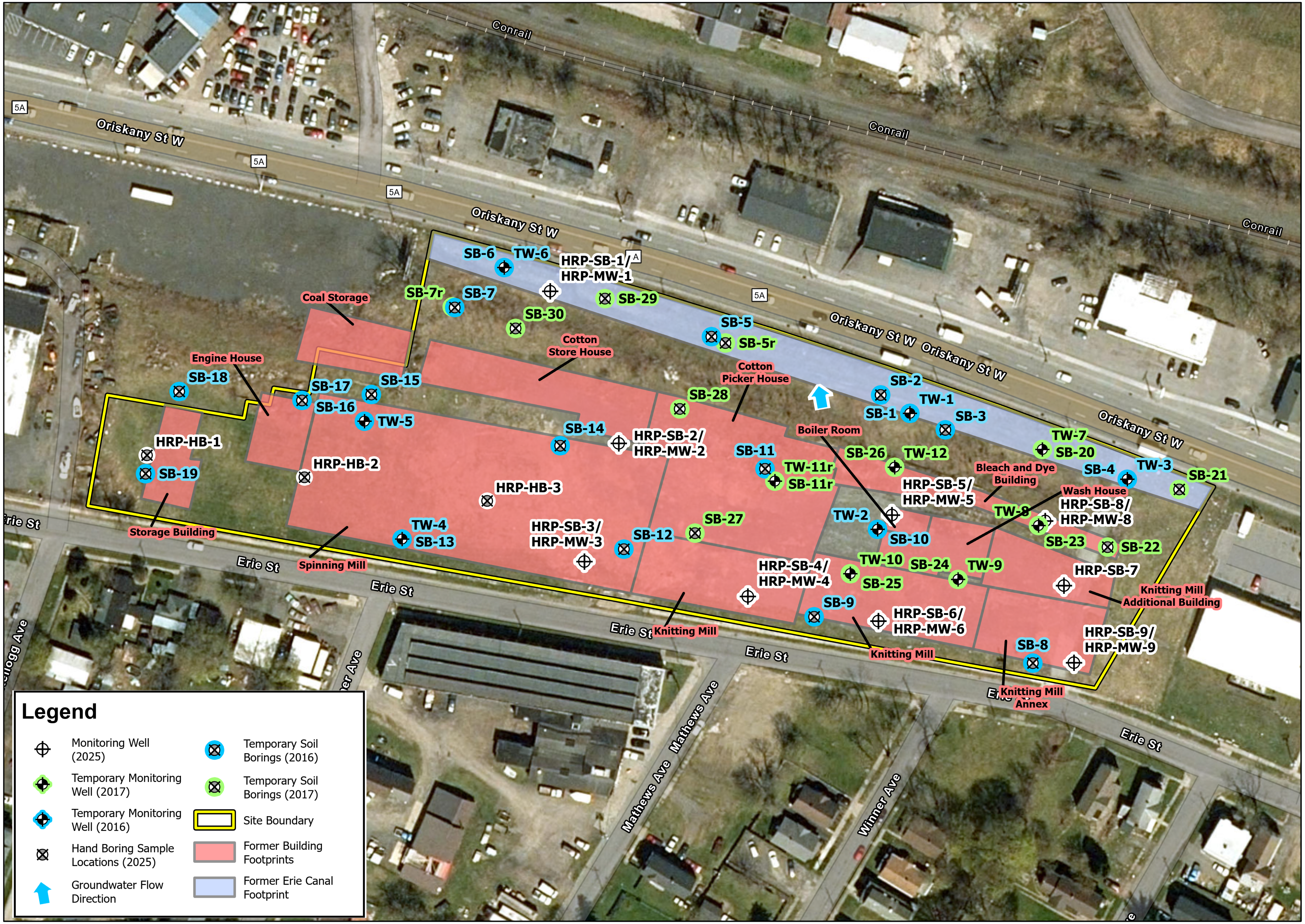

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Revisions	No.	Date

Designed By: CSG
Drawn By: AJN
Reviewed By: MEW
Issue Date: 12/05/2025
Project No: MOH1002.P2
Sheet Size: 11x17

Previous Investigation Sample Locations and Historical Site Structures

Former Mele Site
1904 Erie Street
Utica, New York

Figure No.
2

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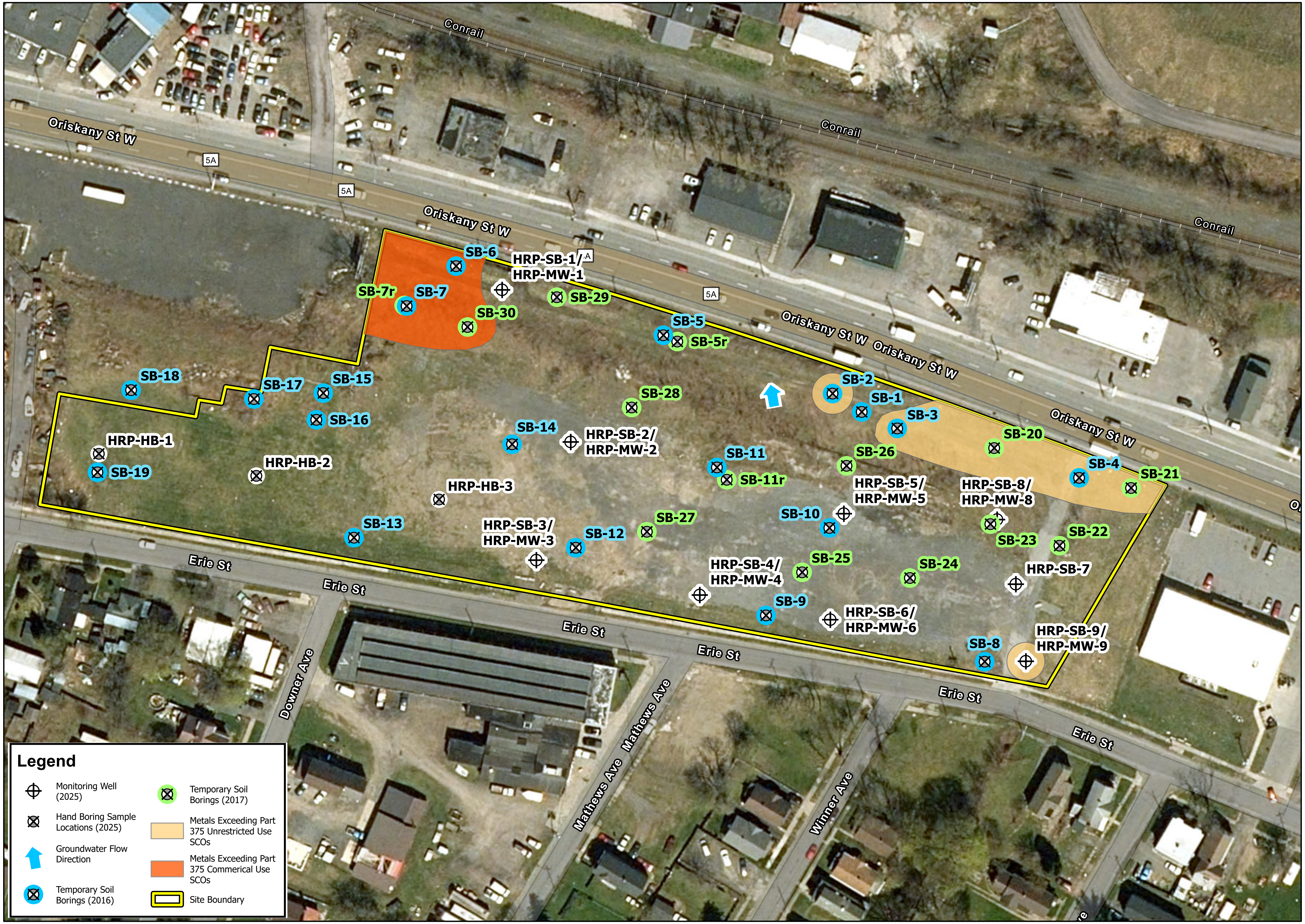

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North

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No.	Date			

Designed By: CSG

Drawn By: AJN

Reviewed By: CSG

Issue Date: 10/14/2025

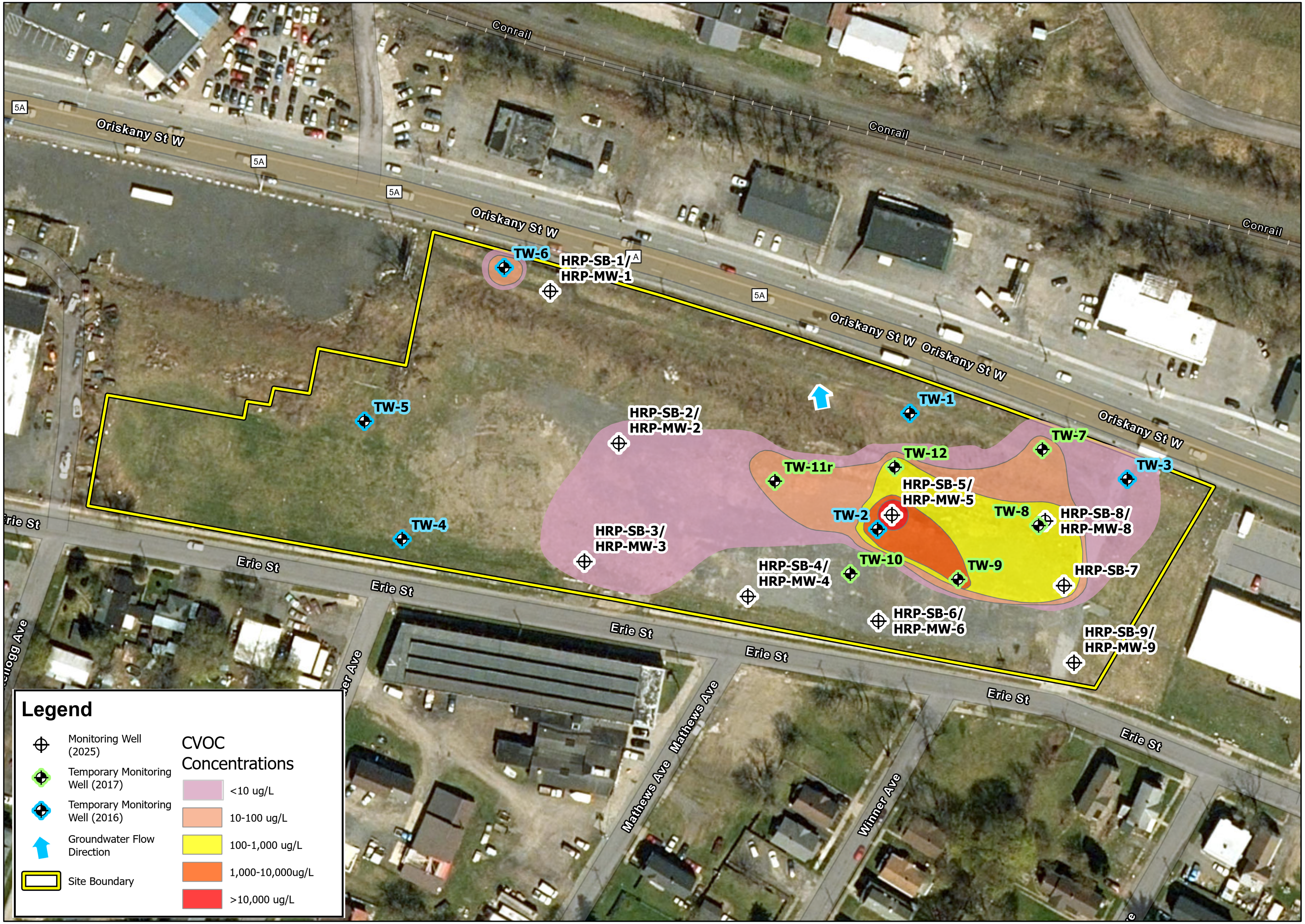
Project No: MOH1002.P2

Sheet Size: 11x17

Metal Impacts in Soil - Previous Subsurface Soil Samples

Former Mele Site
1904 Erie Street
Utica, New York

Figure No.
3



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No.	Date	

Designed By: CSG
Drawn By: AJN
Reviewed By: MEW

Issue Date: 12/10/2025
Project No: MOH1002.P2
Sheet Size: 11x17

CVOC Impacts in Groundwater - Previous Groundwater Samples

Former Mele Site
1904 Erie Street
Utica, New York

Figure No.
4

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Revisions	
No.	Date

Designed By: AJN
Drawn By: AJN
Reviewed By: KLB
Issue Date: 12/09/2025
Project No: MOH1002.P2
Sheet Size: 11x17

Proposed Investigation Locations

Former Mele Site
1904 Erie Street
Utica, New York

Figure No.
5

TABLES

Table 1
Sampling Summary
Remedial Investigation
Former Mele Site
1904 Erie Street
Utica, New York

Activity/ Matrix	Number of Sample Locations	Proposed Sample Locations	Analyses
Vertical Profile Soil Sampling	TBD	One sample within every 5-foot interval	TCL VOCs+10 by EPA Method 8270 QA/QC includes duplicate, MS, MSD
	4	Four samples will be selected for "full suite analyses"	1,4-Dioxane by EPA Method 5030 TAL Metals by EPA Method 6010C TCL PCBs by EPA Method 8082 TCL Chlorinated Herbicides and Pesticides by EPA Method 8081B PFAS by modified EPA Method 1633A QA/QC includes duplicate, MS, MSD
Monitoring Well Installation Soil Sampling	3	One sample within every 5-foot interval	TCL VOCs+10 by EPA Method 8270 QA/QC includes duplicate, MS, MSD
Soil Vapor Point Installation Soil Sampling	5	One sample per soil vapor point	TCL VOCs+10 by EPA Method 8270 QA/QC includes duplicate, MS, MSD
Monitoring Well Groundwater Sampling	6	One groundwater sample to be collected from each newly installed monitoring well and each of the selected existing wells (HRP-MW-5, HRP-MW-7, and HRP-MW-8)	TCL VOCs +10 by EPA Method 8260 QA/QC includes duplicate, MS, MSD
	6	Seven groundwater samples will be selected for "full suite analyses"	TCL SVOCs+20 by EPA Method 8270 TCL PCBs by EPA Method 8082 TCL Chlorinated Herbicides and Pesticides by EPA Method 8081B TAL Metals by EPA Method 6010D PFAS by modified EPA Method 1633A Total Cyanaide by EPA Method 9012B 1,4-Dioxane by EPA Method 8270 SIM QA/QC includes duplicate, MS, MSD
Soil Vapor Sampling	5	One soil vapor sample to be collected from each installed soil vapor point	TCL VOCs by EPA Method TO-15

Acronym List:
PCBs: Polychlorinated Biphenyls
TCL: Total Compound List
VOCs: Volatile organic compounds
SVOCs: Semivolatile organic compounds
PFAS: Per- and Polyfluoroalkyl Substances
QA/QC: Quality Assurance/Quality Control
EPA: Environmental Protection Agency
MS: Matrix Sample
MSD: Matrix Sample Duplicate

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Table 2
Analytical Methods/Quality Assurance Summary
Remedial Investigation
Former Mele Site
1904 Erie Street
Utica, New York

				Containers per Sample			Preservation Requirements			
Parameter	**Matrix**	**Preparation Method**	**Analytical Method**	**No.**	**Size**	**Type**	**Temp.**	**Light Sensitive**	**Chemical**	**Maximum Holding Time**
SOIL										
VOCs by GC/MS	Soil/Sediment	5035A	SW-846 Method 8260B	3 vials	40 ml vials,	glass vials	2-6º C	No	MeOH/	14 days
				1 jar	any size jar	clear glass jar			sodium bisulfate/ freezing	
Chlrorinated Herbicides and Pesticides by GC	Soil/Sediment	3546	SW-846 Method 8081B	1	8 oz	clear glass jar	2-6º C	No	NA	14 days
TAL Metals by ICP	Soil/Sediment	3015A	SW-846 Method 6010C	1	8 oz	clear glass jar	2-6º C	No	NA	14 days
PCBs by GC	Soil/Sediment	3546	SW-846 Method 8082	1	8 oz	clear glass jar	2-6º C	No	NA	14 days
1,4-Dioxane	Soil/Sediment	3510C	SW-846 Method 8270 SIM	1	8 oz	amber bottle	2-6º C	Yes	NA	7 days
PFAS	Soil/Sediment	NA	Modified Method 1633A	2	8 oz	polypropylene	2-6º C	No	NA	14/28 days
GROUNDWATER										
VOCs by GC/MS	Aqueous	5035	SW-846 Method 8260B	3	40 ml	glass vial	2-6º C	No	HCL	14 days
PFAS	Aqueous	NA	Modified Method 1633A	3	250 ml	polypropylene	2-6º C	No	NA	14/28 days
1,4-Dioxane	Aqueous	3510C	SW-846 Method 8270 SIM	2	500 ml	amber glass	2-6º C	Yes	NA	7 days
SVOCs by GC/MS	Aqueous	3510C	SW-846 Method 8270C	2	Liter	amber bottle	2-6º C	Yes	NA	7 days
TAL Metals by ICP	Aqueous	3005A	SW-846 Method 6010D	1	500 ml	plastic bottle	2-6º C	No	Nitric Acid	6 months
Chlorinated Herbicides and Pesticides by GC	Aqueous	3510C	SW-846 Method 8081	2	liter	clear glass bottle	2-6º C	No	NA	14/28 days
Cyanide	Aqueous	3135	Method 9012B	1	Liter	amber bottle	2-6º C	No	NA	7 days
PCBs by GC	Aqueous	3510C	SW-846 Method 8082	2	liter	clear glass bottle	2-6º C	No	NA	7 days
SOIL VAPOR/AMBIENT AIR										
VOCs	Soil Vapor, Air	NA	EPA TO-15	1	6-Liter	summa canister	NA	No	NA	30 days (summa canister

Acronym List:
PCBs: Polychlorinated Biphenyls
TCL: Total Compound List
VOCs: Volatile organic compounds
SVOCs: Semivolatile organic compounds
PFAS: Per- and Polyfluoroalkyl Substances
QA/QC: Quality Assurance/Quality Control
EPA: Environmental Protection Agency
MS: Matrix Sample
MSD: Matrix Sample Duplicate

APPENDIX A

Site-Specific Health and Safety Plan

MOVE YOUR ENVIRONMENT FORWARD

SITE-SPECIFIC HEALTH AND SAFETY PLAN (HASP)

Former Mele Site
1904 Erie Street
Utica, New York 13502

Prepared For:

Bryan Thomas
City of Utica
1 Kennedy Plaza
Utica, New York 13502

Prepared By:

HRP Associates, Inc.
1 Fairchild Square, Suite 110
Clifton Park, NY 12065

HRP #: MOH1002.P2

Issued On: December 30, 2025

ADDENDUM LOG		
Addendum Number	**Date Issued**	**Modification(s) Needed/Reason(s)**

DISCLAIMER

HRP Associates, Inc. does not guarantee the health or safety of any person entering this site. Due to the potential hazards of this site and the activity occurring thereon, it is not possible to discover, evaluate, and provide protection for all possible hazards which may be encountered. Strict adherence to the health and safety guidelines set forth herein will reduce, but not eliminate, the potential for injury at this site. The health and safety guidelines in this plan were prepared specifically for this site for use and should not be used on any other site.

If unexpected conditions were to arise, any employee will have "Stop Work Authority." Employees should be capable of identifying existing and predictable hazards in their surroundings or working conditions that are unsanitary, hazardous, or dangerous to the workers. The employee(s) has the authority to impose prompt corrective measures to eliminate these hazards. Some examples include the ability to stop work, close a jobsite, or evacuate workers if needed.

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Figures

Tables

Appendices

1.0 INTRODUCTION

This Health and Safety Plan (HASP) has been prepared for the Former Mele Site. The general and contact information of the site can be found on **Table 1** below.

This HASP has been developed in accordance with HRP Associates, Inc.'s (HRP) Health and Safety (H&S) procedures as required under the Occupational Safety and Health Administration's (OSHA) Hazardous Waste Operations and Emergency Response (HAZWOPER) regulation (Code of Federal Regulations (CFR), 29 CFR 1910.120). Specific H&S information for the project is contained in this HASP. This Plan has also been developed to establish minimum standards necessary for onsite investigation activities to protect the H&S of HRP personnel.

HRP personnel and associated contractors shall be familiar with this HASP prior to conducting proposed site work. This plan must be present onsite and be available for reference/inspection when the subject site work is being conducted.

All project personnel shall sign the certification page acknowledging that they have read and understand this HASP. Changes in the scope of the project or introduction of new hazards to the project shall require revision of the HASP, and approval by the Project Manager (PM) under the Addendum Log.

TABLE 1 **GENERAL INFORMATION**		
Project Number	MOH1002.P2	
Site/Project Name	Former Mele Site	
Site Address/Location	1904 Erie Street, Utica, New York 13502	
CONTACTS		
HRP's Contacts		
Title	**Name**	**Phone Number**
Project Manager	Kim Baines	518.978.2369
Site Safety Officer	TBD	
Site-Specific Contacts		
Name	TBD	
Title		
Phone		

2.0 EMERGENCY CONTACTS AND PROCEDURES

2.1 Contacts

Table 2 presents the Emergency Contact information associated with the planned Phase II environmental site assessment work. The following information, including directions to the nearest hospital shall be posted at the Site. When contacting the local authorities, be sure to provide: your name, facility name, full address, telephone number, and the nature of the emergency. The information on **Table 2** should be revised, if necessary, upon review of the work to be completed and prior to initializing the activities.

TABLE 2
EMERGENCY CONTACTS

Contact	Name	Phone Number
Local Police	Utica Police Department	315-735-3301
Local Ambulance	Kunkel Ambulance Service	315-797-4111
Local Fire Department	City of Utica Fire Department	315-223-7227
Poison Control Center	Poison Control Center	1-800-222-1222
National Response Center	National Response Center	1-800-424-8802
Spill Response Agency	DEC Spills Hotline	1-800-457-7362
Local Hospital	Wynn Hospital	315-917-9966
Local Hospital Address (Map in **Figure 3**)	111 Hospital Dr, Utica, NY	
HRP's Site Safety Officer	John Gorman	518-978-2379
Project Manager	Cassy George	518-978-2368
State Agency PM (if applicable)	n.a.	n.a.
Site Owner/Contact	Shawna Papale	(315) 338-0393

For the police, ambulance, and fire department, contact 9-1-1.

The Site Safety Officer will coordinate the entry and exit of response personnel in the event of an emergency.

Map and directions to Wynn Hospital, 111 Hospital Drive, Utica NY are provided on **Figure 3**.

2.2 Emergency Procedures

In the event of a worker injury, fire, explosion, spill, flood, or other emergency that threatens the safety and health of site workers, the following procedure will be followed:

1. If the emergency originates within the work area covered by this Plan, the HRP Site Safety Officer shall act as the Emergency Coordinator. The emergency evacuation signal is an air horn or a loud yell. All emergency situations (including worker injuries, no matter how

small) will be reported to the Site Safety Officer, who will determine the appropriate emergency response, up to and including evacuation. The Site Safety Officer will be responsible for reporting any emergency situation to the appropriate authorities, using a telephone or other appropriate method.

2. In the case of an evacuation, site workers will exit the site along the safest route(s) and assemble with team members at a safe rally point. Those workers in the Exclusion Zone will follow the emergency decontamination procedures outlined in **Section 6.4**. Accounting for all site personnel will be conducted by the Site Safety Officer using the personnel log at a location determined by the Site Safety Officer.

3. HRP personnel are not permitted to participate in handling the emergency. Fire and medical emergencies will be handled by the local fire department and ambulance service. In the case of a spill of hazardous materials, a local commercial spill clean-up firm should be contacted.

   NOTE: If the work is completed in New York, the New York State Department of Environmental Conservation (NYSDEC) may be contacted.

   If a petroleum spill greater than 5 gallons is observed, it must be reported within 2 hours of discovery.

   If the spill begins to flow overland and threatens to contaminate a storm drain or surface water, HRP personnel may attempt to contain and isolate the spill using any available resources, but only if, in the judgment of the Site Safety Officer, such action will not expose the workers to dangerous levels of hazardous substances and is necessary to preserve life or property. In the event that <u>a spill of material of any amount threatens to reach navigable waters</u>, the National Response Center (NRC) shall be contacted.

4. Once initial emergency procedures to protect worker safety and health have been addressed, and control of emergency has been completed, the Site Safety Officer will complete HRP's Incident Investigation Report and submit this form to the appropriate personnel (HRP and/or client contact).

5. All site workers will be familiarized with the above procedures during the pre-entry briefing to be conducted before site work begins.

In the event of an evacuation, meet at the following rally points:

- At the corner of Erie Street and Downer Avenue

2.3 Emergency Supplies and Equipment

Table 3 presents the appropriate Emergency Supplies and Equipment List for the planned listed work. Select the appropriate supplies and equipment based on the proposed work. The information on **Table 3** should be revised, if necessary, upon review of the listed work and prior to initializing the activities.

TABLE 3
EMERGENCY SUPPLIES/EQUIPMENT

SUPPLY ITEM	LOCATION ONSITE
☒ First Aid Kit	In vehicle
☒ Fire Extinguisher	In vehicle
☐ Eye Wash (Bottle)	
☒ Spill Kit	In vehicle
☐ Hand Sanitizer	
☒ Caution Tape, Cones	In vehicle
☐ Air Horn	
☐ Flashlight	
☒ Water or Other Fluid	In vehicle
☐ Wash and Dry Towels	
☒ Sunscreen	In vehicle
☒ Insect Repellant	In vehicle
☐ Cooling Aids (cooling towels, vests, etc.)	
☐ Other	

3.0 SCOPE OF WORK

3.1 Site Background

The Site has been used for manufacturing since at least 1899, initially occupied by the Utica Knitting Company. Records indicate ownership by the Utica Spinning Company, with the facility primarily occupying the eastern portion of the Site. The western portion was historically part of an Erie Canal expansion but was later replaced by a New York Central Railroad spur. The surrounding area primarily consisted of residential dwellings, except for industrial structures like the Highland Knitting Mill.

By 1925, the Utica Knitting Company facility had significantly expanded beyond its earlier boundaries, and the Erie Canal and harbor had been removed. A cistern, coal storage area, and boilers were identified on Site, though the coal storage was likely outside the modern Site boundary.

Sanborn Maps from 1950, 1952, and 1969 show little change to the Site except for ownership transferring to Mele Manufacturing Company and the removal of a structure from the western portion. The maps also indicate restricted access to the Site, potentially affecting the accuracy of recorded details. By the 1970s and 1980s, some structures, including the coal storage and an engine house, were removed or repurposed.

Figure 1 shows the site's location map.

3.2 Project Description

The Site known as the Former Site is located at 1904 Erie Street in Utica, New York. It is currently owned by the City of Utica. The Site is located in a predominantly commercial and residential neighborhood in the City of Utica and was used for manufacturing and industrial purposes since as early as 1899. The Site is a rectangular-shaped parcel of land positioned between Oriskany Street and Erie Street. According to a City of Utica tax map, it appears bifurcated by a D&L&W Railroad switch right-of-way (ROW). The railroad ROW appears to coincide with field observations of limestone blocks believed to comprise a wall of the historic Erie Canal. The Site is vacant and overgrown with vegetation, but the ground surface appears to consist largely of building slabs and brick and concrete rubble that remains from building demolition activities. Stormwater drainage grates are located on the property and along the edges of the roadways bounding the Site.

- The full nature and extent of contaminated media due to potential DNAPL contamination has not been fully characterized, including the vertical and horizontal extent of contamination in soil, soil vapor, free-phase NAPL and dissolve-phase NAPL in groundwater.
- TCE and associated breakdown compounds present at concentrations exceeding groundwater standards on the Site have not been fully characterized, including the full nature and extent of groundwater contamination and the potential fate and transport of contaminated media both on and off-Site.
- The range and type of soil contamination has not been determined in full by previous investigations. The presence of potential contamination, including 1,4-dioxane, metals (except Resource Conservation and Recovery Act (RCRA) group of 8 metals), polychlorinated biphenyl, chlorinated herbicides, chlorinated pesticides, as well as per-and polyfluoroalkyl substances, have not been delineated at the Site.
- The range and type of groundwater contamination has not been determined in full by previous investigations. The presence of potential contamination, including 1,4-dioxane, metals (except RCRA group of 8 metals), polychlorinated biphenyl, chlorinated herbicides, chlorinated pesticides, as well as per-and polyfluoroalkyl substances, have not been delineated at the Site. Geochemical parameters have not been determined at the Site, and may be needed to evaluate potential remediation activities following this investigation.

Refer to the Introduction (**Section 1.0**) for the site's information and contacts.

3.3 Site Type

TABLE 4 **SITE TYPE** (Check all that may apply to the site/project.)	
☐ Active	☒ Abandoned

☒ Industrial	☐ Landfill
☒ Inactive	☐ Unsecured
☐ Well Field	☐ Water Work
☐ Residential	☐ Railroad
☒ Undeveloped	☐ Commercial
☐ Secure	☐ Service Station
☐ Other – Specify	

3.4 Scope of Work

In general, the work to be performed by HRP and/or HRP's subcontractors consists of investigative methods to evaluate the environmental condition of the Site. The fieldwork for this task includes the following subtasks:

Approximately 21 temporary soil borings will be advanced using hollow-stem auger and/or direct push methods. Each of the locations will be installed to a maximum depth of 20 ft bg, or until a well-defined confining layer or bedrock is encountered. Installation depths may be adjusted based on field observations, including staining, odors, and elevated gas chromatograph (GC) readings. The proposed soil borings are intended to delineate CVOC soil contamination vertically and laterally around the previously identified source area located at HRP-SB-5/HRP-MW-5. The proposed vertical profile soil boring locations are depicted on **Figure 2**.

Approximately 84 soil samples will be collected from the 21 temporary soil borings, with an expected four samples collected from each boring. Sample collection depths will be biased to the depth of the water table (approximately 8-10 ft bg), the top of the confining layer (if encountered), and based on screening results from the GC. depths will also be biased based on field observations (staining, odors, and elevated GC readings). Approximately 99 soil samples (84 regular samples, 15 QA/QC) will be analyzed for TCL VOCs +10 via EPA Method 8260. A total of seven soil samples (4 regular samples, 3 QA/QC) taken from 4 temporary soil borings will be analyzed for the following parameters:

- 1,4-Dioxane by EPA Method 5030
- TAL Metals by EPA Method 6010C
- TCL PCBs by EPA Method 8082;
- TCL chlorinated herbicides and pesticides by EPA Method 8081B; and
- PFAS by modified EPA Method 537.1.

Approximately three permanent soil borings will be advanced using hollow-stem auger and/or direct push methods. These will be installed for the purpose of installing permanent monitoring wells to delineate the lateral and vertical extent of CVOC impacts at the Site. Each of the locations will be installed to a maximum depth of 20 ft bg, or until a well-defined confining layer or bedrock is encountered. Installation depths may be adjusted based on field observations, including staining, odors, and elevated GC readings.

Approximately 12 soil samples will be collected from the 3 soil borings, with an expected four samples collected from each boring. Sample collection depths will be biased to the depth of the water table (approximately 8-10 ft bg), the top of the confining layer (if encountered), and based on screening results from the GC. depths will also be biased based on field observations (staining, odors, and elevated GC readings). Approximately 15 soil samples (12 regular samples, 3 QA/QC) will be analyzed for TCL VOCs +10 via EPA Method 8260.

Groundwater characterization proposed for this RI will consist of sampling the existing monitoring wells near and close to the source area, including HRP-MW-5, HRP-MW-7, and HRP-MW-8. Additional grab groundwater samples will be taken from the vertical profile sampling points at the soil-groundwater interface. Up to two monitoring wells will be installed based on observations taken in-field and based on previous investigation data. The proposed monitoring well locations were selected to delineate the extent of CVOC groundwater plume laterally and vertically by complimenting the existing network of monitoring wells. The locations of existing and proposed monitoring wells are presented on **Figure 2**.

Groundwater samples will be collected from each of the three existing wells described above in accordance with EPA low-flow groundwater sampling procedures and will be submitted to Eurofins for analysis of TCL VOCs +10 by EPA Method 8260. A total of 13 groundwater samples (8 regular samples, 5 QA/QC) will be submitted to Eurofins under chain of custody procedures and analyzed for TCL VOCs +10.

Approximately three monitoring wells will be installed to an approximate depth of 20 ft bg co-located with the soil borings installed as a part of this RI. Each newly installed well will be developed a minimum of 24 hours after completion by pumping and surging until the field parameters stabilize for a minimum of three consecutive readings of 10 percent variability of less.

Approximately 21 groundwater samples will be collected from all vertical profile sampling points as a part of this investigation. Additional samples will be collected as deemed necessary based upon observations taken during the soil investigation and based on results from GC screening. A total of 26 groundwater samples (21 regular samples, six QA/QC) will be submitted to Eurofins under chain of custody procedures and analyzed for TCL VOCs +10. Duplicate and matrix/matrix spike duplicates, and field blanks will be collected at a frequency of 1 per 20 samples. Trip blanks will be submitted at a frequency of one per cooler per day if analysis for VOCs is included in the sampling set within the cooler.

Approximately 3 groundwater samples will be collected from each of the newly installed monitoring wells as a part of this investigation. Additional samples will be collected as deemed necessary based upon observations taken during the soil investigation and based on results from GC screening. Groundwater samples will be collected from each of the newly installed wells a minimum of seven days after well development has been completed. All groundwater samples will be collected in accordance with EPA low-flow groundwater sampling procedures and will be submitted to Eurofins for analysis of TCL VOCs +10 by EPA Method 8260.

Approximately 3 groundwater samples will be collected from monitoring wells HRP-MW-5, HRP-MW-7, and HRP-MW-8 as a part of this investigation. Groundwater samples will be collected from each of the wells mentioned in this section a minimum of seven days after well development has been completed on the newly installed monitoring wells. All groundwater samples will be collected in accordance with EPA low-flow groundwater sampling procedures and will be submitted to Eurofins for analysis of TCL VOCs +10 by EPA Method 8260.

A total of 33 groundwater samples (27 regular samples, 6 QA/QC) will be submitted to Eurofins laboratory under chain of custody procedures and analyzed for TCL VOCs +10. A total of seven groundwater samples (3 regular, 1 duplicate, 1 MS, 1 MSD, and 1 PFAS field blank), will be collected for a suite of analytical and geochemical parameters including:

- TCL SVOCs+20 via EPA Method 8270;
- TCL PCBs by EPA Method 8082;
- TCL chlorinated herbicides and pesticides by EPA Method 8081B;
- PFAS by modified EPA Method 537.1; and
- 1,4-dioxane by EPA Method 8270 SIM.
- TAL Metals by EPA Method 6010D
- Biological oxygen demand (BOD) by EPA Method SM5210B
- Chemical oxygen demand (COD) by EPA Method 410.4
- Iron and manganese, total and dissolved by ICP by EPA Method 6010C
- Chloride and sulfate by EPA Method 300.0_28D
- Sulfide by EPA Method SM4500_S2_F
- Nitrates by EPA Method 353.2
- Total organic carbon (TOC) by EPA Method 5310C
- Total Alkalinity by EPA Method 310.2
- Methane, Ethane, and Ethene by EPA Method RSK_175
- Carbon Dioxide (CO2) by EPA Method RSK_175_CO2

Samples analyzed for these additional analyses will be collected from monitoring wells hydraulically upgradient and downgradient of the source area. Duplicate and matrix/matrix spike duplicates, and field blanks will be collected at a frequency of 1 per 20 samples. Trip blanks will be submitted at a frequency of one per cooler per day if analysis for VOCs is included in the sampling set within the cooler.

To assist in the evaluation of potential remedies for the CVOC groundwater contamination, a total of two groundwater samples (two regular samples, no QA/QC), will be analyzed for natural attenuation parameters including:

- Biological oxygen demand (BOD);
- Chemical oxygen demand (COD);
- Total and dissolved iron by EPA Method 6010C;
- Total and dissolved manganese by EPA Method 6010C;
- Chloride and sulfate by EPA Method 300.0;
- Sulfide by SM4500_S2_F;
- Nitrate by EPA Method 353.2;
- Total organic carbon (TOC) by EPA Method 5310C;
- Total alkalinity by EPA Method 310.2;
- Methane, ethane, and ethene by EPA Method RSK 175; and
- Carbon dioxide by EPA Method RSK 175.

To delineate soil vapor impacts on the Site, up to five permanent soil vapor points will be installed upgradient (south) and downgradient (north) of the source area for the collection of soil vapor samples with a two-hour collection interval. The two upgradient soil vapor points will be installed in the two dry wells, HRP-MW-9 and HRP-MW-4, on the south portion of the Site. The two downgradient soil vapor points will be installed based on locations of receptors and previous investigations to help delineate the downgradient extent of TCE impacts in soil vapor at the Site. An additional soil vapor point will be installed adjacent to the source area near HRP-MW-5. Proposed soil vapor point sampling locations are shown on **Figure 2**.

Prior to installation of each soil vapor point, soils will be sampled continuously, characterized by HRP's on-site geologist, and screened using a handheld GC. Approximately seven soil samples (4 regular samples, 3 QA/QC) will be analyzed for TCL VOCs +10 via EPA Method 8260. Prior to sampling a leak test will be performed using a tracer gas with a minimum of three (3) tubing volumes of air purged from the vapor point. Following purging, soil vapor will be screened for VOCs using a calibrated PID. One (1) soil vapor sample will be collected from each point using a six (6)-liter summa canister fitted with two (2) hour regulator and analyzed for VOCs via EPA Method TO-15.

Up to seven air samples (five soil vapor, one outdoor ambient air, one duplicate soil vapor), will be submitted to Eurofins and analyzed for VOCs via EPA Method TO-15. One outdoor air sample will be collected per day of sampling. Duplicate soil vapor samples will be collected at a frequency of one per 20 soil vapor samples.

The checked boxes indicate topics that are applicable to the project being completed (**Table 5**).

TABLE 5 **TASKS**	
☐ Site Inspections (e.g., ESA)	☐ Drum Sampling
☐ Industrial Hygiene	☒ Ground Water Sampling
☐ Asbestos Survey	☐ Landfill Sampling
☐ Bridge Inspections	☐ Product Sampling
☒ Drilling/Probing	☐ Remediation Monitoring (air/water)
☐ Well Repair/Abandonment	☐ Soil Gas Sampling
☐ Stack Testing	☐ Stormwater Sampling
☐ Surface Water Sampling	☐ Surveying
☐ Wastewater Sampling/Benchmark Test	☐ Confined Space Entry
☐ Excavation	☐ Emergency Spill Response Oversight
☐ Chemical/Waste Exposure/Handling	☐ Other

Should conditions or the scope of work described herein change significantly, a HASP Addendum will be completed.

A Safety and Logistics Planning call will be held prior to conducting any intrusive activities at the site. Representatives from HRP and each subcontractor will attend the call to discuss logistical and safety challenges general to the scope of work and specific to the Site. This call is documented on the Safety and Logistics Planning Log in **Appendix A**.

Specific procedures which may be needed for certain job tasks are included at the end of this HASP.

4.0 ROLES AND RESPONSIBILITIES

The following personnel on **Table 6** are designated to perform the stated project activities and to ensure that the requirements of this HASP are met. The same person may fill more than one role, and/or serve as an alternate in the absence of the designated team member.

A complete list of HRP employee and subcontractor responsibilities (as applicable) can be found in HRP's H&S procedures.

NOTE: Any employee has STOP WORK AUTHORITY (sometimes known as PAUSE WORK).

TABLE 6
ROLES AND RESPONSIBILITIES

Project Team Member	Responsibilities and Tasks
TBD	**HRP's Site Safety Officer:** Ensuring all site work is performed in accordance with HRP's H&S Programs, as well as in accordance with local, state, and federal regulations. • Directing and implementing HRP's HASP. • Reviewing the Subcontractor's HASP and being aware of the hazards detailed therein. • Conduct a job orientation meeting and routine safety meetings for HRP employees and subcontractors, as applicable. • Provide copies of these inspections, recordkeeping/personnel logs to the engineer/contractor as required. • Ensuring all project personnel have been adequately trained in the recognition and avoidance of unsafe conditions. • Address Stop Work Orders that shall be executed upon the determination of an imminent H&S concern and will notify the appropriate contacts upon issuance of this order. • Authorizing work to resume, upon approval from the Contractor. • Directing activities, as defined in the HRP's and the Contractor's written HASP, during emergency situations. • Providing personnel monitoring where applicable. • Ensuring that adequate personal protective equipment (PPE) and first aid supplies are available. • Ensure site security, to the extent practicable. • Ensure accident victims are promptly cared for, and the incident is investigated and properly reported. • Communicating with HRP's PM, Office H&S Manager (OHSM), and others when needed. • Report all injuries, illnesses, and other incidents to the PM.

TABLE 6
ROLES AND RESPONSIBILITIES

Project Team Member	Responsibilities and Tasks
Kim Baines	**HRP's Site Supervisor/Project Manager** • Monitor and assist the Site Safety Officer. • Maintain appropriate rules, regulations, and codes at the job site. • Provide advanced safety planning for all activities through the use of scheduling and administrative controls. • Obtain site-specific H&S information and communicate that information with the appropriate personnel (i.e., contractors, client, etc.) • Report all injuries, illnesses, and other incidents to the Regional Office Manager (ROM) and Corporate H&S Officer (CHSO). If ROM or CHSO cannot be reached, contact Chief Operating Officer (COO) or Human Resources. • Ensure all HRP personnel are trained and qualified to perform site work.
Site Workers (Subcontractors)	**Site Workers** • Read and work in accordance with this HASP. • Report all unsafe work practices to the Site Safety Officer. • Report all incidents, including near-misses to the Site Safety Officer. • Work in a safe manner. • Provide designated Competent Person

*A list of site workers will be maintained in the Personnel Log (**Appendix B**).

5.0 PROJECT HAZARDS AND CONTROL MEASURES

5.1 Identifying Hazards

The Site Supervisor/PM shall complete the Job Safety Analysis (JSA) in **Appendix C** prior to the start of the project. The JSA identifies the steps of the task to be performed with its hazards, unsafe conditions, and materials that are known or suspected to be onsite. The hazards that are listed in the JSA must be ranked using HIGH (H), MEDIUM (M), or LOW (L) based on current site knowledge. Use the results of this analysis to verify that controls in the JSA are adequate to mitigate task hazards.

Details of specific hazards associated with individual tasks will be discussed in the Toolbox Talk (formerly known as the Daily Job Brief Record (**Appendix D**)). **The Toolbox Talk is the key to the entire operation**. We are writing this HASP prior to going onsite and therefore cannot anticipate all of the site-specific hazards. The PM must do a thorough job on the Toolbox Talk, so we remain compliant. The Daily Toolbox Talk records will be reviewed by the PM at the conclusion of the field work.

5.2 Task Policy Reminders

Confined Spaces

Only properly trained HRP personnel are authorized to enter confined spaces. Confined space entry may be performed by subcontractors who have the proper training and experience to conduct this work.

Emergency Spill Response Oversight

HRP personnel are not permitted to participate in handling the emergency, only the oversight of such activities.

Excavations

It is HRP's policy to ensure that for excavation projects the subcontracted environmental contractor will provide a competent person to perform daily and as needed inspections of excavation sites. This policy will be conveyed through the subcontract agreement with the environmental contractor. At a minimum HRP will provide our employees involved with construction projects with awareness level training regarding excavation hazards and notify the subcontracted firm if any obvious excavation safety hazard exists during the course of onsite activities.

Drilling

HRP employees will not perform drilling, rather HRP will use a competent subcontractor to perform drilling services. At a minimum, HRP will provide our employees involved with this type of project with awareness level training regarding drilling, the hazards of the equipment and distance of the drilling.

Chemical Hazards

Hazardous materials and/or chemicals are listed on **Table 9**. Contaminants that are known or suspected onsite are listed at the end of this document on **Table 13** includes Chemical name, odor threshold OSHA permissible exposure limit (PEL), the American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit value (TLV), OSHA short-term exposure limit (STEL), Immediately Dangerous to Life or Health (IDLH) Concentrations, routes of exposure, and symptoms of acute exposure. Chemicals likely to be encountered during site work are highlighted.

Physical Hazards

Physical hazards known or suspected to be onsite are listed on **Table 8**. **Table 8** includes description of potential hazards, methods to identify/minimize them, potential for occurrence and potentially affected tasks.

Air Monitoring

In order to determine potential health hazards and to determine the level of personal protection needed during drilling, excavation, and sampling activities within the areas of concern, a photoionization detector (PID) will be periodically operated to monitor air quality for the purpose of ensuring minimal exposure to volatile organic compounds.

Background ambient air levels will be established outside the exclusion zone prior to commencement of site work. Ambient air sampling will occur in the breathing zone of site workers for comparison to the action levels (described below). Additionally, air sampling will be conducted in the vicinity of any intrusive exploration (i.e., near excavations, trenches, etc.) to determine if any contaminants are present. See **Table 7** for action levels to be used.

TABLE 7
ACTION LEVELS
Use the following Action Levels

INSTRUMENT	ACTION LEVEL	LEVEL OF PROTECTION OR ACTION REQUIRED
PID	<5 ppm	• Continue to monitor • Recheck levels after fifteen minutes • If levels are sustained, reassess • Use engineering controls to lower breathing zone vapors • Level C protection (at the H&S Officer's (HSO) discretion)
PID	>5 ppm	• Stop work and evacuate exclusion zone • Recheck levels after fifteen mins • Use engineering controls to lower breathing zone vapors • If levels are sustained, contact CHSO and/or OHSM, and re-evaluate HASP

NOTE: When the background reading is >1 ppm, assess the area and equipment, but continue PID monitoring and wear Level D protection

ppm = parts per million

When an action level is equaled or exceeded, the work area should be evacuated, and the area re-tested with the sampling device. If the appropriate action level continues to be exceeded, the Site Safety Officer will have to assess the use of engineering controls to lower vapor levels or availability of required increased personal protection equipment before authorizing re-entry.

TABLE 8
HAZARDS KNOWN OR SUSPECTED ONSITE
*Check all that may potentially apply to the tasks being performed. Chemical Hazards are included on **Table 8**.

PHYSICAL HAZARDS

☐ Structure Unsafe
☒ Uneven Floors/Surfaces
☐ Ceiling Unsafe
☐ Falling Objects/Loads
☐ Flying Debris
☐ Slippery Floor/Ground
☐ Obstructed Walking Areas
☐ Misuse of Machinery
☒ Excessive/Loud Noise
☐ Poor Lighting
☐ Fire
☐ Radiation
☐ Magnetic Fields
☐ Pressure Extremes
☒ Extreme Heat/Cold
☒ Inclement Weather
☐ Confined Space Entry
☐ Atmosphere
☐ Drowning
☐ Flooding
☐ Poor Visibility
☐ Other (Specify)

SAFETY HAZARDS

☒ Slipping/Tripping/Falling
☐ Improper Machine Guard
☐ Equipment Malfunction
☐ Struck By
☐ Homeless Encampments
☐ Falling Into
☐ Cave In/Collapses
☒ Underground Utilities
☐ Excavation Spoils
☐ Superimposed Loads
☒ Mobile Equipment/Machinery
☐ Electrical
☐ Poor Housekeeping
☐ Suspicious Activity/Person
☐ Security
☐ Traffic
☐ Other (Specify)

BIOLOGICAL HAZARDS

☐ Bacteria
☐ Viruses
☒ Insects
☒ Plants
☒ Animals/Birds
☐ Other (Specify)

ERGONOMIC HAZARDS

☒ Repetitive Movements
☐ Improper Work Setup
☐ Poor Equipment Design
☐ Poor Workstation Design
☒ Postural/Workflow
☐ Manual Handling
☐ Other (Specify)

PSYCHOLOGICAL HAZARDS

☐ Workload
☐ New Worker
☐ Lone Worker
☐ Stress
☐ Harassment
☐ Communication Issue
☐ Other (Specify)

CONTROL MEASURES AND WORK PRACTICES

Appropriate protective gear, including eye/ear/foot/hand protection will be worn during drilling activities.
All personnel will be warned prior to the start of work that footing may be uneven and to exercise caution while walking on site.

NOTE: Hand signals are encouraged to communicate during a job where hearing is limited, but vision is not. These hand signals should be listed within the Toolbox Talk and JSA.

REQUIRED PERMITS

TABLE 8
HAZARDS KNOWN OR SUSPECTED ONSITE

*Check all that may potentially apply to the tasks being performed. Chemical Hazards are included on **Table 8**.

☒ None ☐ Excavation ☐ Encroachment ☐ Confined Space Entry ☐ Hot Tap ☐ Street Open/Closing ☐ Hot Work
☐ Energized Equipment ☐Other (Specify)

***These permits may not be issued by HRP employees. You may reference them as needed.**

TABLE 9
HAZARDOUS MATERIAL SUMMARY

Check all that may apply onsite. Attach Safety Data Sheets (SDS) in **Appendix F** for each chemical that will be brought to the site.

HAZARDOUS MATERIAL LIST		**KNOWN CHEMICALS** List the actual chemical name that HRP employees are exposed to.
☐ Acids ☐ Pickling Liquors ☐ Caustics ☒ Pesticides ☐ Dyes/Inks ☐ Cyanides ☐ Phenols ☐ Halogens ☐ Dioxins ☐ Fly Ash ☐ Asbestos ☐ Millings/Mine Tailings	☒ Diesel Fuel/Oil ☐ Lubricants ☒ PCBs ☒ PAHs ☐ Kerosene ☐ Propane ☒ PFAS ☐ Mold ☐ Distillation Bottoms ☐ Fecal Matter/Animal Waste ☐ Laboratory Waste ☐ Pharmaceuticals	No known chemicals brought to site
		CONTROL MEASURES:

☐ Ferrous Smelter ☐ Non-Ferrous Smelter ☒ Metals ☒ Chlorinated Solvents ☒ Hydrocarbons ☐ Alcohols ☐ Ketones ☐ Esters ☐ Ethers ☐ Oily Wastes ☐ Gasoline	☐ Hospital Waste ☐ Radiological Waste ☐ Municipal Waste ☐ Construction Debris ☐ Aluminum ☐ Paint ☐ Pigments ☐ Metal Sludges ☐ POTW Sludges ☐ Other (Specify)	Wearing appropriate PPE such as nitrile gloves when handling sampled media.

5.3 Equipment Usage

Table 10 below lists the equipment that will be used for the above task(s). Equipment must be included in the JSA and/or Toolbox Talk for proper hazard identification of tasks being performed.

TABLE 10
EQUIPMENT USAGE

EQUIPMENT/ INSTRUMENT	USED FOR	CALIBRATION BY	CALIBRATION DATE
Gas Chromatograph	Volatiles assessment and field screening	Field staff	Daily

6.0 SUSPECTED CONTAMINATION AND DECONTAMINATION

6.1 Suspected Contamination

Prior to commencement of work in the area of suspected contamination, protective zones specific for each phase of the HASP will be established by the Site Safety Officer, if necessary, prior to the start of field work. These zones will be defined during the Toolbox Talk.

The purpose of the protective zones is to prevent potential cross-contamination of adjacent areas as well as to protect project personnel from exposure to contaminated areas.

6.2 Protective Zones

Protective zones shall be delineated as follows:

- **Exclusion Zone:**

  This is the contaminated area in which intrusive activities are performed. The area of environmental concern (AOEC) is located within this area. A single access point for entrance and exit should be established and maintained, if possible. This zone should be delineated from the Contaminant Reduction Zone via perimeter cones or caution tape, or other applicable method. Work areas are shown on **Figure 2**. The Exclusion Zone delineation and any necessary modifications will be based onsite conditions.

- **Contaminant Reduction Zone:**

  This zone is a transition zone located between the Exclusion Zone and the Support Zone and is utilized to decontaminate personnel and equipment.

- **Support Zone:**

  This zone will be utilized by equipment and vehicle storage and will be kept free of contaminated material. The Site Safety Officer will determine the location of this zone. In the event of a site evacuation, see **Figure 2** and the Emergency Contacts/Planning for the rally point. The designated rally point may be relocated by the Site Safety Officer based on project or site conditions. All site workers will be notified of any relocation prior to implementation.

NOTE: Protective zones are not anticipated for this project.

6.3 Decontamination Procedures

All personnel and equipment leaving the exclusion zone must be properly cleaned and decontaminated. When there is evidence of chemical contamination during the site operations, all personnel will be decontaminated under the direction of the Site Safety Officer. Clean-up and/or decontamination of personnel shall consist of washing off excessively soiled PPE with a disinfectant detergent scrub and water. At the very least, all personnel should wash their hands and face before leaving the exclusion zone. After washing, all disposable clothing (Tyvek, gloves, etc.) will be removed and placed in a double lined plastic bag.

Sampling tools and any other non-disposable items will be decontaminated between sampling points, and at the direction of HRP personnel, to prevent cross-contamination of work areas or environmental samples, as applicable.

6.4 Emergency Decontamination

If immediate medical attention is required in an emergency, decontamination will be performed after the victim has been stabilized. If a worker has been exposed to an extremely toxic or corrosive material, then emergency decontamination will consist of flushing with copious amounts of water. If the victim cannot be decontaminated because it will interfere with emergency medical aid being administered, then the victim should be wrapped with plastic or other available items (i.e., an uncontaminated coverall) to reduce potential contamination of other personnel or medical equipment.

If a site worker has been overcome by heat related illness, then any protective clothing should be removed immediately. In the case of non-medical emergency evacuation, decontamination should be performed as quickly as possible, unless instant evacuation is necessary to save life or prevent injury.

6.5 Personal Hygiene

All employees will be required to wash their hands and face prior to eating, smoking, drinking, and going to the bathroom. Workers will be required to remove contaminated PPE and clothing prior to leaving the Contaminant Reduction Zone. All field personnel should avoid contact with potentially contaminated substances such as puddles, pools, mud, etcetera.

7.0 PERSONAL PROTECTIVE EQUIPMENT

There is different equipment that is worn to minimize exposure to hazards that can cause serious work injuries and illnesses. **Table 11** will list out the PPE that is required onsite and for the job that needs to be performed.

TABLE 11
PERSONAL PROTECTIVE EQUIPMENT
Check all the PPE that may apply and give the description of PPE.

TYPE of PPE	DESCRIPTION of PPE
HEAD AND FACE: ☐ Not Needed ☒ Safety Glasses ☐ Safety Goggles ☐ Face Shield ☒ Hard Hat ☒ Hearing ☐ Other	ANSI-rated hard hat, protective eye wear, and appropriately rated hearing protection, if needed
FEET: ☐ Not Needed ☒ Steel Toes ☐ Overboots ☐ Disposable Booties ☐ Rubber Boots ☐ Electrostatic Discharge (ESD) ☐ Chemical Resistant ☐ Other	ANSI-rated footwear
PROTECTIVE CLOTHING: ☐ Not Needed ☐ Encapsulated Suit ☐ Splash Suit ☐ Apron ☒ High Visibility Vest ☐ Coveralls ☐ Other	High visibility vest or other high visibility outer garment
HANDS: ☐ Not Needed ☐ Cut Resistant ☐ Chemical Resistant ☐ Under Gloves ☐ Over Gloves ☐ Heat Resistant ☒ Other	Nitrile gloves

TABLE 11
PERSONAL PROTECTIVE EQUIPMENT
Check all the PPE that may apply and give the description of PPE.

TYPE of PPE	DESCRIPTION of PPE
RESPIRATOR: ☒ Not Needed ☐ Supplied Air ☐ APR	☐ Filtering Face Piece (N95/Dust Mask) ☐ Half Face ☐ Full Face

7.1 Levels of Personal Protective Equipment

As identified in **Section 5.0**, the overall H&S risk associated with chemical hazards for HRP, and associated contractors is considered significant. This is primarily due to the moderate concentrations of chemical contaminants expected based on minimal contact personnel will have with any potentially contaminated media. Therefore, the minimal level of protection for HRP personnel during the conduct of all the environmental work performed at the site will be Level D PPE. The following constitute Level D PPE; it may be used as appropriate:

- Coveralls
- Gloves, as applicable
- Chemical-resistant steel toe and shank shoes
- Boots, outer, chemical-resistant (disposable), as applicable
- Safety glasses or chemical splash goggles
- Hard hat, as applicable
- Escape mask, as applicable
- Face shield, as applicable

If site conditions warrant, an upgrade to Level C PPE may be required. If required, the Contractor will make Level C PPE readily available. The following constitute Level C PPE; it may be used as appropriate:

- Full-face or half-mask, air purifying respirators (National Institute for Occupational Safety and Health (NIOSH) approved)
- Hooded chemical-resistant clothing (e.g., Tyvek, overalls, two-piece chemical-splash suit, disposable chemical-resistant overalls)
- Coveralls, as applicable
- Gloves, outer, chemical-resistant
- Gloves, inner, chemical-resistant
- Boots (outer), chemical-resistant steel toe and shank, as applicable
- Boot-covers, outer, chemical-resistant (disposable), as applicable
- Hard hat, as applicable

- Escape mask, as applicable
- Face shield, as applicable

NOTE: Safety vest may or may not be required depending on site conditions/location and will be addressed at the time of task assignment by the Site Safety Officer.

If the Toolbox Talk determines that protection beyond Level D is required, HRP will re-evaluate the HASP as well as the site conditions, and will revise the HASP as required.

NOTE: The level of protection identified here does not include the necessary equipment for entering confined spaces.

The following table provides a general description of potential field activity tasks to be performed and associated (recommended) PPE. The use of this PPE may or may not vary depending onsite conditions and will be addressed at the time of task assignment by the Site Safety Officer.

TABLE 12
POTENTIAL FIELD ACTIVITY TASKS AND ASSOCIATED PPE

Task Description	Invasive (Y/N)	Protection Level
Site Mobilization - Surveying, fence and barrier installation, hay bale installation, decon and work zone set up, soil staging areas preparation	N	Level D
Soil and Water Sampling - Drilling, sampling, soil moving as needed.	Y	Modified Level D or Level C – Respirator as needed based on monitoring. Eye protection required during collection of any liquid sample
Soil Excavation, Staging and Load-Out	Y	Modified Level D – or Upgrade to Level C dependent on monitoring
Decontamination - Truck dry sweeping, decon pressure wash of equipment, PPE change out	Y	Modified Level D – or Upgrade to Level C dependent on monitoring
Waste Management - Soil load-out for offsite disposal, water removal for disposal, PPE disposal	Y	Modified Level D – or Upgrade to Level C dependent on monitoring
Site Control (Exclusion, Decontamination, Support Zones)	N	Modified Level D – or Upgrade to Level C dependent on monitoring
Communications - Use of hand signals, backup alarms, and voice	N	NA
Site Restoration	Y	Level D

8.0 TRAINING/MEDICAL SURVEILLANCE

8.1 Training Requirements

All HRP and HRP subcontractor personnel who enter the work zone and/or Exclusion Zone must have successfully completed the 40-hour or 24-hour training requirement outlined in 29 CFR 1910.120(e). If the 40-hour or 24-hour training of any person occurred more than twelve months prior to commencement of work, then that person must have attended an 8-hour refresher course within the twelve months prior to commencement of work.

If respirators are in use in the Exclusion Zone, then all personnel must have undergone respirator training and a fit test within the last twelve months.

Training certificates and records for HRP employee(s) are maintained by HRP. All other contractors will be required to supply written proof of training before being allowed into the Exclusion Zone.

8.2 Pre-Entry Briefing

Prior to commencement of work in an area of suspected contamination, HRP’s HSO will conduct a pre-entry briefing with onsite contractors, which will include the following:

- Name of the Site Safety Officer and person responsible for the visitor log
- Description of the parcel as well as location of emergency telephones and the location/boundaries of the Exclusion Zone, Contamination Reduction Zone, and Support Zone, if established
- Review of hospital locations and directions
- Review of tasks to be conducted within the parcel by the site workers
- Review of the Emergency Action Plan and rally point, including the nearest emergency communications and telephone numbers
- The nature, level, and degree of anticipated hazards (physical and chemical) involved in the site work
- Required PPE
- Decontamination procedures

The Site Safety Officer should also, at this time, ensure that all onsite HRP and HRP subcontractor personnel have read the HASP and signed the Field Team Acknowledgement (**Section 12.0**). If additional information on the site becomes available, the Site Safety Officer will call additional briefings, as necessary.

8.3 Toolbox Talk (Daily Job Brief)

The HRP Site Safety Officer will conduct a safety overview meeting at the beginning of each workday on the site. The meeting will be held in addition to any safety meetings that the subcontractor conducts. A summary of the meeting topics signed by the personnel attending the meeting is included in **Appendix D**.

8.4 Medical Surveillance

All HRP and HRP subcontractor personnel entering the Exclusion Zone must have had a physical within the twelve months prior to commencement of site work. A physician's written opinion regarding fitness for work for each employee including work limitations, if any, is on file at HRP, as applicable. A written opinion for all other site personnel must be supplied prior to commencement of site work to the HRP Site Safety Officer. Any work limitations for site personnel, or relevant medical information (i.e., allergic reactions to medication) should be included in this Plan.

9.0 AUTHORIZATION

Personnel authorized to enter the Exclusion Zone include the personnel listed from **Table 6** of this plan. Persons not listed on **Table 6** may enter the Exclusion Zone only if the appropriate training and medical fitness certifications have been supplied to either the HRP PM or OHSM and the Site Safety Officer or his/her designee onsite has approved site entry. All personnel entering or leaving the Exclusion Zone must sign in and sign out with the recordkeeper.

10.0 RECORDKEEPING

By the completion of the Project this Site-Specific HASP document, and all associated records (Toolbox Talks, JSA, Monitoring data, etc.) must be provided to the appropriate personnel at the office that implemented the Project. The appropriate personnel will then electronically store these records into the project folder. It is expected that some scanning will be necessary.

11.0 SITE-SPECIFIC HEALTH AND SAFETY PLAN APPROVAL

This plan meets the minimum requirements of 29 CFR 1910.120 and 29 CFR 1929.65 and has been written for specified site conditions, dates, and personnel, and must be amended if conditions change. By their signature, the undersigned certify that this HASP is approved and will be utilized during activities at the project.

____
[CONSULTANT NAME HERE] Date
Site Safety Officer

____
Kim Baines Date
Project Manager

____
Bryan Sherman Date
Office Health and Safety Manager

Subcontractor:
I have been provided a copy of this HASP for review.

____ ____________
[Name] Date

Representing ____

The Designated Competent person representing [subcontractor] at the site will be:

____.

Any alternate Competent Person will be noted in the Toolbox Talk (**Appendix D**).

ADDITIONAL APPROVALS (or Re-Approvals)	
Name:	**Date:**

12.0 FIELD TEAM ACKNOWLEDGMENT

All HRP personnel shall sign below after reading this HASP and shall agree with the following statement:

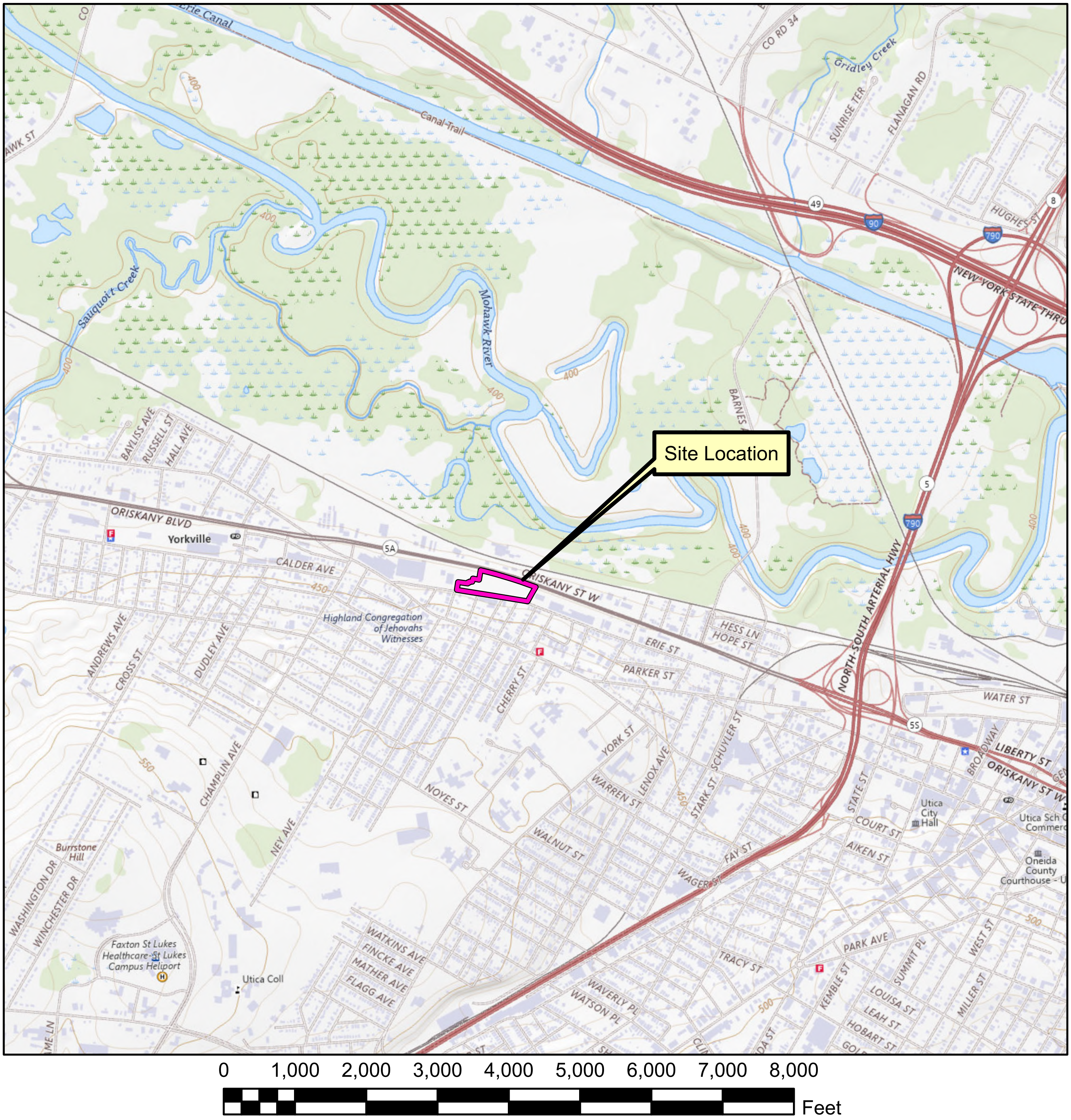
"I have read and understand this Site-Specific Health and Safety Plan.
I will comply with the provisions set forth therein."

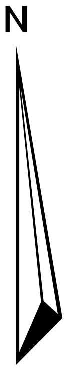
Printed Name	Signature	Date

FIGURES

Figure 1

Site Location Map





USGS Quadrangle Information
Quad ID: 43075-A3
Name: Utica West, New York
Date Rev: 2013
Date Pub: 2016

Figure 1
Site Location
Former Mele Site
1904 Erie Street
Utica, New York
HRP # MOH1002.P2
Scale 1" = 2,000'

HRP
MOVE YOUR ENVIRONMENT FORWARD

ONE FAIRCHILD SQUARE
SUITE 110
CLIFTON PARK, NY 12065
(518) 877-7101
HRPASSOCIATES.COM

Path: S:\Data\MMOHVA - MOHAWK VALLEY EDGE\584 PHOENIX DRIVE, ROME, NY\MOH1002P2 - 2024 EPA Assessment Grant\GIS\Mele\Mele Figure 1- Site Plan.aprx

Figure 2

Site Plan with Areas of Environmental Concern

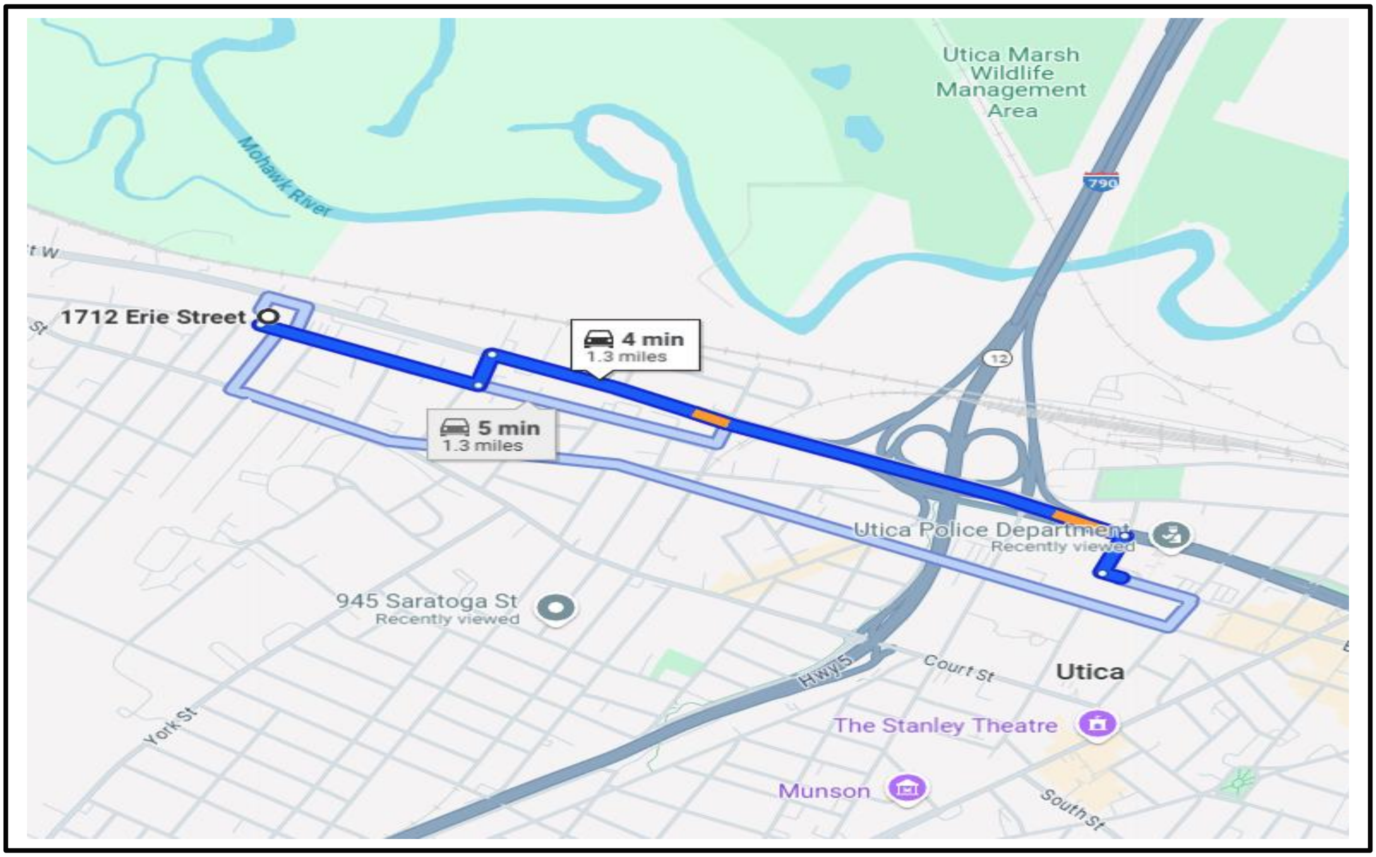
Figure 3

Route and Map to Nearest Hospital

Directions to Wynn Hospital

Starting Address: 1904 Erie Street, Utica, NY
Ending Address: 111 Hospital Drive, Utica, NY

Total Estimated Time: 4 minutes
Total Estimated Distance: 1.3 miles



TABLES

TABLE 13
CONTAMINANTS OF CHEMICALS KNOWN OR SUSPECTED ONSITE

*HIGHLIGHT THOSE THAT APPLY TO THE TASK BEING PERFORMED.

CONTAMINANT	ODOR THRESHOLD	OSHA PEL[1]	TLV (ACGIH)	OSHA CEILING[2] /STEL	IDLH CONC.	ROUTES OF EXPOSURE	SYMPTOMS OF ACUTE EXPOSURE[3]
1,1,1 Trichloroethane	44 ppm	350 ppm	350 ppm	---	700 ppm	Inh, Ing, Con	Head, Lass, CNS, Derm
1,1,2-Trichloroethane	---	10 ppm	10 ppm	----	[100 ppm]	Inh, Ing, Abs, Con	Eyes, Nose Irrit, Resp Irrit, CNS, Liver, Kidney Damage, Derm, [Carc]
1,2,4 Trimethylbenzene 1,3,5 Trimethylbenzene		25 mg/m^3	25 ppm	25 mg/m^3	ND	Inh, Ing, Con	Irrit Eyes, Skin, Nose, Throat, Resp Sys, Bron, Hyprochronic Anemia, Head, Drow, Ftg, Dizz, Nau, Inco, Vomit, Conf, Chemical Pneu (aspir lig)
1,1' Biphenyl	0.0062 mg/m^3	0.2 ppm	0.2 ppm	---	100 mg/m^3	Inh	
1,1-Dichloroethane	120 ppm	100 ppm	100 ppm	---	3,000 ppm	Inh, Ing, Con	CNS Depres, Skin Irrit, Liver, Lung, and Kidney Damage
1,1-Dichloroethylene***	500 ppm	---	5 ppm	---	---	Inh, Con	CNS depress, Resp, [Carc]
1,2-Dichlorobenzene	50 ppm	50 ppm	25 ppm		200 ppm	Inh, Ing, Abs, Con	Irrit, Resp
1,2-Dichloroethylene	26-87 ppm	200 ppm	200 ppm	---	1,000 ppm	Inh, Ing, Con	Vomit, Irrit Eyes, Resp Sys; CNS Depres
1,2-Dichloropropane	130-190 ppm	75 ppm	75 ppm	---	[400 ppm]	Inh, Con, Ing	Eye irritation, Drow, light-headedness; irritated skin, [Carc]
1,3-Dichlorobenzene	---	----	---	----	---	----	----
1,4-Dichlorobenzene	20 ppm	75 ppm	10 ppm	----	[150 ppm]	Inh, Ing	[Carc], Eye Irrit, swelling around eye, headache, nausea, vomiting
1-Methylnaphthalene	0.02 ppm	---	---	---	---	---	---
2,4-Dichlorophenol	1.4007 mg/m^3	---	---	---	---	---	---
2,4-Dimethylphenol	0.001 mg/m^3	---	---	---	---	---	---
2-Methylnaphthalene	0.01 ppm	---	---	---	---	---	---

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CONTAMINANT	ODOR THRESHOLD	OSHA PEL[1]	TLV (ACGIH)	OSHA CEILING[2] /STEL	IDLH CONC.	ROUTES OF EXPOSURE	SYMPTOMS OF ACUTE EXPOSURE[3]
2-Methylphenol (o-cresol) [skin]	1.4 mg/L	5 ppm	5 ppm	---	250 ppm	Inh, Abs, Ing, Con	Confusion, depression, Resp Fail; difficulty breathing, irregular rapid respiration, weak pulse; skin, eye burns; dermatitis
3, 3'-Dichlorobenzidine	---	None	---	---	---	Inh, Abs, Ing, Con	Sens, Derm, Head, Dizz, Burns, GI Upset, [Carc]
4-Isopropyltoluene	---	---	---	---	---	Con, Inh, Ing	Defat, Eryt
Acenephthene	0.5048 mg/m^3	---	---	---	---	---	---
Acenaphthylene	---	---	---	---	---	---	---
Acetone	47.5 mg/m^3	1,000 ppm	500 ppm		2,500 ppm	Ing, Inh, Con	Head, Dizz; Irrit Eyes, Nose, Throat; Derm, CNS, Depress, Derm
Acetonitrile	70 mg/m^3	40 ppm	20 ppm	---	500 ppm	Inh, Ing, Abs, Con	Asphy; Nau, Vomit; Chest Pain; Weak, Stupor, Convuls; Eye Irrit
Aldrin	---	0.25 mg/m^3	0.25 mg/m^3	---	25 mg/m^3	Inh, Abs, Ing, Con	Head, Dizz, Nau, Vomit, Mal, Myo, [Carc]
Anthracene (Coal Tar Pitch)	---	0.2 mg/m^3			[80 mg/m^3]	Inh, Con	Derm, bron, [carc]
Antifreeze		50 ppm	100 mg/m^3 (aerosol)	---	ND	Inh, Ing, Con	Irrit Eyes, Skin, Nose, Throat, Nau, Vomit, Abdom Pain, Lass, Dizz, Stup, Conv, CNS, Depres, Skin Sen
Arsenic	----	0.010 mg/m^3	0.01 mg/m^3	----	[5 mg/m^3]	Abs, Inh, Con, Ing	Derm; GI; Resp Irrit; ulceration of nasal septum; Resp, Irrit, Hyper Pig of Skin, [Carc]
Barium (elemental)	---	0.5 mg/m^3	0.5 mg/m^3		50 mg/m^3 (barium components)	Inh, Ing, Con	Resp. Irrit, GI, Muscle Spasm, Eye Irrit, Slow Pulse; skin burns
Benzene*	4.7 ppm	1 ppm	0.5 ppm	5 ppm	[500 ppm]	Inh, Ing, Abs, Con	Irrit Eyes, Nose, Throat; Head, Nau, Derm, Ftg, Anor, Lass, [Carc]

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CONTAMINANT	ODOR THRESHOLD	OSHA PEL[1]	TLV (ACGIH)	OSHA CEILING[2] /STEL	IDLH CONC.	ROUTES OF EXPOSURE	SYMPTOMS OF ACUTE EXPOSURE[3]
Benzo(a)anthracene (coal tar pitch)	---	0.2 mg/m^3			[80 mg/m^3]	Inh, Con	[Carc], Derm, Bron
Benzo(a)pyrene (coal tar pitch)	---	0.2 mg/m^3	---		[80 mg/m^3]	Inh, Con	[Carc], Derm, Bron
Benzo(b)fluoranthene (coal tar pitch)	---	0.2 mg/m^3	---		[80 mg/m^3]	Inh, Con	[Carc], Derm, Bron
Benzo(g,h,i)perylene (coal tar pitch)	---	0.2 mg/m^3			[80 mg/m^3]	Inh, Con	[Carc], Derm, Bron
Benzo(k)fluoranthene (coal tar pitch)	---	0.2 mg/m^3			[80 mg/m^3]	Inh, Con	[Carc], Derm, Bron
Bis (2-ethylhexyl) Phthalate**	N/A	5 mg/m^3	5 mg/m^3	10 mg/m^3	[5,000 mg/m^3]	Inh, Ing, Con	[Carc], Irrit Eyes
Cadmium (dust)	---	0.005 mg/m^3	Lowest concentration feasible 0.01 mg/m^3	---	[9 mg/m^3]	Inh, Ing	CNS, Resp, Irrit, Vomit, Cough, Head, Chills, Nau, Diarr, Pulm Edema, Dysp, Chest Tight, [Carc]
Carbazole	---	---	---	---	---	Inh	---
Carbon disulfide	0.1-0.2 ppm	20 ppm	1 ppm	30 ppm	500 ppm	Inh, Abs, Ing, Con	Diz, Head,Ftg, Ner, anorexia, trembling hands, loss of fine motor coord, gastritis, eye, skin burns, Derm
Carbon Tetrachloride***	21.4 ppm	10 ppm	5 ppm	25 ppm	[200 ppm]	Inh, Abs, Con, Ing	CNS Depres, Nau, Vomit, Irrit, Irrit Eyes, Skin, Drow, Dizz, [Carc]
Chlorobenzene***	0.98 mg/m^3	75 ppm	10 ppm	---	1,000 ppm	Inh, Ing, Con	Irrit, Drow, CNS, Depres, Eyes, Skin, Nose, Inco.
Chloroform***	85 ppm	50 ppm	10 ppm	50 ppm	[500 ppm]	Inh, Ing. Con, Abs	Dizz, Dullness, Nau, Head, Ftg, Irrit Eyes, Skin, Conf, [Carc]
Chromium	---	1 mg/m^3	0.5 mg/m^3	---	250 mg/m^3	Inh, Ing, Con	Irrit Eyes, Sens Derm

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Chrysene (coal tar pitch)		0.2 mg/m^3	---		[80 mg/m^3]	Inh, Con	Derm, Bron, [Carc]
Cis-1-2-Dichloroethylene	---	200 ppm	200 ppm	----	1000 ppm	Inh, Con, Ing	Irrit Eyes, Resp, CNS Depress
Copper (dusts and mists) (fumes)		1 mg/m^3 0.1 mg/m^3	1 mg/m^3 0.2 mg/m^3	----	100 mg/m^3	Inh, Ing, Con	Vomit, Derm, CNS, Irrit, Derm, Nau, Taste (metallic)
Cyanide	0.9 mg/m^3	5 mg/m^3	5 mg/m^3 (10 min)	5 mg/m^3	25 mg/m^3	Inh, Ing, Abs, Con	Weak, Head, Nau, Conf, Cyan
Dibenzo(a,h)anthracene						Inh, Ing	
Dichloromethane	540 mg/m^3	25 ppm	50 ppm	125 ppm	[2,300 ppm]	Inh, Abs, Ing, Con	Irrit Eyes, Skin, lass, drow, dizz, Numb, tingl, Nau, [Carc]
Diethylphthalate**	---	None	5 mg/m^3	---	N.D.	Inh, Ing, Con	Irrit Eyes, Skin, Nose, Throat, Head, Dizz, Nau, Lac, Possible Polyneur, Vestibular Dysfunc, Pain, Numb, lass, Spasms in Arms and Legs
Di-n-octylphthalate	---	---	---	---	---	Inh, Ing, Con	---
Dimethylpthalate	---	5 mg/m^3	5 mg/m^3	---	2,000 mg/m^3	Inh, Ing, Con	Irrit, Resp, Abdom
Ethyl Benzene*	8.7 mg/m^3	100 ppm	100 ppm	125 ppm	700 ppm	Inh, Abs, Con	Head. Irrit, Derm, Narc., Irrit Eyes, Skin; Coma
Fluoranthene		0.2 mg/m^3	0.2 mg/m^3			Ing, Inh	[Carc]
Fluorine*	6 mg/m^3	0.1 ppm	1 ppm	2 ppm	25 ppm	Inh, Con	
Fuel Oil/#2	----	----	300 ppm	----		Inh, Abs, Ins, Con	Irrit Eyes, Skin, Derm, Head, Ftg, Blurred Vision, Dizz, Conf
Ideno(1,2,3-cd)pyrene		0.2 mg/m^3				Ing, Inh	
Lead (inorganic forms and dust as Pb)****		0.05 mg/m^3	0.05 mg/m^3		100 mg/m^3	Inh, Ing, Con	Irrit, Cns, Vomit, Narco, Weak, Pall, Insom, Lass, Abdom, Constip

TABLE 13
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Mercury (organic alkyl compounds) [skin]		0.01 mg/m^3	0.01 mg/m^3	0.03 mg/m^3	2 mg/m^3	Inh, Abs, Ing, Con	Irrit Eyes, Skin; Cough & Chest Pain, Bron Pneu, Tremor, Insom, Irrty, Indecision, Head, Ftg, Weak, Stomatitis, Salv, GI Dist, Anor, Low-wgt, Ataxia
Mercury (compounds)	----	0.1 mg/m^3	0.025 mg/m^3	0.1 mg/m^3	10 mg/m^3	Inh, Abs, Ing, Con	Irrit Eyes, Skin; Cough & Chest Pain, Bron Pneu, Tremor, Insom, Irrty, Indecision, Head, Ftg, Weak, Stomatitis, Salv, GI Dist, Anor, Low-wgt, Ataxia
Methanol	13.1150 mg/m^3	200 ppm	200 ppm	---	6,000 ppm	Inh, Abs, Ing, Con	Irrit Eyes, Skin, Resp, Head, drow, dizz, Nau, Vomit, vis dist, Optic, derm
Methyl Ether	----	----	---	----	---	Inh	Poison
Methyl Ethyl Ketone (2-Butanone)***	0.7375 mg/m^3	200 ppm	200 ppm	300 ppm	3,000 ppm	Inh, Con, Ing	Irrit Eyes, Skin, Nose, Throat, Head, Dizz, Vomit, Derm
Methylene Chloride	540 mg/m^3	25 ppm	50 ppm	125 ppm	[2,300 ppm]	Inh, Ing, Con, Abs	Ftg, Weak, dizz, drow, Numb, Tingle [carc], Irrit Eyes, Skin, Nau
Mineral Spirit	20 ppm	500 ppm	100 ppm	---	20,000 mg/m^3	Inh, Ing, Con	Irrit Eyes, Nose, Throat, Dizz, Derm, Chemical pneu
Methyl tert butyl ether (MTBE)	---	---	50 ppm	---		Inh, Abs	
Naphtha	0.86 ppm	100 ppm	400 ppm	---	1,000 ppm	Inh, Con, Ing	Light Head, Drow, Irrit, Derm, Irrit Eyes, Skin, Nose
Naphthalene*	0.084 ppm	10 ppm	10 ppm	15 ppm	250 ppm	Inh, Abs, Ing, Con	Eye irritation; headache; confusion, excitement, malaise (vague feeling of ill-being); nausea, vomiting, abdominal pain; irritated bladder; profuse sweating; renal shutdown; dermatitis

TABLE 13
CONTAMINANTS OF CHEMICALS KNOWN OR SUSPECTED ONSITE

*HIGHLIGHT THOSE THAT APPLY TO THE TASK BEING PERFORMED.

CONTAMINANT	ODOR THRESHOLD	OSHA PEL[1]	TLV (ACGIH)	OSHA CEILING[2] /STEL	IDLH CONC.	ROUTES OF EXPOSURE	SYMPTOMS OF ACUTE EXPOSURE[3]
Nickel (metal)	---	1 mg/m^3	1.5 mg/m^3	---	[10 mg/m^3]	Inh, Ing, Con	Head, Verti, Nau, Vomit, Pain, Cough, Weak, Convuls, Delirium, Pneu, ,[Carc]
Nitrobenzene	0.0235 mg/m^3	1 ppm	1 ppm	---	200 ppm	Inh, Abs, Ing, Con	Irrit Eyes, Skin, Anoxia, Derm, Anem, Methem
n-Butylbenzene	---	---	---	---	---	---	---
n-Propylbenzene	---	---	---	---	---	---	---
PCBs 42% chlorine (Aroclor 1242)	---	1 mg/m^3 (skin)	1 mg/m^3 (skin)	---	[5 mg/m^3]	Inh, Abs, Ing, Con	Irrit Eyes, Chloracne, Liver Damage [carc]
PCBs 54% chlorine (Aroclor 1254)	---	0.5 mg/m^3 (skin)	0.5 mg/m^3 (skin)	---	[5 mg/m^3]	Inh, Abs, Ing, Con	Irrit Eyes; Chloracne, Liver Damage [carc]
PFAS	There are currently no established exposure limits for PFAS. If your project involves potential exposure to PFAS, reach out to the CHSO or OHSM about current best practices relative to exposure controls.						
Petroleum Distillates	---	500 ppm	100 ppm		[1,100 ppm]	Inh, Ing, Con	Dizz, Drow, Head, Dry Skin, Nau, Irrit Eyes, Nose, Throat, [Carc]
Phenanthrene (Coal Tar Pitch)		0.2 mg/m^3	0.2 mg/m^3		[80 mg/m^3]	Inh, Con	Derm, bron, (carc)
Phenol**	0.1786 mg/m^3	5 ppm	5 ppm	---	250 ppm	Inh, Abs, Ing, Con	Irrit Eyes, Nose, Throat, Anor, Low Wgt, Weak Musc Ache, Pain, Dark Urine, Cyan, Liver, Kidney Damage, Skin, Burns, Derm, Ochronosis, Tremor, Convuls, Twitch
Pyrene		0.2 mg/m^3			[80 mg/m^3]	Inh, Con	[Carc]
Sec-Butylbenzene	---	---	---	---	---	---	---
Selenium	N/A	0.2 mg/m^3	0.2 mg/m^3	Unknown	1 mg/m^3	Inh, Ing, Con	Irrit, Head, Fever, Chills, Skin/Eye Burns, Metallic Taste, GI, Dysp, Bron

TABLE 13
CONTAMINANTS OF CHEMICALS KNOWN OR SUSPECTED ONSITE

*HIGHLIGHT THOSE THAT APPLY TO THE TASK BEING PERFORMED.

CONTAMINANT	ODOR THRESHOLD	OSHA PEL[1]	TLV (ACGIH)	OSHA CEILING[2] /STEL	IDLH CONC.	ROUTES OF EXPOSURE	SYMPTOMS OF ACUTE EXPOSURE[3]
Silver (metal and soluble compounds as Ag)	----	0.01 mg/m^3	Metal = 0.1 mg/m^3 Soluble 0.01 mg/m^3		10 mg/m^3	Inh, Ing, Con	Blue-gray Eyes, Nasal Septum, Throat, Skin; Irrit, Ulcer, Skin, GI Dist
Tetrachloroethylene (a.k.a. perchloroethylene)***	4.68 ppm	100 ppm	25 ppm	200 ppm	[150 ppm]	Inh, Ing, Con, Abs	Irrit Eyes, Skin, Nose, throat, Resp. Nau, flush face, Neck, dizz, inco, head, drow, eryth, [Carc]
Toluene*	2.14 ppm	200 ppm	50 ppm	300 ppm	500 ppm	Inh, Abs, Ins, Con	Resp, Irrit, Ftg, Conf, Dizz, Head, Derm, Euph, Head, Dilated Pupils, Lac, Ner, Musc FTg, Insom, Pares, Derm, lass
Petroleum Distillates (naphtha)	10 ppm	100 ppm	400 ppm	---	1,000 ppm	Con, Inh, Ing	---
Trans 1,2-Dichloroethylene	0.3357 mg/m^3	200 ppm	200 ppm	---	1,000 ppm	Inh, Con	Irrit, Resp, CNS depress
Trichloroethylene***	21.4 ppm	100 ppm	50 ppm	200 ppm	[1,000 ppm]	Inh, Con, Abs, Ing	Head, Vert, Nau, Vomit, Derm, Vis Dist, Tremors, Som, Nau, Irrit Eyes, Skin, Card Acc., Ftg, [Carc]
Trichlorofluoromethane	28 mg/m^3	1,000 ppm	1,000 ppm		2,000 ppm	Inh, Con, Ing	Inco, trem, derm, card, asph, frost
Trichlorotrifluoroethane	45 ppm	1,000 ppm	1,000 ppm	1,250 ppm	2,000 ppm	Inh, Con, Ing	Irrit Skin, throat, Drow, Derm, CSN, Depress
Vinyl Chloride***	10-20 ppm	1 ppm	1 ppm	5 ppm	ND	Inh, Con	Lass, Abdom, Gi Bleeding; Hepatomegaly; Pallor or Cyan of Extremities; Liq: Frostbite; [Carc]
VM&P Naphtha (petroleum naphtha)	---	---	300 ppm	---	ND	Con, Ing, Inh	Irrit Eyes, Nose, Throat, Dizz, drow, head, nau, dry skin, chem. Pneumonitis
Xylene*	4.5 mg/m^3	100 ppm	100 ppm	150 ppm	900 ppm	Inh, Ing, Abs, Con	Dizz, Drow, Irrit, Excite, Nau, Vomit, Eyes, Skin, Nose, Throat

TABLE 13
CONTAMINANTS OF CHEMICALS KNOWN OR SUSPECTED ONSITE

*HIGHLIGHT THOSE THAT APPLY TO THE TASK BEING PERFORMED.

CONTAMINANT	ODOR THRESHOLD	OSHA PEL[1]	TLV (ACGIH)	OSHA CEILING[2] /STEL	IDLH CONC.	ROUTES OF EXPOSURE	SYMPTOMS OF ACUTE EXPOSURE[3]
Zinc (oxide)	---	5 mg/m^3	2 mg/m^3	---	500 mg/m^3	Inh	Dry Throat, Cough, Chills, Tight Chest, Blurred Vision
4,4’ DDD	---	---	---	---	---	Ing, Inh, Con	---
4,4’ DDE	---	---	---	---	---	Ing, Inh, Con	---
4,4’ DDT	5.0725 mg/m^3	1 mg/m^3	1 mg/m^3	---	[500 mg/m^3]	Inh, Abs, Ing, Con	Irrit Eyes, Skin, Pares, Tongue, Lips, Face, Trem, Anxi, Dizz, Conf, Mal, Head, Lass, Conv, Paresi Hands, Vomit, [Carc]
Aldrin		0.25 mg/m^3	0.25 mg/m^3	---	[25 mg/m^3]	Inh, Abs, Ing, Con	Head, Dizz, Nau, Vomit, Mal, Myo [Carc]
Chlordane [skin]	0.0084 mg/m^3	0.5 mg/m^3	0.5 mg/m^3		[100 mg/m^3]	Inh, Abs, Ing, Con	Blurred vision, confusion, delirium, cough; abdominal pian, nausea, vomiting diarrhea; irritability, tremor, convulsions [Carc]
EDB	76.8 mg/m^3	20 ppm		30 ppm	[100 ppm]	Inh, Abs	Resp. Irr, Eye Irr. [Carc]
Endosulfan I Endosulfan II	---	0.1 mg/m^3	0.1 mg/m^3	---	N.D.	Inh, Abs, Ing, Con	Irrit, Skin, Nau, Conf, Agit, Flush, Dry, Trem, Conv, Head
Endosulfan Sulfate		---	0.1 mg/m^3	---	---	Ing, Con	---
Endrin	1.8 x 10^{-2} ppm	0.1 mg/m^3	0.1 mg/m^{-3}	---	2 mg/m^3	Inh, Abs, Ing, Con	Epil Conv, Stup, Head, Dizz, Abdom, Nau, Vomit, Insom, Agress, Conf, Drow, Lass, Anor
Endrin Aldehyde	1.8 x 10^{-2} ppm	---	---	---	---	Inh, Con	---
Endrin Ketone	---	---	---	---	---	---	---
Heptachlor	0.02 ppm	0.5 mg/m^3	0.05 mg/m^3	---	[35 mg/m^3]	Inh, Abs, Ing, Con	In animals, Trem, Conv, [Carc]
Heptachlor epoxide	0.02 ppm	---	0.05 mg/m^3	---	---	Ing, Inh	Trem, Conv, [Carc]
Hydrogen Cyanide(Hydrocyanic Acid)	0.9 mg/m^3	10 ppm (11 mg/m^3)	4.7 ppm	4.7 ppm	50 ppm	Con, Inh, Ing, Abs	Asphy & death at high levels; Weak, Head, Conf, Nau, Vomit, Incr. Rate and Depth of Respiration or Respiration Slow and Gasping

TABLE 13
CONTAMINANTS OF CHEMICALS KNOWN OR SUSPECTED ONSITE

*HIGHLIGHT THOSE THAT APPLY TO THE TASK BEING PERFORMED.

CONTAMINANT	ODOR THRESHOLD	OSHA PEL[1]	TLV (ACGIH)	OSHA CEILING[2] /STEL	IDLH CONC.	ROUTES OF EXPOSURE	SYMPTOMS OF ACUTE EXPOSURE[3]

NOTES

* = Constituent found in ETPH

**=Constituent found in Acid/Base/Neutral Extractable Compounds

***=Constituent found in Volatile Organic Compounds

****=Constituent found in Leaching Lead

[1] PEL = Permissible Exposure Limit. If no PEL is available, then the NIOSH Threshold Limit Value (TLV) should be used, if available.

[2] Ceiling limit or Short-Term Exposure Limit (STEL), if available. Again, the NIOSH TLV may be used if no OSHA standard exists.

[3] Abbreviations are contained on the next page

[   ] = Potential Occupational Carcinogen

ND = Not Been Determined

ABBREVIATIONS

abdom = Abdominal
abs = Absorption
aggress = Aggressiveness
agit = Agitation
anor = Anorexia
anos = Anosmia (loss of the sense of smell)
Anxi = anxiety
anem – Anemia
aspir = Aspiration
asph – asphyxia
bron = Bronchitis
bron pneu = Bronchitis pneumonitis
[carc] = Potential occupational carcinogen
Card = Cardiac arrhythmias
CNS = Central nervous system
conf = Confusion
constip = Constipation
con = Skin and/or eye contact
conv = Convulsions
corn = Corneal
cyan = Cyanosis
defat = Defatting
depres = Depressant/Depression
derm = Dermatitis
diarr = Diarrhea
dist = Disturbance
dizz = Dizziness
drow = Drowsiness
dry = Dry mouth
dysp = Dyspnea (breathing difficulty)
emphy = Emphysema
epil-conv = Epileptiform convulsions
eryth = Erythema
euph = Euphoria
fib = Fibrosis
frost = frostbite
ftg = Fatigue
flush = Flushing
GI = Gastrointestinal
head = Headache
hyperpig = Hyperpigmentation
inco = Incoordination
ing = Ingestion
inh = Inhalation
inj = Injury
insom = Insomnia
irrit = Irritation
irrty = Irritability
lac = Lacrimination (discharge of tears)
lass = Lassitude (weakness, exhaustion)
li-head = Lightheadedness
liq = Liquid
low-wgt = Weight loss
mal = Malaise (vague feeling of discomfort)
malnut = Malnutrition
methem = Methemoglobinemia
myo = Myochonic (jerks of limbs)
mg/m = milligrams/cubic meter
muc memb = Mucous membrane
mus ftg = Muscle fatigue
narco = Narcosis
nau = Nausea
ner = Nervousness
numb = Numbness
optic = Optic nerve damage (blindness)
pall = Facial pallor
parap = Paralysis
ppm = Parts per million
pares = Paresthesia
paresi = Paresis
peri neur = Peripheral neuropathy
pneu = Pneumonitis
prot = Proteinuria
pulm = Pulmonary
peri neur = Peripheral neuropathy
pneu = Pneumonia
prot = Proteinuria
pulm = Pulmonary
repro = Reproductive
resp = Respiratory
skin sen = skin sensitization
salv = Salvation
som = Somnolence (sleepiness unnatural drowsiness)
subs = Substernal (occurring beneath the sternum)
stup = Stupor
sys = System
tingle = tingle limbs
trem – Tremors
verti = Vertigo
vis dist = Visual disturbance
vomit = Vomiting
weak = Weakness

APPENDIX A

Safety and Logistics Planning Log

Safety and Logistics Planning Log
DEC009808

Date of Call	
Work Assignment Number / Task	
DEC Site Name and Number	

ATTENDEES		
HRP		
POSITION	**NAME**	**NUMBER**
HRP PM		
HRP SSO		
HRP Other:		
HRP Other:		
SUBCONTRACTORS		
POSITION	**NAME**	**NUMBER**
Driller Contact		
Utility Survey		
Surveyor		
Construction		
Other		
DEC		
POSITION	**NAME**	**NUMBER**
DEC PM		
DEC Other:		
DEC Other:		
BRIEF DESCRIPTION: SCOPE OF WORK (Task Specific)	*Use additional forms for additional tasks	

LOGISTICS			
Date of Work		Time to Meet	
Site Contact (phone)			
Notification of Site Contact made by			
Describe any unusual site-specific conditions/logistics here (if any):			

QUESTIONS	**Y/N**	**NOTES**
Water Needed? Source Confirmed?	Y / N	
Electricity Needed? Source Confirmed?	Y / N	
Water Storage Needed?	Y / N	
Water Discharges? Permits Needed/Attained?	Y / N	
Air Monitoring – CAMP?	Y / N	
Will there be intrusive work?	Y / N	
Locations marked in the field?	Y / N	
NYS Code Rule 753/Dig Safe System	Y / N	Ticket Number:
Confirmed that mark-out complete?	Y / N	
Anticipated Subsurface Conditions (Geology, Utilities, etc.):		
Anticipated Depth to Groundwater:		
Will NAPL/Product be Present?	Y / N Describe:	
Will there be any other parties entering the work zones? Describe control measures.		

APPENDIX B

Personnel Log

PERSONNEL LOG

Name	Representing	Date	Time In	Time Out

APPENDIX C

Job Safety Analysis (JSA)

JSA Completed By	

HAZARD RANKING CHART

SEVERITY	**CONSEQUENCE**	**PROBABILITY**				
	Injury	**Frequent**	**Likely**	**Occasional**	**Seldom**	**Unlikely**
	Fatality	**H**	**H**	**H**	**H**	**M**
	Injury Requiring Hospitalization	**H**	**H**	**H**	**M**	**L**
	Injury Requiring Medical Treatment Beyond First Aid	**H**	**M**	**M**	**L**	**L**
	Injury Requiring First Aid	**M**	**L**	**L**	**L**	**L**

TASK			
LOCATION OF TASK PERFORMED		**DATE OF JSA**	

TASK DESCRIPTION

*There are different categories of hazards to include: Biological, Physical, Safety, Chemicals, and Ergonomics

STEPS	HAZARD	CONTROL MEASURES	RISK RATING

APPENDIX D

Toolbox Talk

TOOLBOX TALK

GENERAL INFORMATION		
Person Conducting	**Site Name/Address**	**HRP Client Name/Job #**
Client Contact/Phone	**HRP H&S Rep.**	**HRP Supervisor**
Date/Time	**Number Attending**	**Weather**
Designated Competent Person:		
Description of Work		

ATTENDEES (Use additional sheets as needed)		
Name	**Company**	**Signature**

EMERGENCY CONTACT INFORMATION		
Emergency Telephone Numbers	FIRE / POLICE / AMBULANCE: 911	
Hospital Name & Location:		
NYSDEC Spill Line: 1-518-457-7362	National Response Center: 800-424-8802	CBYD: 800-922-4455
Health & Safety Manager:		

HAZARDS

- ☐ Toxic
- ☐ Corrosive
- ☐ Flammable
- ☐ Combustible
- ☐ Reactive
- ☐ Path Waste
- ☐ Asbestos
- ☐ Abrasive Blasting
- ☐ Drum Handling
- ☐ Pneumatic Tools
- ☐ Vac Truck
- ☐ Extreme Cold/Heat
- ☐ Drains/Sumps
- ☐ Sharp Objects
- ☐ Drilling in Soil
- ☐ Lighting
- ☐ Slips/Trips/Falls
- ☐ Lead
- ☐ Abrasive Blasting
- ☐ Live Electrical Circuits
- ☐ Elevated Work Area
- ☐ Hot Work
- ☐ Soil Excavation
- ☐ Tank Excavation
- ☐ Trenching
- ☐ Floor Holes
- ☐ Working on/near Water
- ☐ Underground/Overhead Utilities
- ☐ Power washing
- ☐ Lifting
- ☐ Noise
- ☐ Ladders
- ☐ Vehicle Traffic
- ☐ Other (s):

TOOLBOX TALK

PERSONAL SAFETY / PERSONAL PROTECTIVE EQUIPMENT (PPE)

☐ Supplied Air Respirator	☐ SAR w/Egress Bottle	☐ SCBA	☐ Air Purifying Respirator Cartridge:
☐ Fully Encapsulating Suit	☐ Flash Suit	☐ NOMEX (flam resistant)	☐ Protected Coveralls, Type:
☐ Overboots	☐ Lifebelt/Lanyard	☐ Hardhats	☐ Outer Gloves, Type:
☐ Safety Glasses	☐ Chemical Goggles	☐ Face Shield	☐ Inner Gloves, Type:
☐ Reflective Vests	☐ Eye Wash	☐ Safety Shower	☐ First Aid Kit
☐ Hearing Protection	☐ Evacuation Plan	☐ Communications	☐ Properly Sloped Excavation/ Trench
☐ PFD's	☐ Ventilation	☐ Steel Toe Boots	

FIRE SAFETY

☐ Fire Extinguishers	☐ Hot Work Permit	☐ Fire Blanket	☐ Explosion-Proof Equipment
☐ Equipment Grounded & Bonded	☐ Non-Sparking Tools	☐ Eliminate Ignition Sources	☐ Area Kept Wet
☐ Smoking Area Designated Location:	☐ Fire Hose Laid Out	☐ Alarm Box in Area, Location:	

ISOLATE EQUIPMENT & ELECTRICAL EQUIPMENT

☐ Establish Exclusion Zone/Traffic Cones	☐ Work Signs	☐ LockOut/TagOut	☐ Non-Conductive Tools
☐ Stop Transfers	☐ Caution Tape Area	☐ Equipment Grounded	☐ FR Suits/Coveralls
☐ GFCIS	☐ Temporary Fencing		

AIR MONITORING

Type of Meter:		Date last calibrated:	

SUBSTANCE	LEVEL B MAX.	ACTION LEVEL/LEVEL C MAX.	LEVEL D MAX.

HEALTH & SAFETY COMMENTS-QUESTIONS-CONCERNS / TOPICS & SAFET RULES REVIEWED

Contaminants of Concern:			
HEALTH & SAFETY SIGNATURE:		Date:	

Is there a Health & Safety Plan available on-site? Yes ☐ No ☐

☐ HAZARD ZONES NOT APPLICABLE, GENERAL WORK AREA Level D ☐ Modified Level D ☐ Level C ☐

Anything above Level C, foreman should use a Confined Space Permit/Form.

Note: HOT WORK requires a hot work permit and minimum 20# fire extinguisher. Foreman or HSM must record at least one contaminant of concern above. Toxic plants may be considered a COC if no chemical hazards are expected.

LEVEL C

Respirator Type:	

Name	Zone	Time In	Time Out	Decon Type

Before performing Level C work, ALL employees must review HRP's Respiratory Protection Program - a copy of which must be on-site along with a HASP.

APPENDIX E

Specific Procedures
(Not included)

APPENDIX F

Safety Data Sheets

(Not included-No chemicals brought to the site)

REVISION HISTORY

REVISION AND APPROVAL LOG			
REVISION DATE	**REVISION CONTENT**	**REVISED BY**	**APPROVED BY**
1/18/2021	Initiation of document/Reviewed by Jackie Baxley	SF	TAG
6/6/2024	- Update formatting - Update order of headers - Implemented tables within HASP, not as Appendix - Combining NY and other states – generic HASP to make site-specific - Checkbox formatting - Updated Action Levels Table	JLE	TAG

APPENDIX B

Community Air Monitoring Plan

Community Air Monitoring Plan

This Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress during remedial activities at the site. The CAMP is not intended for use in establishing action levels for workers respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air. The CAMP was developed in accordance with Appendices 1A & 1B of DER-10, included at the end of this CAMP.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Depending on the nature of known or potential contaminants at the site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary.

Continuous monitoring will be required for all ground intrusive activities. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and groundwater samples. "Periodic" monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuing monitoring may be required during sampling activities.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring will be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment will be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration will be visually assessed during all work activities.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than the background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work may continue with dust suppression techniques provided that no visible dust is migrating from the work area.

- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work will be stopped and a re- evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

- All readings will be recorded and be available for State (DEC and DOH) personnel to review.

VOC Monitoring, Response Levels, and Actions

VOCs will be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work will be performed using a photo ionization detector (PID) equipped with a 10.2 eV bulb. The PID will be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment will be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15- minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities will be halted, the source of the vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less- but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities will be shutdown.

- All 15-minute readings will be recorded and be available for State (DEC and DOH) personnel to review. Instantaneous readings, if any, used for decision purposes will also be recorded.

Special Requirements for Work Within 20 Feet of Potentially Exposed Individuals or Structures

When work areas are within 20 feet of potentially exposed populations or occupied structures, the continuous monitoring locations for VOCs and particulates must reflect the nearest potentially exposed individuals and the location of ventilation system intakes for nearby structures. The use of engineering controls such as vapor/dust barriers, temporary negative-pressure enclosures, or special ventilation devices should be considered to prevent exposures related to the work activities and to control dust and odors. Consideration should be given to implementing the planned activities when potentially exposed populations are at a minimum, such as during weekends or evening hours in non-residential settings.

- If total VOC concentrations opposite the walls of occupied structures or next to intake vents exceed 1 ppm, monitoring should occur within the occupied structure(s). Depending upon the nature of contamination, chemical-specific colorimetric tubes of sufficient sensitivity may be necessary for comparing the exposure point concentrations with appropriate pre-determined response levels (response actions should also be predetermined). Background readings in the occupied spaces must be taken prior to commencement of the planned work. Any unusual background readings should be discussed with NYSDOH prior to commencement of the work.

- If total particulate concentrations opposite the walls of occupied structures or next to intake vents exceed 150 mcg/m3, work activities should be suspended until controls are implemented and are successful in reducing the total particulate concentration to 150 mcg/m3 or less at the monitoring point.

- Depending upon the nature of contamination and remedial activities, other parameters (e.g., explosivity, oxygen, hydrogen sulfide, carbon monoxide) may also need to be monitored. Response levels and actions should be pre-determined, as necessary, for each site.

Special Requirements for Indoor Work with Co-Located Residences or Facilities

Unless a self-contained, negative-pressure enclosure with proper emission controls will encompass the work area, all individuals not directly involved with the planned work must be absent from the room in which the work will occur. Monitoring requirements shall be as stated above under "Special Requirements for Work Within 20 Feet of Potentially Exposed Individuals or Structures" except that in this instance "nearby/occupied structures" would be adjacent occupied rooms. Additionally, the location of all exhaust vents in the room and their discharge points, as well as potential vapor pathways (openings, conduits, etc.) relative to adjoining rooms, should be understood and the monitoring locations established accordingly. In these situations, it is strongly recommended that exhaust fans or other engineering controls be used to create negative air pressure within the work area during remedial activities. Additionally, it is strongly recommended that the planned work be implemented during hours (e.g. weekends or evenings) when building occupancy is at a minimum.

Daily CAMP reports will be provided to the NYSDEC and NYSDOH Project Managers for review. Daily CAMP reports will include a site figure depicting work zones, wind direction, locations of CAMP monitoring stations and data downloads. Exceedances of CAMP action levels will be corrected and communicated to the NYSDEC and NYSDOH within one business day.

Appendix 1A
New York State Department of Health
Generic Community Air Monitoring Plan

Overview

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical- specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate DEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. APeriodic@ monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

December 2009

Appendix 1B
Fugitive Dust and Particulate Monitoring

A program for suppressing fugitive dust and particulate matter monitoring at hazardous waste sites is a responsibility on the remedial party performing the work. These procedures must be incorporated into appropriate intrusive work plans. The following fugitive dust suppression and particulate monitoring program should be employed at sites during construction and other intrusive activities which warrant its use:

1. Reasonable fugitive dust suppression techniques must be employed during all site activities which may generate fugitive dust.

2. Particulate monitoring must be employed during the handling of waste or contaminated soil or when activities on site may generate fugitive dust from exposed waste or contaminated soil. Remedial activities may also include the excavation, grading, or placement of clean fill. These control measures should not be considered necessary for these activities.

3. Particulate monitoring must be performed using real-time particulate monitors and shall monitor particulate matter less than ten microns (PM10) with the following minimum performance standards:

(a) Objects to be measured: Dust, mists or aerosols;
(b) Measurement Ranges: 0.001 to 400 mg/m3 (1 to 400,000 :ug/m3);
(c) Precision (2-sigma) at constant temperature: +/- 10 :g/m3 for one second averaging; and +/- 1.5 g/m3 for sixty second averaging;
(d) Accuracy: +/- 5% of reading +/- precision (Referred to gravimetric calibration with SAE fine test dust (mmd= 2 to 3 :m, g= 2.5, as aerosolized);
(e) Resolution: 0.1% of reading or 1g/m3, whichever is larger;
(f) Particle Size Range of Maximum Response: 0.1-10;
(g) Total Number of Data Points in Memory: 10,000;
(h) Logged Data: Each data point with average concentration, time/date and data point number
(i) Run Summary: overall average, maximum concentrations, time/date of maximum, total number of logged points, start time/date, total elapsed time (run duration), STEL concentration and time/date occurrence, averaging (logging) period, calibration factor, and tag number;
(j) Alarm Averaging Time (user selectable): real-time (1-60 seconds) or STEL (15 minutes), alarms required;
(k) Operating Time: 48 hours (fully charged NiCd battery); continuously with charger;
(l) Operating Temperature: -10 to 50° C (14 to 122° F);
(m) Particulate levels will be monitored upwind and immediately downwind at the working site and integrated over a period not to exceed 15 minutes.

4. In order to ensure the validity of the fugitive dust measurements performed, there must be appropriate Quality Assurance/Quality Control (QA/QC). It is the responsibility of the remedial party to adequately supplement QA/QC Plans to include the following critical features: periodic instrument calibration, operator training, daily instrument performance (span) checks, and a record keeping plan.

5. The action level will be established at 150 ug/m3 (15 minutes average). While conservative,

this short-term interval will provide a real-time assessment of on-site air quality to assure both health and safety. If particulate levels are detected in excess of 150 ug/m3, the upwind background level must be confirmed immediately. If the working site particulate measurement is greater than 100 ug/m3 above the background level, additional dust suppression techniques must be implemented to reduce the generation of fugitive dust and corrective action taken to protect site personnel and reduce the potential for contaminant migration. Corrective measures may include increasing the level of personal protection for on-site personnel and implementing additional dust suppression techniques (see paragraph 7). Should the action level of 150 ug/m3 continue to be exceeded work must stop and DER must be notified as provided in the site design or remedial work plan. The notification shall include a description of the control measures implemented to prevent further exceedances.

6. It must be recognized that the generation of dust from waste or contaminated soil that migrates off-site, has the potential for transporting contaminants off-site. There may be situations when dust is being generated and leaving the site and the monitoring equipment does not measure PM10 at or above the action level. Since this situation has the potential to allow for the migration of contaminants off-site, it is unacceptable. While it is not practical to quantify total suspended particulates on a real-time basis, it is appropriate to rely on visual observation. If dust is observed leaving the working site, additional dust suppression techniques must be employed. Activities that have a high dusting potential--such as solidification and treatment involving materials like kiln dust and lime--will require the need for special measures to be considered.

7. The following techniques have been shown to be effective for the controlling of the generation and migration of dust during construction activities:

(a) Applying water on haul roads;
(b) Wetting equipment and excavation faces;
(c) Spraying water on buckets during excavation and dumping;
(d) Hauling materials in properly tarped or watertight containers;
(e) Restricting vehicle speeds to 10 mph;
(f) Covering excavated areas and material after excavation activity ceases; and
(g) Reducing the excavation size and/or number of excavations.

Experience has shown that the chance of exceeding the 150ug/m3 action level is remote when the above-mentioned techniques are used. When techniques involving water application are used, care must be taken not to use excess water, which can result in unacceptably wet conditions. Using atomizing sprays will prevent overly wet conditions, conserve water, and provide an effective means of suppressing the fugitive dust.

8. The evaluation of weather conditions is necessary for proper fugitive dust control. When extreme wind conditions make dust control ineffective, as a last resort remedial actions may need to be suspended. There may be situations that require fugitive dust suppression and particulate monitoring requirements with action levels more stringent than those provided above. Under some circumstances, the contaminant concentration and/or toxicity may require additional monitoring to protect site personnel and the public. Additional integrated sampling and chemical analysis of the dust may also be in order. This must be evaluated when a health and safety plan is developed and when appropriate suppression and monitoring requirements are established for protection of health and the environment.

APPENDIX C

FROG-5000 Chemical Analysis System User's Manual

FROG-5000™
Chemical Analysis System

User's Manual

Defiant Technologies, Inc.

2018 Rev.3

How to assemble a ferrule.

This problem has arisen so often and caused so many problems, that we have added it as a preface to the manual. There is a Teflon ferrule where the air sampler and glass sparge bottle mounts to the FROG-5000™. At some point, the ferrule will probably be disassembled and if it is re-assembled incorrectly, there will be a leak in the system. The photograph below shows the proper orientation of the ferrule components:

We hope that this helps you achieve the full degree of enjoyment our instrument can provide.

Sincerely, Defiant Tech

FROG-5000™
Chemical Analysis System
User’s Manual

Defiant Technologies, Inc.
2018 Rev. 3
www.defiant-tech.com


Sparge Bottle

HANDLING INSTRUCTIONS

FROG-5000™ is a robust, portable instrument, which can be operated in a lab setting or in the field. This instrument can be damaged if the unit is mishandled. The following precautions are given to ensure correct handling of the instrument.

PRECAUTIONS

- **DO NOT** invert with water in the sparge bottle.

  System can NOT analyze a water or soil sample when inverted!

  Damage to instrument is possible!

  (If this does occur, the system may require maintenance. Refer to Section 8, Trouble Shooting)

- **DO NOT** handle or carry system when water sample is being analyzed. For the best results, limit movement to before or after sample analysis.
- **DO NOT** transport or store the instrument with liquid in the sparge bottle.

When there is Water in the Sparge Bottle

Do NOT invert 90° Angle

Do NOT invert 180° Angle

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TABLE OF CONTENTS

TABLE OF CONTENTS CONTINUED

COMMONLY USED ACRONYMS

PC: Preconcentrator

PID: Photo Ionization Detector

GC: Gas Chromatography

VOCs: Volatile Organic Compounds

BTEX: Benzene, Toluene, Ethylbenzene, Xylenes

Ellvin™: Defiant's Chromatography Software

FROG-5000™

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SECTION 1: GETTING TO KNOW THE FROG-5000TM

1.1 MANUAL OVERVIEW

The FROG-5000TM uses a practical approach to instrument set-up and operations. This manual includes the following:

- An overview of the FROG-5000TM operational systems, components, and features.
- Diagrams illustrating the flow of a sample during loading, sparge, collection and analysis.
- Instructions for using the chromatography software (EllvinTM).
- Detailed procedures for using the FROG-5000TM.
- Instructions for calibrating the instrument.
- Routine maintenance information.
- Troubleshooting information.

1.2 OPERATIONS OVERVIEW

The FROG-5000™ instrument analyzes air, water or soil to identify volatile organic compounds (VOCs) present in a sample and determines their concentrations.

The instrument is designed to operate either in the field or in a laboratory, and either connected or not connected to a computer running the Ellvin™ Software. Data is stored on the user's hard drive when the FROG is attached to a computer. Data is also stored on the FROG's internal memory card and can be imported to a computer later.

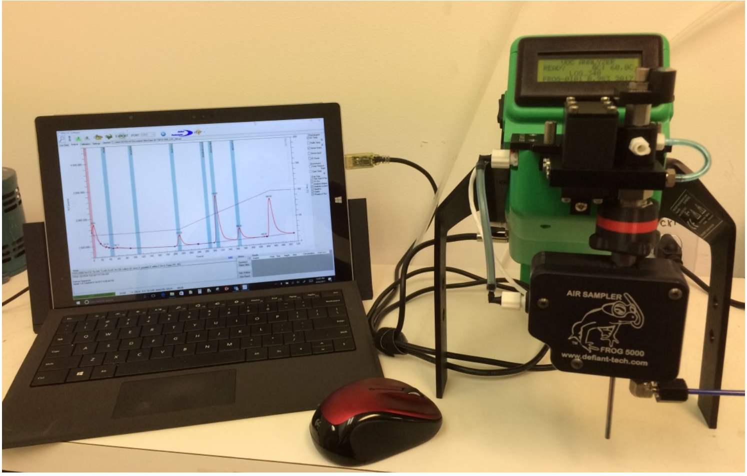
The FROG-5000™ has a 5 mL sparge bottle that can be used for water or solid samples. It is good practice to keep the total volume in the sparge bottle at a constant 5 mL. For instance, if the user wishes to dilute a water sample 10 to 1, a sample volume of 0.5 mL would be diluted with 4.5 mL of clean water, resulting in a total volume of 5 mL.
If analyzing soil samples, the user must add water to the sparger to ensure that the sample is appropriately agitated.

The basic steps for operating the system are:

1. Adjust/apply the settings as needed.
2. Ensure that the instrument displays a clean baseline.
3. Load a 5 mL sample.
4. Run an analysis, either connected or not connected to Ellvin™.
5. If not connected to Ellvin during the analysis cycle, read analysis data using Ellvin at a later time.

NOTE: A working knowledge of Ellvin™ is necessary to correctly operate the instrument. Users should be familiar with the software before attempting to analyze samples.

The FROG-5000TM is designed for use in the field.



The FROG-5000TM is designed for use in the laboratory. Connect to EllvinTM Software for more detailed analysis results.

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SECTION 2: COMPENENTS AND SYSTEMS

The FROG-5000™ instrument has two main operational systems:

The Purge System

This system manages the loading of a sample, sparging the sample, if liquid, to release VOCs, and the introduction of gas phase compounds to the Gas Phase Analysis System. All components of the Purge System are visible on the instrument exterior.

The Gas Phase Analysis System

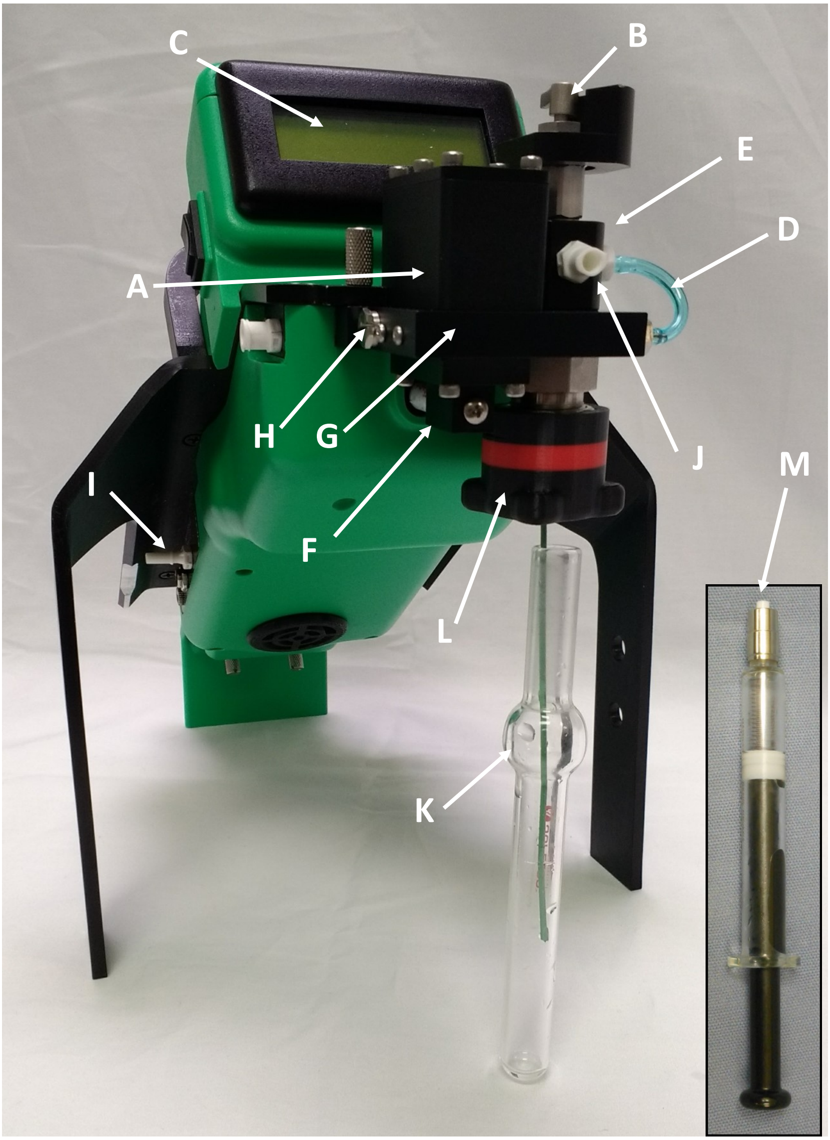
The Gas Phase Analysis System receives the VOCs from the Purge System and carries them through all stages of sample analysis, Collection → Injection → Separation → Detection

The instrument's components are briefly described on the following pages.

2.1. INSTRUMENT COMPONENTS

Components Reference for FROG-5000™:

A. Scrubber
B. Load/Analyze Valve Handle
C. Display Screen
D. Sparge-Air Line
E. Sparge-Valve
F. Flow Selection-Valve
G. Sparge Manifold
H. Pump Vent Orifice
I. Pump Air Supply Inlet
J. Sample Inlet
K. Sparge Bottle with PEEK Tube (i.e., sparge needle)
L. Sparge Bottle Nut
M. 5 mL Syringe to load water sample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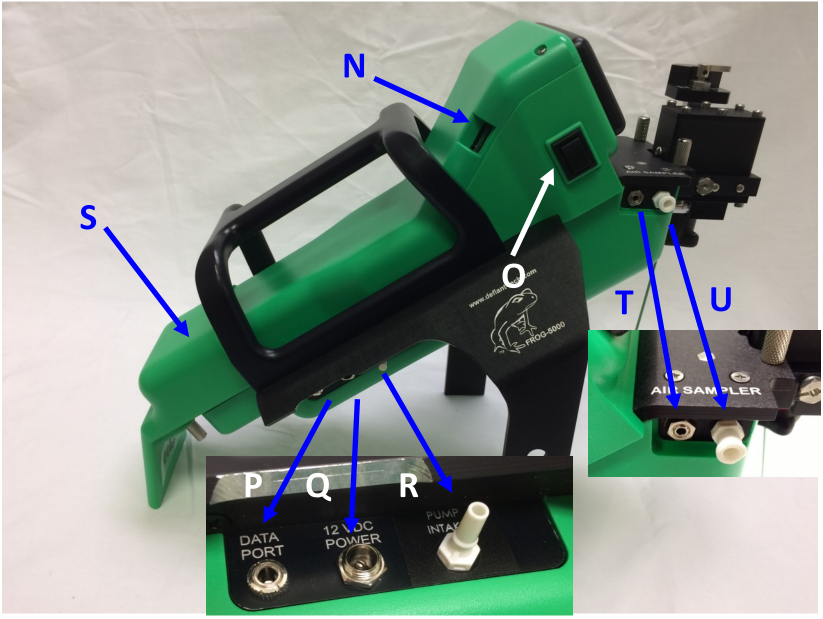
2.1. Instrument Components Continued

N. micro-SD Card for stored chromatograms
O. Run Start and Data Toggle Switch
P. Port for Serial Data Plug
Q. Port for 12VDC Power Plug
R. Port for Pump Intake for Carrier/Sparge Gas
S. Battery Cover
T. Power Port for Air Sampler Adapter
U. Exhaust Port from Gas Analysis Module
V. Power Switch
W. Battery Charging Light
X. Battery Charge Level Indicator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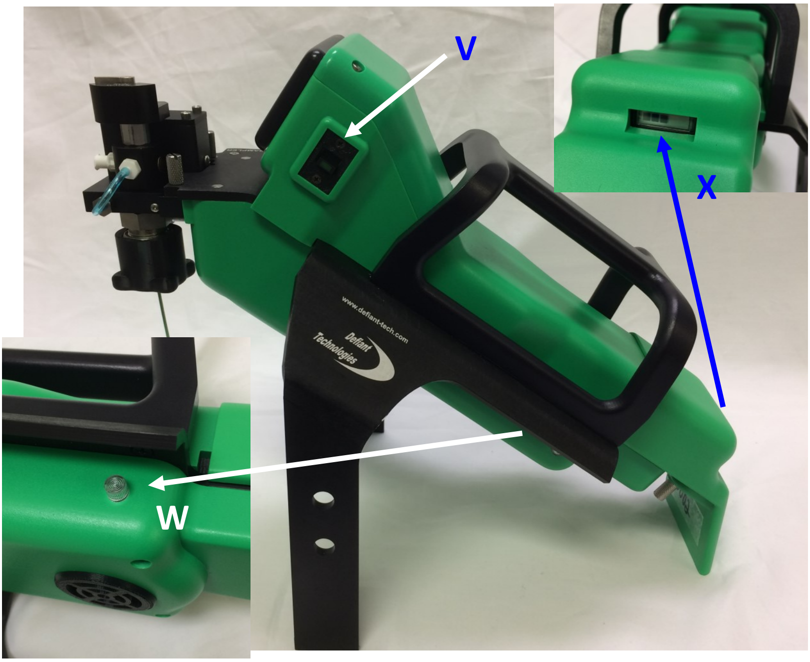
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2.2. PURGE SYSTEM

Purge System Components and their Functions
Figures 2.2-1 and 2.2-2.

A) **Scrubber:** Activated Carbon and Molecular Sieves
Function: Cleans the ambient air to prevent external VOCs from interfering in analyses.
*See NOTE on following pages for replacement supplies.

B) Load/Analyze Valve:
Function: Opens and closes the sample inlet for sample loading. The valve has three positions, LOAD WATER, RUN WATER and RUN AIR.

E) Sparge-Valve:
Function: Directs pumped air from purging water to analysis.

G) Sparge Manifold:
Function: Routes gas to the proper ports for sparging and analysis functions.

J) Water Sample Inlet:
Function: Attachment for syringe to load a sample.

K) Sparge Bottle with PEEK Tube: Needle type sparge bottle, 0.5" x 5mL.
Function: Holds sample to purge VOCs. The Sparge bottle has two positions, <u>UP</u> and <u>DOWN</u>.
(See Section 2.2.2 for operating instructions)

L) Sparge Bottle Nut:
Function: Holds Sparge bottle in place and provides gas tight seal.

M) Syringe: 5mL, with Luer Lock.
Function: Loads a fixed sample volume to the sparger. Attaches to sample inlet (J).

Figure 2.2-1: Purge and Trap System

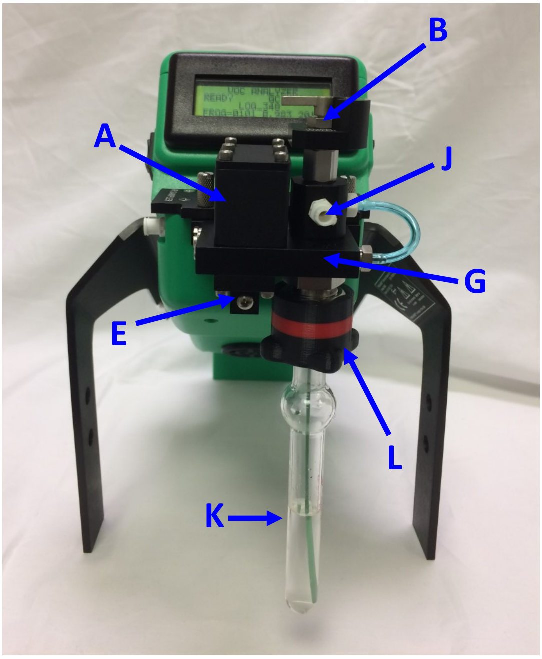
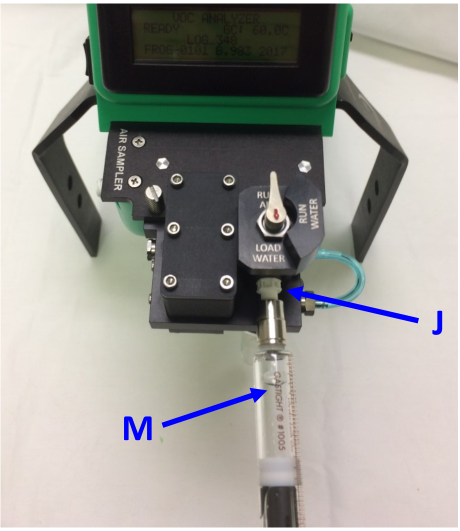


Figure 2.2-2: Purge System



2.2 Purge and Trap System Continued

2.2.1. LOAD/ANALYZE VALVE

- Turn the load/analyze valve to the LOAD WATER position to load a water sample.

- After loading a water sample, turn the handle counter clockwise to the RUN WATER position before starting a water analysis cycle.

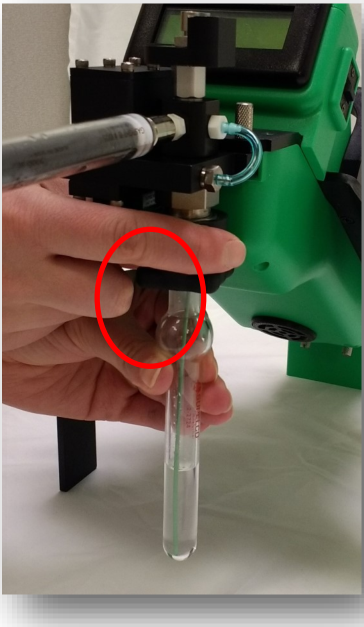
- When running air samples, leave the load/analyze valve in the RUN AIR position

2.2.2. SPARGE BOTTLE POSITIONS

The sparge bottle moves UP and DOWN and is secured with a sparge bottle nut.

- The bottle must be in the DOWN position to rinse the instrument or to remove the sparge bottle.
- The bottle must be in the UP position to analyze a sample.
- The bottle may be in the UP or DOWN position for sample loading. We will present the DOWN position for consistency in this manual.

Sparge bottle
in the DOWN position.



Sparge bottle
in the UP position.

NOTE: When the sparge bottle is fully UP, the sparge tube is near the bottom of the sparge bottle. A partially lowered sparge bottle will cause analyte peaks to shift right.

2.3. GAS PHASE ANALYSIS SYSTEM

Gas Phase Analysis System Components and their Functions
Figures 2.3-1 and 2.3-2:

A-Internal) Pump: Diaphragm pump
Function: Circulates carrier gas through system.

B-Internal) Preconcentrator (PC):
Function: Collects and injects VOCs into GC column.

C-Internal) Micro Gas Chromatography Column: (GC)
Function: Separates VOCs.

D-Internal) Photo Ionization Detector (PID): 10.6eV lamp
Function: Detects VOCs.

E) Sparge-Valve:
Function: Directs pump flow into sparge bottle to purge VOCs from sample.

F -Internal) Bypass-Valve:
Function: Allows the VOCs to pass over the PC and bypass the GC and PID.

G) Pump Vent Orifice:
Function: Provides a small leak in pump flow for improved flow control.

H-Internal) Injection Split Vent:
Function: Provides a small leak to prevent rebound injection.

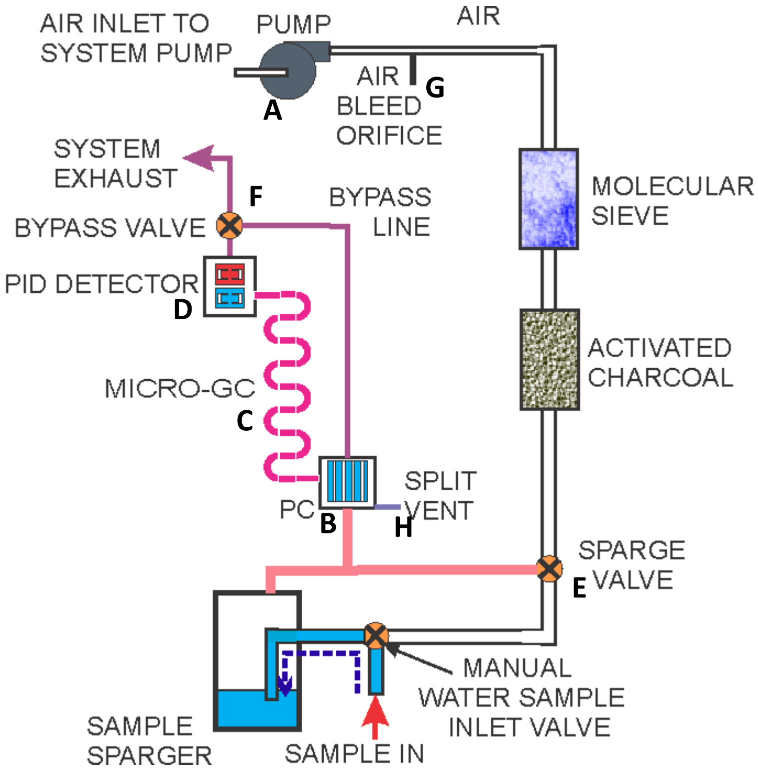


Figure 2.3-1 Gas Phase Analysis System components.

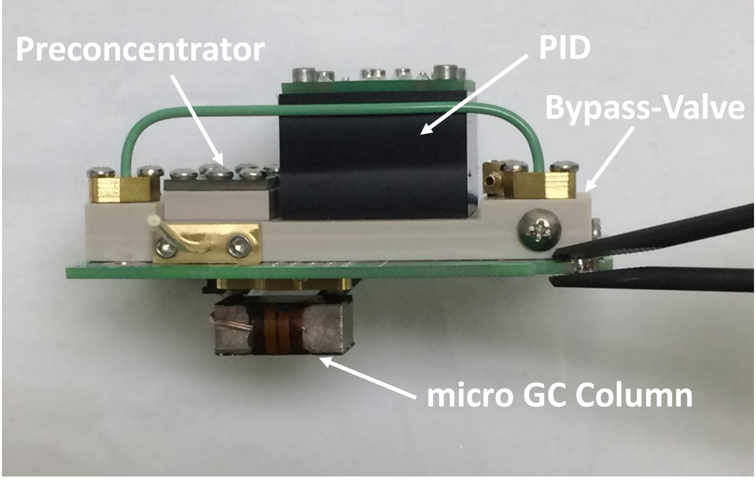


Figure 2.3-2 Gas Phase Analysis System internal components.

2.3. Gas Phase Analysis System Continued

Gas Phase Analysis System Components and their Functions
Figure 2.3-3

Gas/Purge System, An Internal View. Analytes that are sparged from water samples exit through a port at the top of the sparge bottle and move through the transfer line to the Gas Analysis System

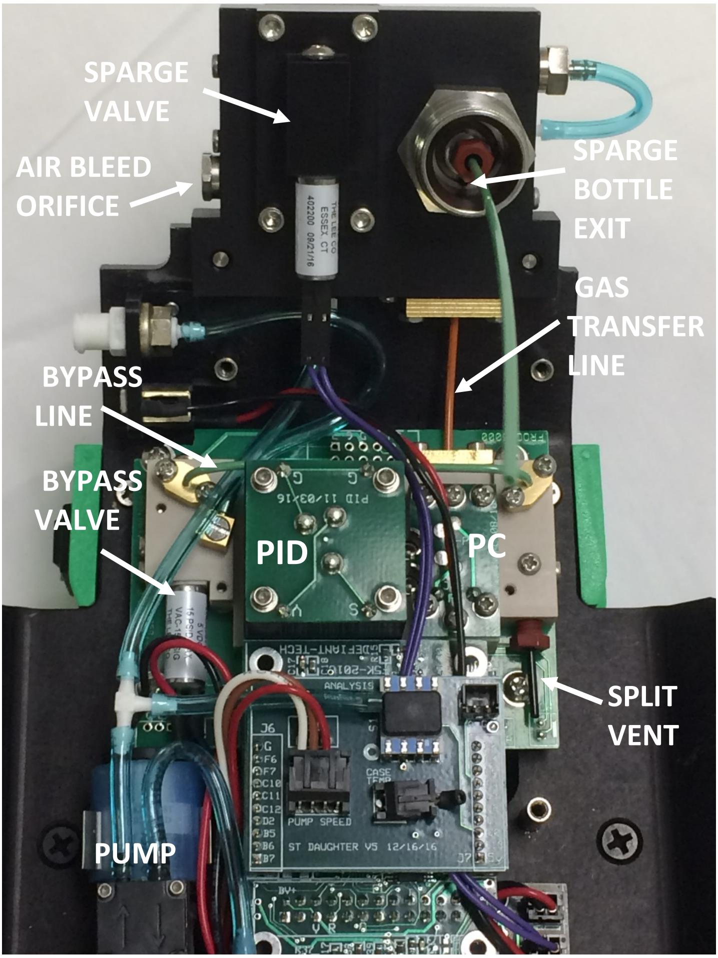


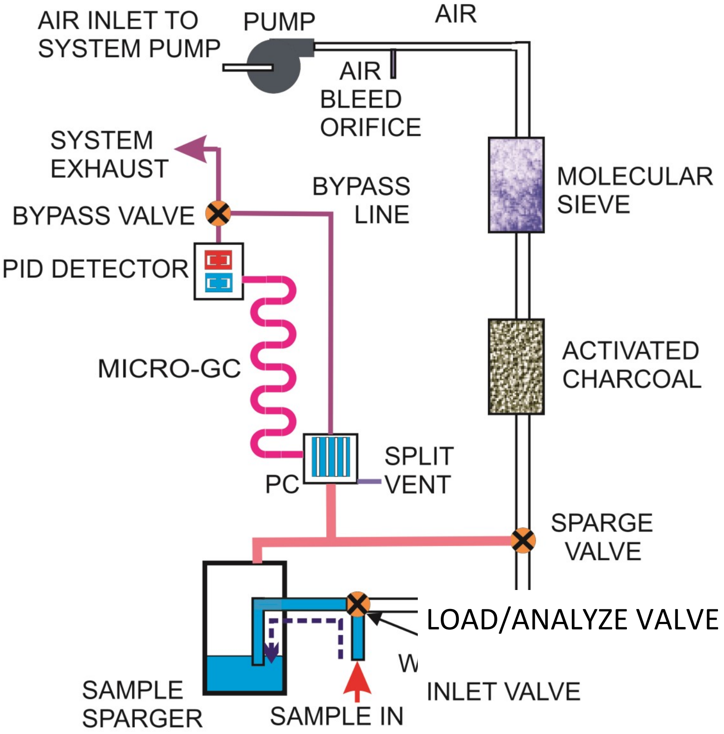
Figure 2.3-3 Gas Phase Analysis System internal and external components

2.4. GAS FLOW DIAGRAMS

This section describes and illustrates the flow of a sample from loading through the components of the Gas Phase Analysis System (Section 2.2).

2.4.1. SAMPLE LOADING

(Diagram 2.4-1) The sparge bottle is in the DOWN position for loading a liquid sample. The load/analyze valve is in the LOAD position. A sample is loaded into the sample inlet with a 5mL syringe.



FLOW DIAGRAM FOR FROG 5000 H2O LOAD

Diagram 2.4-1: Sample Loading

2.4.2. SPARGE AND COLLECTION

(Diagram 2.4-2) After the sample has been loaded, the load/ analyze-valve is placed in the RUN WATER position, and the sparge bottle is moved into the UP position. The start button is pressed, and the pump flow starts. The carrier gas moves through: 1) the activated charcoal/molecular sieve scrubbers then to the 2) sparge valve. If the sample is a liquid, scrubbed air sparges the liquid to release the VOCs into the headspace of the sparge bottle, through the gas transfer line and onto the preconcentrator (PC). The scrubbed air continues past the PC and out of the system exhaust.

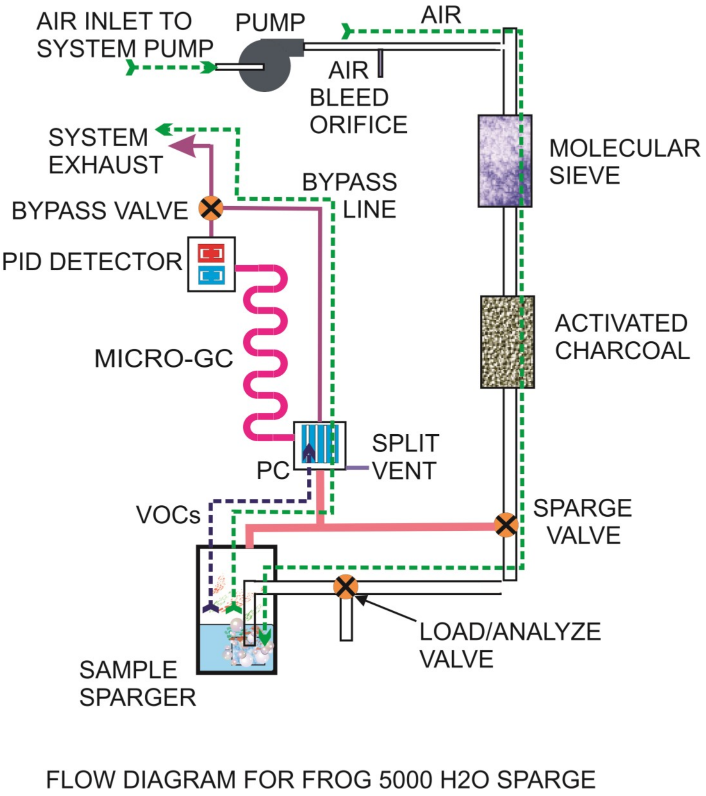
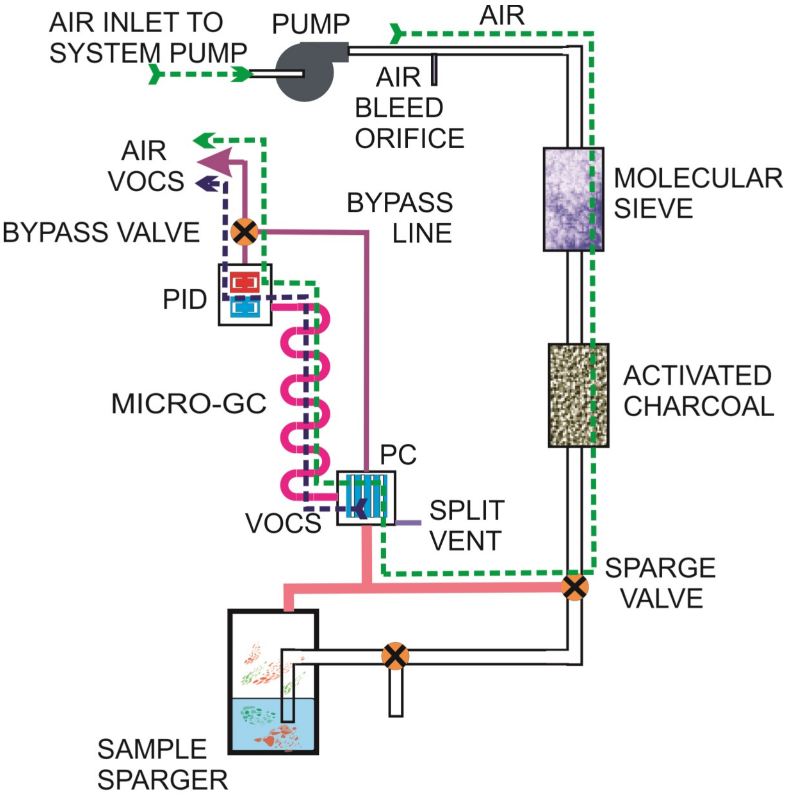


Diagram 2.3-2: Sparge and Collection

2.4.3. INJECTION (RELEASE), SEPARATION, AND ANALYSIS

(Diagram 2.4-3) Once the VOCs are collected onto the PC, the PC is heated to release the VOCs and inject them into the Micro-Gas Chromatograph Column (GC). The VOCs separate through the column and then continue to the Photo Ionization Detector (PID). The PID signal is analyzed and displayed through the software. The sample then exits through the exhaust.



FLOW DIAGRAM FOR FROG 5000 H2O ANALYZE

Diagram 2.4-3: Injection, Separation and Analysis

2.5. GAS FLOW DIAGRAMS THROUGH AIR SAMPLER

This section describes the flow of an air sample when it is loading into the Gas Phase Analysis System using the air sampler (see Section 4.4.3).

2.5.1. SAMPLE COLLECTION

(Diagram 2.5-1) The air sampler is connected to the FROG-5000. The start button is pressed and sample collection starts. Sample gas moves through: 1) an inert valve in the air sampler 2) over the preconcentrator, and 3) out of the gas module. A pump in the air sample adapter provides vacuum for pulling the air sample over the preconcentrator.

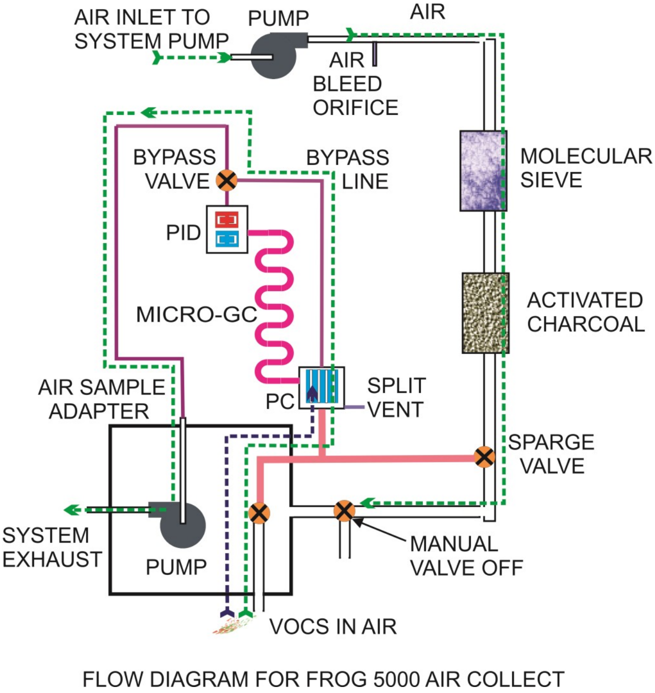


Diagram 2.5-1: Sample Collection

2.5. Gas Flow Diagram Continued

2.5.2. INJECTION (RELEASE), SEPARATION, AND ANALYSIS

(Diagram 2.5-2) Once the VOCs are collected onto the PC, the PC is heated to release the VOCs and inject them into the Micro-Gas Chromatograph Column (GC). The VOCs separate through the column and then continue to the Photo Ionization Detector (PID). The PID signal is measured and displayed through the software. The sample exits through the exhaust.

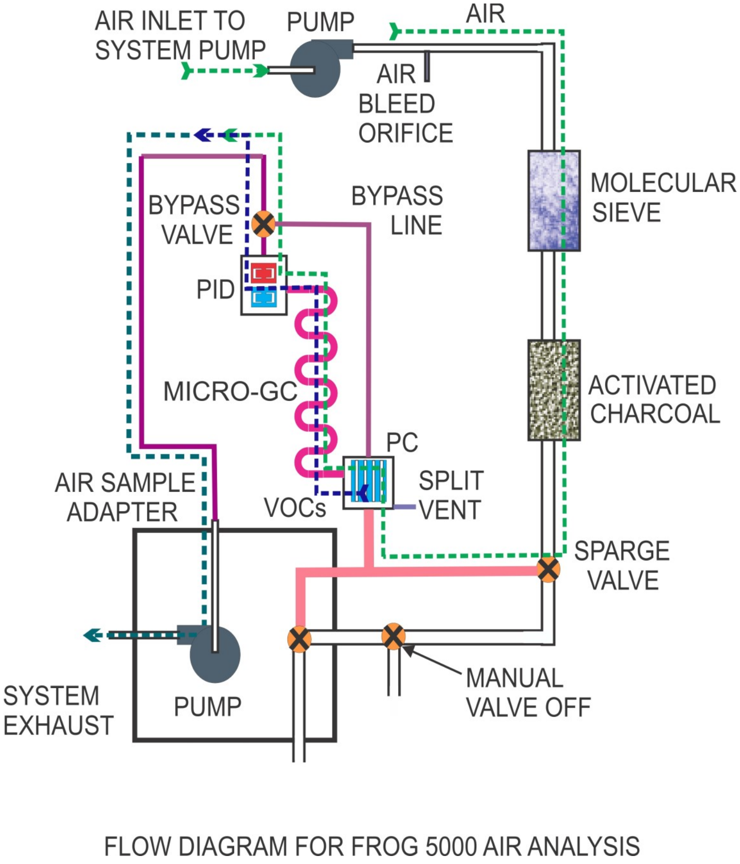
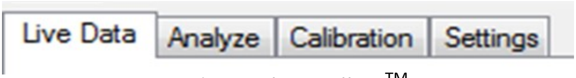


Diagram 2.5-2: Injection, Separation and Analysis

SECTION 3: OVERVIEW OF ELLVIN™ SOFTWARE

The Ellvin™ Software has four windows that are accessed with tabs when the software is open.



Window Tabs in Ellvin™

- **Live Data Window**: This is the default window for Ellvin™. In Live Data Window, Ellvin™ creates a chromatogram from sample analysis data. The data source may be:
    a. From a sample loaded and simultaneously analyzed by Ellvin™.
    b. From sample data previously recorded on the instrument's SD card, then imported to Ellvin™.
- **Analyze Window:** In this window, Ellvin™ retrieves analysis data that was previously stored on a computer and creates a chromatogram. In the Analyze Window, the user can examine chromatograms closely, integrate chromatogram peaks, and export data to Excel.

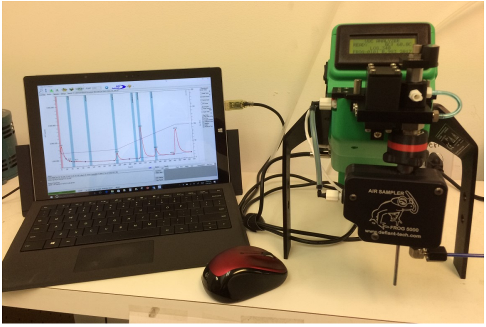
- **Calibration Window:** In this window, Ellvin™ uses analysis data from chemical standards to create a FROG calibration file.

- **Settings Window:** In this window, Ellvin™ manages the settings for operation of the FROG. The settings define temperature and duration parameters for various phases of the instrument's collection and analysis cycle.

There are several general features of Ellvin™ as well as a few features specific to Analyze Window that are described in Section 5. The user should be familiar with all the features before starting a sample analysis.

SECTION 4: FIELD AND LAB ANALYSIS PROCEDURES

The simplest way to use the FROG is to load samples and run analyses while the instrument is connected to a computer and Ellvin™. The software analyzes sample data and displays a live chromatogram during analyses. The length of the cycle depends on the parameters set for each analysis. Data is stored both on the FROG's internal SD card and on the computer.



The FROG can also analyze samples when not connected to Ellvin™. An analysis cycle takes the same amount of time as it does when it's connected, and an estimate of the results is displayed on the instrument's screen. Data is stored on the FROG's internal SD card and can be imported to Ellvin™ and analyzed at a later time if desired. Section 4.7. gives instructions for importing data from the FROG.

Continued next page.

Section 4: Field and Lab Analysis Procedures Continued

This section provides detailed instruction for various procedures that are essential to operating the FROG-5000$^{\text{TM}}$.

Procedures include:

4.1: Powering On/Charging Battery

Description of components and connections.

4.2: Connecting to Computer/Ellvin$^{\text{TM}}$

Instructions/description for components and connections.

4.3: Instrument Settings

Set parameters to optimize instrument function.

4.4: Instrument Preparation

Remove interfering contaminants/ensure a clean instrument.

4.5: Loading a Sample

Air, liquid, and soil sample preparation and loading instructions.

4.6: Running A Sample

Instructions/description for an analysis cycle.

4.7: Importing Data to Ellvin™

Import stored data from FROG to Ellvin for analysis.

Complete the following procedures to run an analysis.

NOTE: The user should be familiar with Ellvin™ before loading and running an analysis. To help meet this need, some handy Quick Start guides are provided with the system.

1. 4.1: Powering On/Charging Battery
2. 4.4: Instrument Preparation
3. 4.5: Loading a Sample
4. 4.6: Running A Sample

If not connected to Ellvin,

5. 4.7: Importing Data to Ellvin™

6. Clean the instrument when all samples have been completed by repeating Step 2.

4.4: Instrument Preparation

Exception: Samples of the same, known analyte may be run consecutively from low concentration to high without rinsing the instrument and creating a clean baseline.

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4.1: Powering On/Charging Battery

Powering On

- Connect power cable to power port (R) 12V POWER, or use battery power. (Figure 4.1-1)
- Turn power switch (O) to ON (fully up) position. The instrument display screen will be visible.

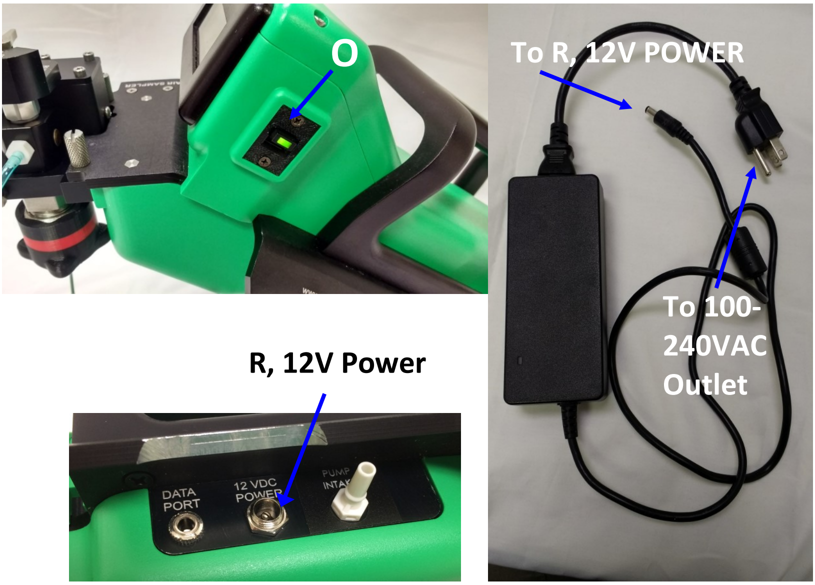
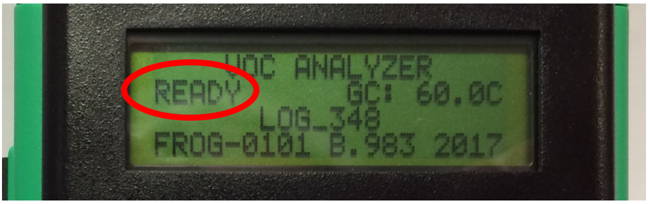


Figure 4.1-1: Power port, power cable and power switch.

- When the FROG-5000^{TM} display screen shows **READY,** the instrument is ready to perform an analysis.



4.1. Powering On/Charging Battery Continued

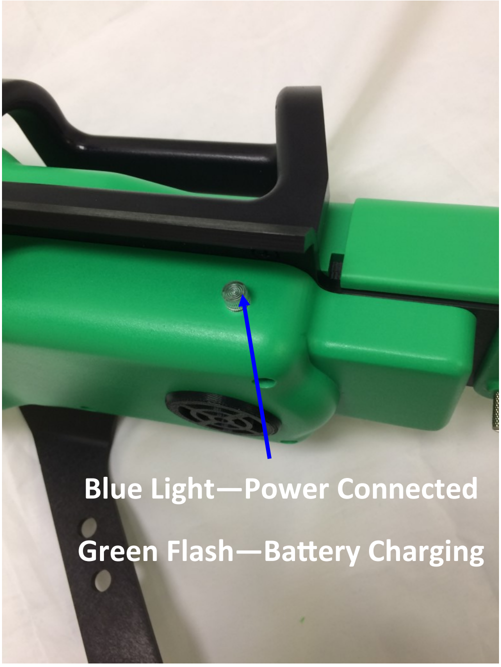
Charging the Battery

1. Plug 12 VDC power supply into 12VDC POWER port.
2. The battery recharges while the unit is plugged into external power.
3. Blue light shows power is supplied.
4. Flashing green light indicates battery is charging.
5. Unit may be operated while charging.


To R, 12V POWER

To 100-240VAC Outlet

12V Power


Blue Light—Power Connected

Green Flash—Battery Charging

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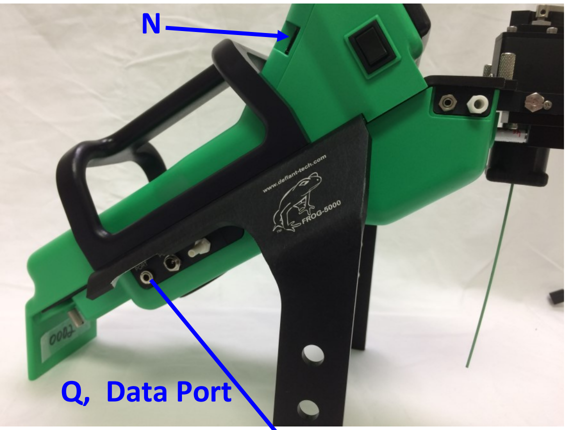
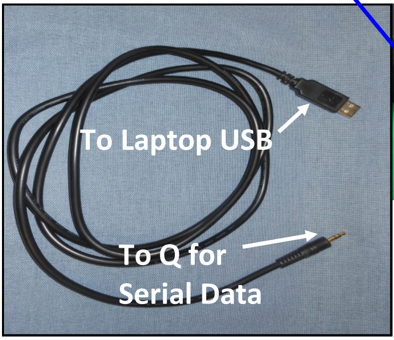
4.2: Connecting to Computer/Ellvin™

There are two possible connections between the FROG and a computer.

To receive live data and communicate with the FROG through Ellvin™, connect a computer to the serial data port (Q) on the FROG with the USB-to-Serial-Data Cable.

To import data from the instrument's micro-SD card (N), press in to eject the card. An adapter is provided to plug the card into a USB port on a computer.



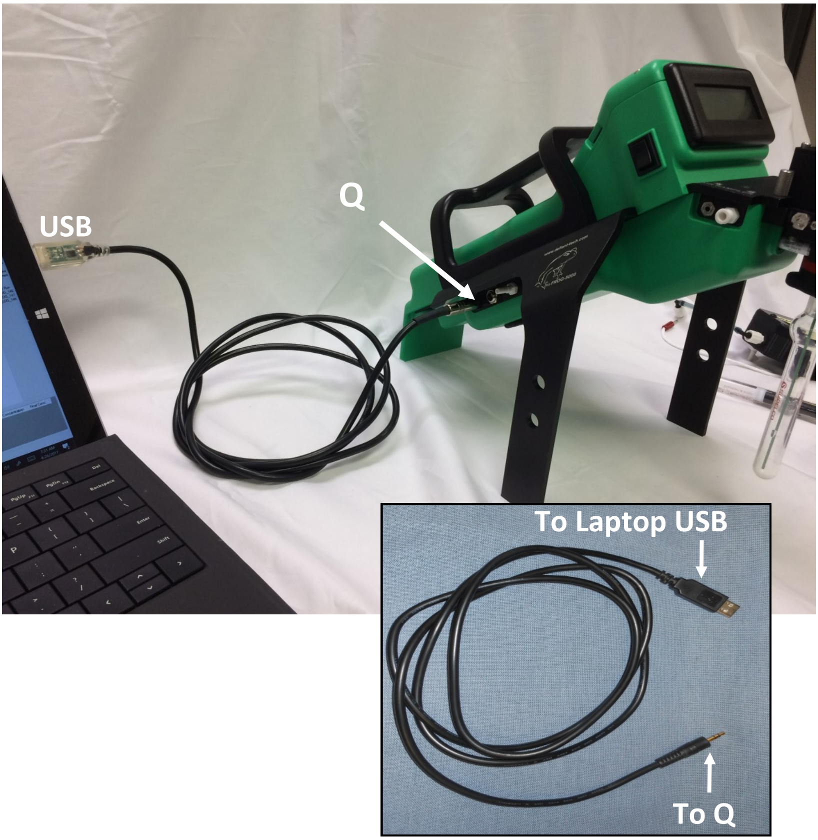


USB to Serial Data-Cable

4.2. Connecting to Computer/Ellvin Continued

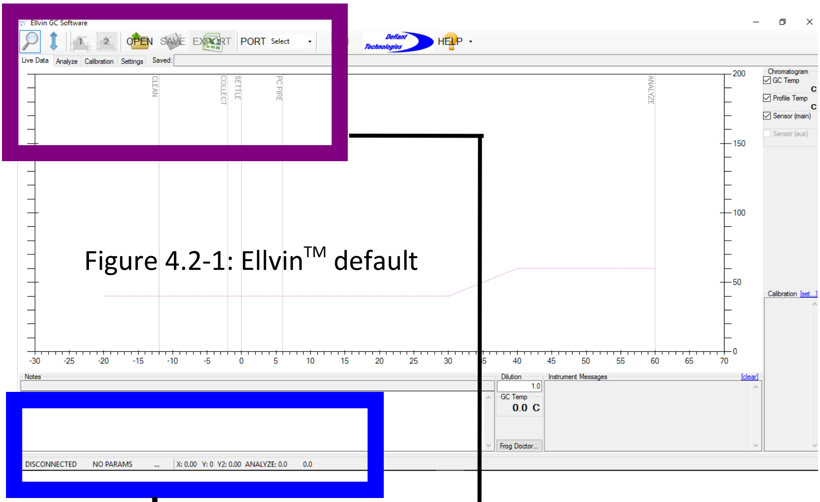
Serial data-cable Connection

1. Connect the serial data-cable from the FROG's serial data port (Q) to a USB port on a computer.
2. Set the instrument power switch to the ON position.
3. If necessary, install Ellvin™ onto laptop or PC.
4. Open Ellvin™ by double clicking on the Ellvin™ icon.



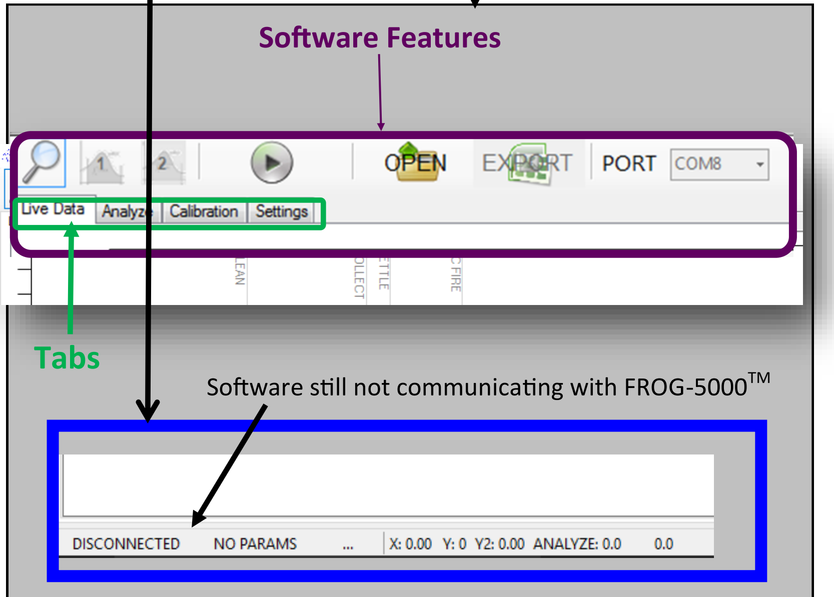
Serial Data-Cable

After Ellvin™ has opened, the default screen that appears is the chromatogram display screen in Live Data Window.
(Figure 4.2-1)
Figure 4.2-2 shows details of the display screen



DISCONNECTED NO PARAMS ... X: 0.00 Y: 0 Y2: 0.00 ANALYZE: 0.0 0.0

Figure 4.2-1: Ellvin^{TM} default

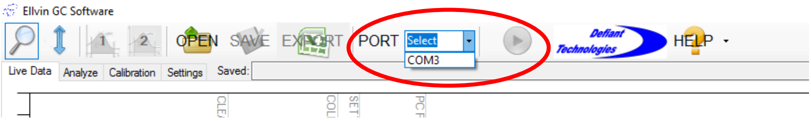


DISCONNECTED NO PARAMS ... X: 0.00 Y: 0 Y2: 0.00 ANALYZE: 0.0 0.0

Figure 4.2-2: Ellvin default screen details.

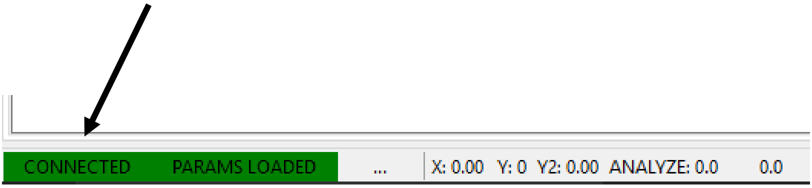
4.2. Connecting to Computer/Ellvin™ Continued

5. Click "Port" on the display screen, then select a COM#.

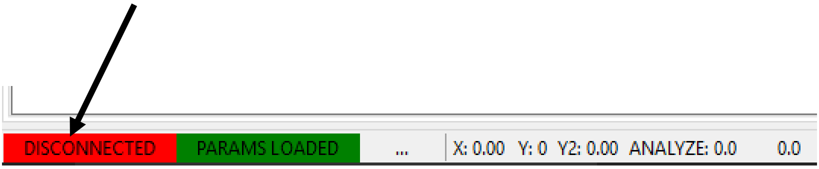


6. The connection status indicator in the lower left corner should now read CONNECTED indicating that the FROG and Ellvin™ are connected. The user may now manage settings and run analyses from Ellvin™.

7. If Ellvin™ ever disconnects with the FROG, a red flag will show in the lower left corner.



CONNECTED PARAMS LOADED ... X: 0.00 Y: 0 Y2: 0.00 ANALYZE: 0.0 0.0



DISCONNECTED PARAMS LOADED ... X: 0.00 Y: 0 Y2: 0.00 ANALYZE: 0.0 0.0

4.3: Instrument Settings

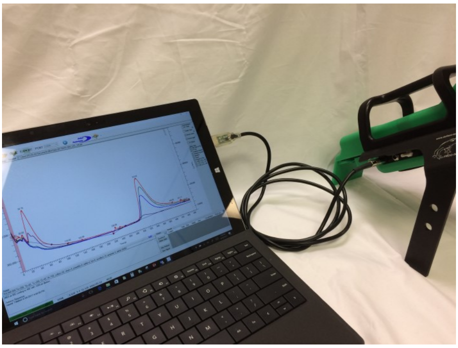
The FROG-5000™ comes with general default settings for VOCs, which are shown in Figure 4.3-2 on the following page.

The settings determine the duration of different analysis phases, as well as the desired temperature of the GC column. The settings are defined and loaded to the instrument using Ellvin™. Table 4.3-1 on the following page describes the various settings.

The FROG-5000™ default settings are best for the analysis of Benzene, Toluene, Ethylbenzene and Xylenes (BTEX), but the settings can be altered for analyzing a wide variety of compounds and concentrations.
(See Appendix I for a list of detectable chemicals).

The current operational settings are stored in the FROG-5000™ memory and do not revert to the default settings when the instrument is disconnected from the software or power. They are retrieved and displayed under the Settings Window when the instrument is connected to a computer through Ellvin™.

Instructions for adjusting the settings begin on the following pages.



Connect to Ellvin™ to manage the settings.

4.3. Instrument Settings Continued

Table 4.3.1 Description of Settings	
Settings	**Description**
T_a	Hold time at lower GC temperature (seconds)
T_b	Ramp time from GC cold to GC hot temperature (°C)
T_c	Hold time at hot GC temperature (°C)
C_t	Initial cold GC temperature (°C) **NOTE:** If used outdoors, the user must consider ambient conditions.
H_t	Final hot GC temperature (°C)
COLLECT	Collection time of VOCs onto PC (seconds) This corresponds to the sparge time.
CLEAN	Time cleaning PC by heating (seconds)
PRESETTLE	Time PC cools after cleaning (seconds)
SETTLE	Time allowed for pressure to stabilize before PC FIRE (seconds) for GC analysis
FIRE	Time PC is Heated to Release VOCs (seconds)

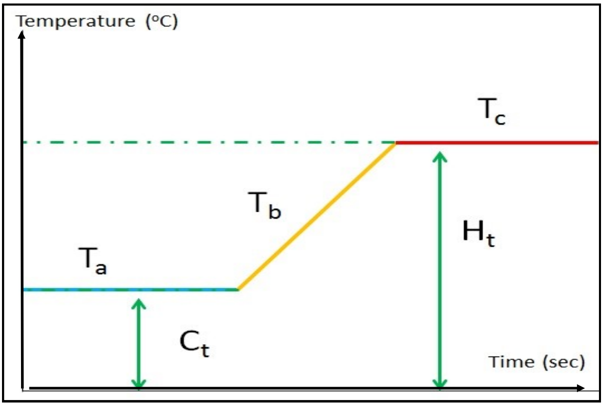


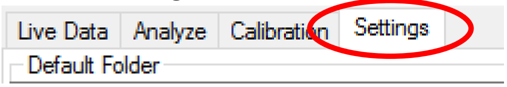
Figure 4.3-1: Description of GC Temperature Settings.

Defining and applying the settings.

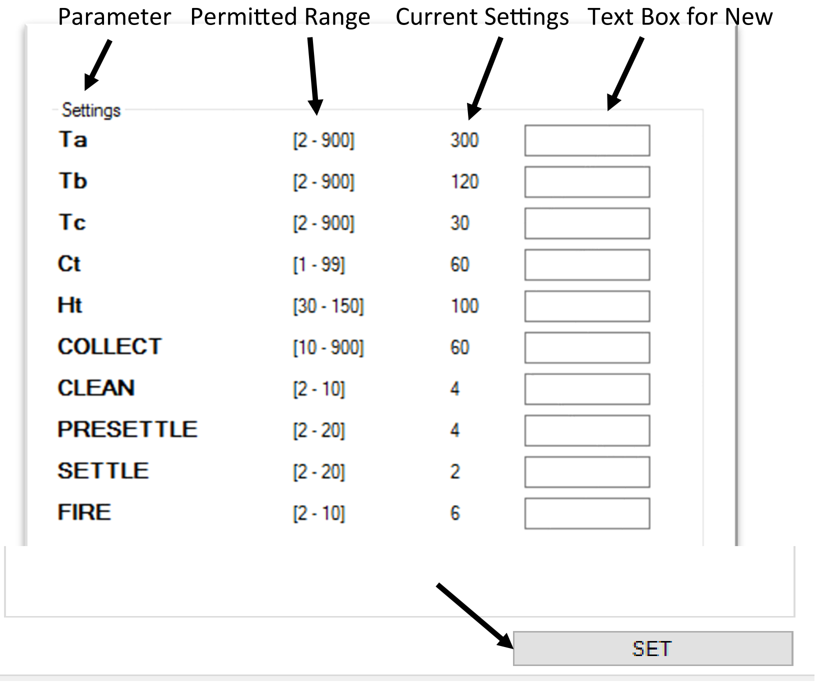
1. Connect to Ellvin™. Refer to:

4.2: Connecting to Computer/Ellvin

2. Click on the Ellvin Settings Tab.



3. Type in a non-zero integer then click SET to apply the settings to the instrument. Changes to the settings are stored on the instrument. Settings **DO NOT** revert to the default parameters when power is removed or computer is disconnected. The minimum and maximum values are listed next to the Figure 4.3-2.



Parameter	Permitted Range	Current Settings	Text Box for New
Ta	[2 - 900]	300	
Tb	[2 - 900]	120	
Tc	[2 - 900]	30	
Ct	[1 - 99]	60	
Ht	[30 - 150]	100	
COLLECT	[10 - 900]	60	
CLEAN	[2 - 10]	4	
PRESETTLE	[2 - 20]	4	
SETTLE	[2 - 20]	2	
FIRE	[2 - 10]	6	

Figure 4.3-2: Setting Window showing Default Settings

Section 4: Field and Lab Analysis Procedures Continued

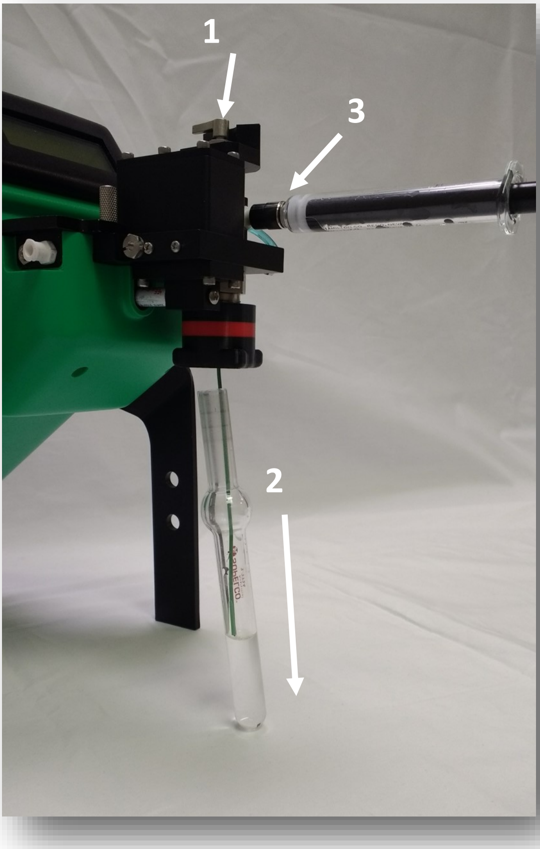


Figure 4.4-1 Rinsing the Instrument Steps 1-3

4.4: Instrument Preparation

Before running analyses, the instrument should be rinsed and display a clean baseline.

4.4.1. RINSING THE INSTRUMENT

1. Place the load/analyze valve in the LOAD WATER position.
(See Section 2.2.1)

2. Place sparge bottle in the DOWN Position.
(See Section 2.2.2)

3. Attach syringe with 5 mL deionized water to FROG-5000™.
(Figure 4.4-1, opposite page)

Figure 4.4-2: Load/ Analyze Valve

4. Load deionized water into FROG-5000™.

5. Remove sparge bottle and empty the water into waste container.

6. Repeat steps 3-5 twice more for a total of three rinses.

7. Remove and rinse sparge bottle with deionized water.

8. Replace the sparge bottle in the DOWN position.

Proceed to demonstrate a clean baseline (following pages).

4.4. Instrument Preparation Continued

4.4.2. CREATING A CLEAN BASELINE

A Clean Baseline should be achieved before analyzing a sample. This procedure ensures that there are no contaminants in the instrument that could effect the analysis results.

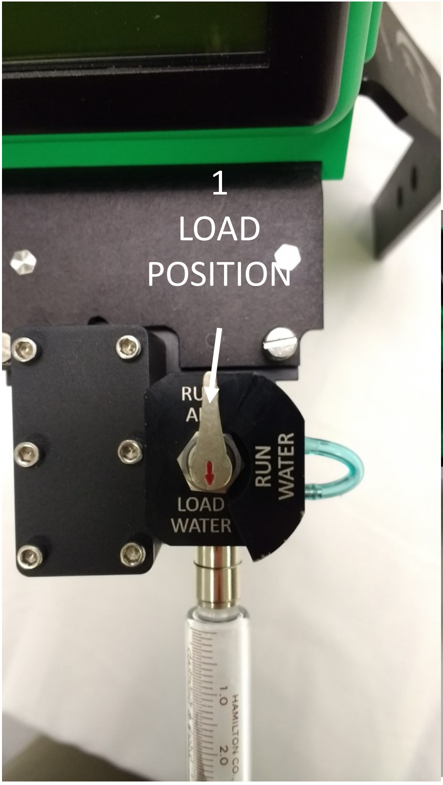
If the instrument is connected to a computer and Ellvin, the start button and display screen are in the software. If the instrument is not connected to Ellvin, the start button and display screen are on the instrument.

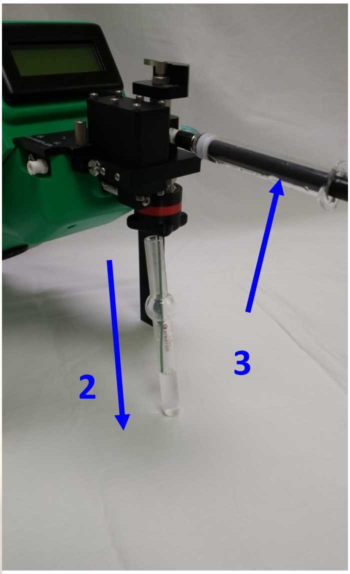
Rinse the instrument as described in Section 4.4.1 before attempting to achieve a clean baseline

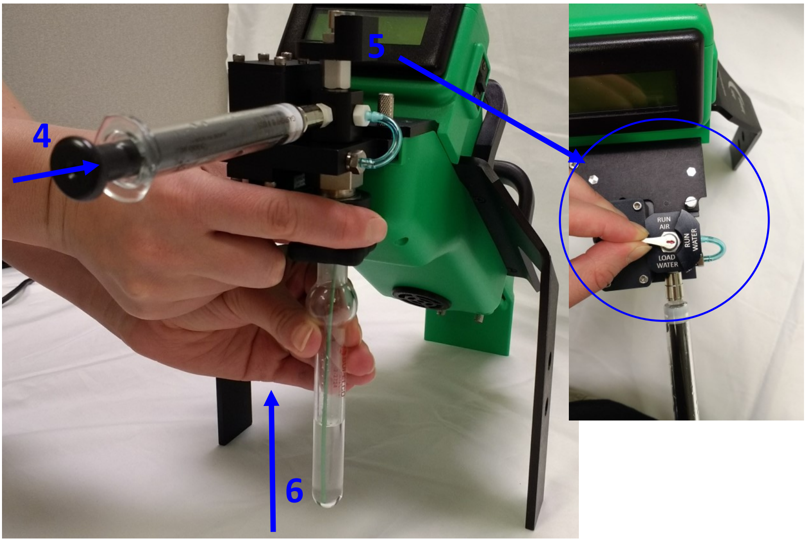
Procedure:

1. Place load/analyze valve in the LOAD WATER position. (See Section 2.2.1)
2. Place rinsed sparge bottle in the DOWN position. (See Section 2.2.2)
3. Attach syringe with 5 mL deionized water to FROG-5000$^{TM.}$
4. Load deionized water into FROG-5000^{TM}
5. Place the load/analyze valve in the RUN WATER position.
6. Move the sparge bottle to the fully UP position and tighten the sparge nut in the clockwise direction until lightly snug.
7. Remove the empty syringe

Continued following pages.

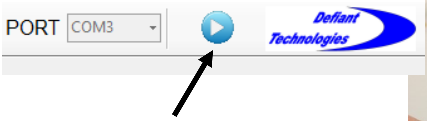

1
LOAD
POSITION
RU
A
RUN
WATER
LOAD
WATER
1.0
2.0
HAMILTON CO.


2
3


4
5
6
RUN
AIR
RUN
WATER
LOAD
WATER

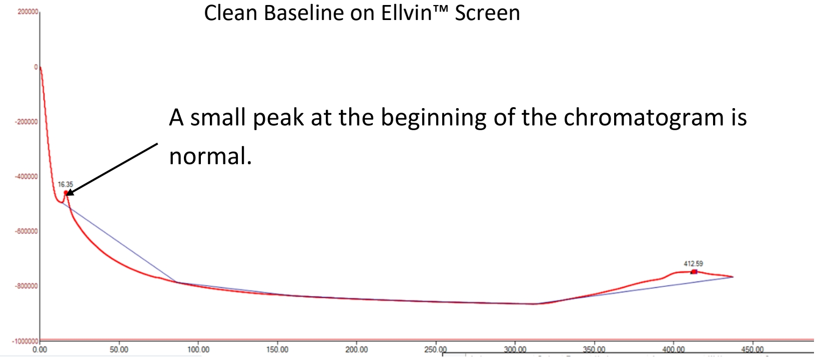
4.4.2. CREATING A CLEAN BASELINE CONTINUED

7. Begin an analysis cycle using deionized water. If connected to Ellvin™, click the start button in the software. If not connected to Ellvin™, press in the top of the black toggle button on the instrument. When the analysis is finished, a clean baseline should appear. A clean baseline is basically smooth with no significant peaks. A small peak at the beginning of the chromatogram and small waves in the clean baseline are acceptable.



Start Button in Ellvin™

Clean Baseline on Ellvin™ Screen

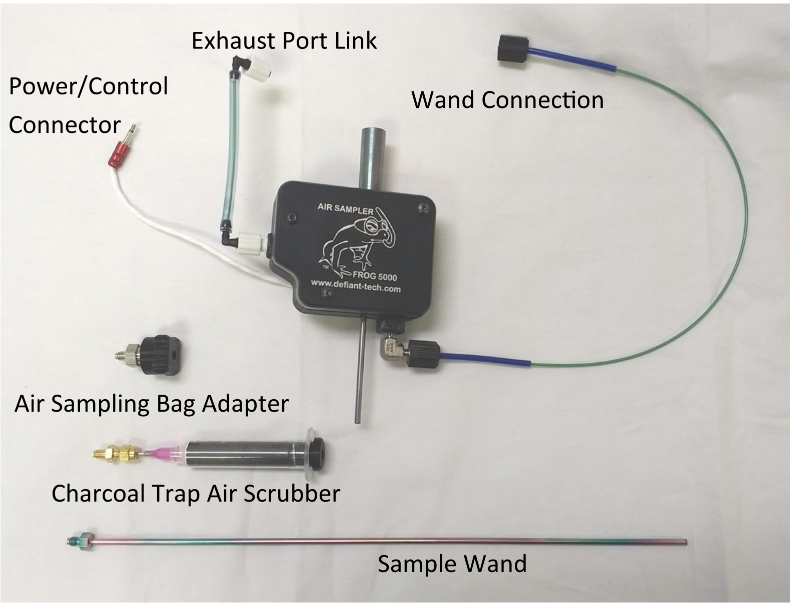


A small peak at the beginning of the chromatogram is normal.

If Peaks **do** appear, repeat the instrument preparation procedures (4.4.1, Rinsing the Instrument and 4.4.2, Creating a Clean Baseline) until a clean baseline is achieved.

4.4.3. CONNECTING THE AIR SAMPLE ADAPTOR

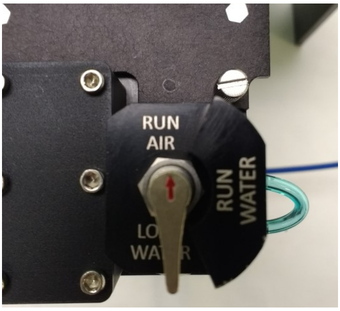
If analyzing air samples, the user must first connect the air sample adaptor to the FROG.

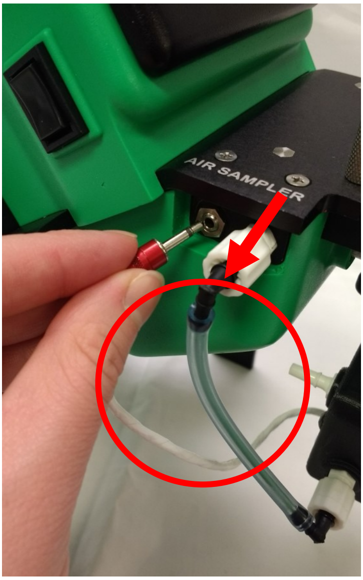


The air sample kit includes a sample wand and an air sample bag adapter. The air sample bag adapter enables direct connection to an air sample bag.

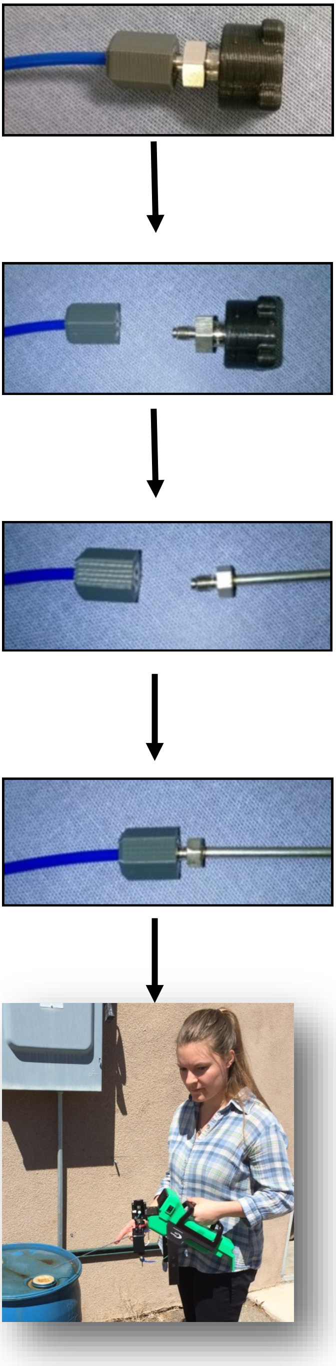
4.4.3. CONNECTING THE AIR SAMPLE ADAPTOR CONTINUED

1. Attach the air sampler to the FROG sparge block. Be sure the load/analyze valve is pointed to RUN AIR.
2. Connect the air sampler's power/control connector to the air sampler power port. This connection supplies power to the air sampler.
3. Attach the exhaust connector to the FROG exhaust with a twisting motion.

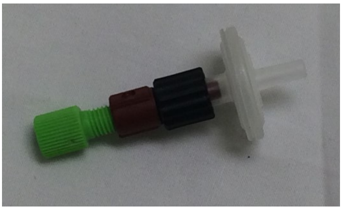




If the Sparge Bottle Nut was completely removed, make sure that the ferrule is properly assembled before it is installed.



4. A properly installed Air Sampler will look like the picture above.
5. The sampler can be used with air sample bags using the 1/16” to 3/16” adapter.
6. The sample bag adapter can be replaced with the wand for direct sample collection.
7. Connect the air sample wand to the air sampler as illustrated to the right.
8. It is advisable to install a syringe filter on the end of the wand in dusty environments.



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4.5: Loading a Sample

NOTE: The instrument should have a clean baseline to begin sample loading and analysis. Refer to:

4.4: Instrument Preparation

To ensure optimal sample analysis, adhere to the following sampling and cleaning procedures :

⇒ **Liquid Sample**:

a. Pull 5mL of the sample liquid into a syringe.
b. Transfer sample liquid to the sparge bottle.
c. Rinse sparge bottle and syringe between test runs.

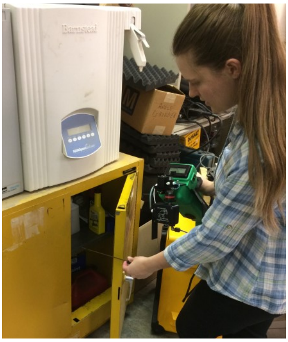
⇒ **Soil Sample:**

a. Remove the sparge bottle from the instrument.
b. Add 1 g of soil to the sparge bottle with then add 5 mL of clean water. (See our website for an application note on methanol extraction.)
c. Rinse the sparge bottle thoroughly between samples.

⇒ **Air Sample**: Connect the air sampler adaptor and wand to the FROG (Section 4.4.3).

When running an analysis (Section 4.6), hold the wand in the area desired for sample collection.

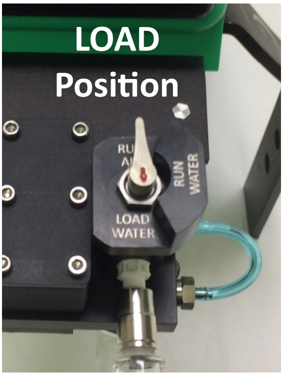
If heavy concentrations are detected, run a sample of clean air to clear the system.



Detailed instruction begin on the following page.

4.5. Loading a Sample Continued

- If concentrations are known, during calibration for example, a series of samples of the **same** analyte may be run consecutively without rinsing the instrument. They must be run in order from low to high concentrations to prevent cross contamination.



Procedure:

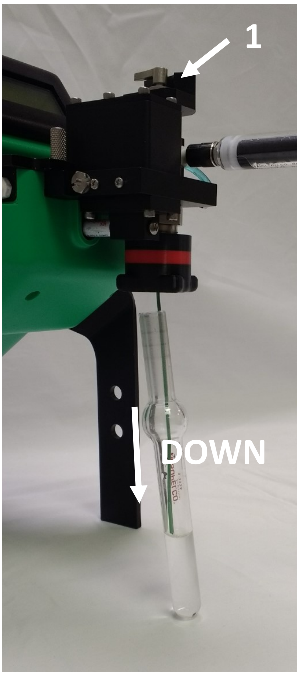
1. Place load/analyze valve in the WATER LOAD position (open). (See Section 2.2.1)

2. Load sample into sparge bottle

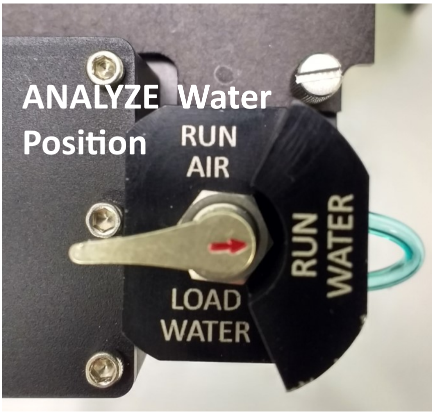
   ⇒ Liquid Samples: Place sparge bottle in DOWN position. Load 5 mL of sample through Sample Inlet

   ⇒ Silty Liquid Samples: Load 5 mL of sample directly into the top of the sparge bottle. Place sparge bottle in DOWN position.

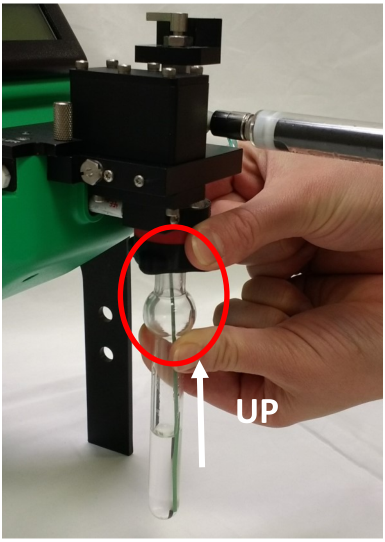
   ⇒ Soil: Load 1 g sample directly into the top of the sparge bottle. Fill 5mL syringe with deionized water. Transfer the 5mL of deionized water into the sparge bottle while rinsing soil to the bottom. Place sparge bottle in DOWN position.



3. Immediately place the load/analyze-valve in the RUN WATER position (closed). The syringe may now be removed.



4. Return sparge bottle to the UP position. Rotate the sparge bottle nut counter clockwise until finger tight to secure the sparge bottle. The sparge bottle should not spin in the sparge bottle nut.

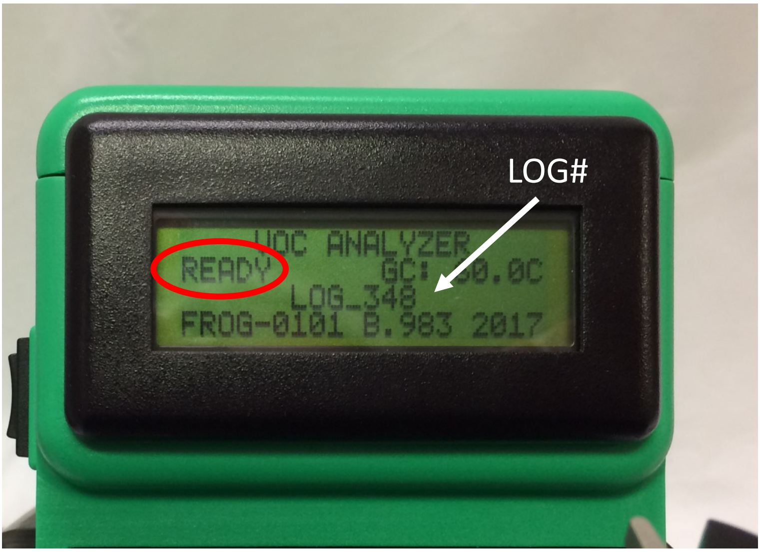


Sparge bottle
in the UP position.

NOTE: When the sparge bottle is fully UP, the green sparge tube is near the bottom of the sparge bottle. A partially lowered sparge bottle will cause analyte peaks to shift right.

4.5. Loading a Sample Continued

The instrument display screen shows **READY** throughout Steps 1-4 of Loading a Sample. The Log # is automatically generated and assigned to the data file produced by the current analysis cycle.



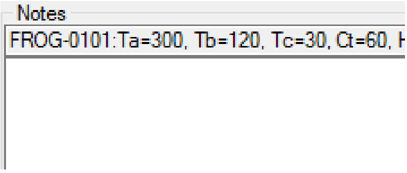
4.6: Running A Sample

This section describes the procedure for running an analysis and the instrument's stages during an analysis cycle.

Procedure:

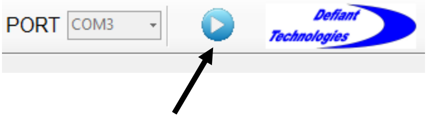
Record notes for future reference:

- If not connected to Ellvin™, the user should record the LOG #'s and other relevant information for future reference. The instrument records this number in the file name on the internal SD card.
- If connected to Ellvin™, the user can record relevant information for sample identification in the Ellvin™ Notes section. Ellvin™ automatically stores the analysis data file in a folder labeled with the date. The file itself is labeled with the time it was created.



FROG-0101:Ta=300, Tb=120, Tc=30, Ct=60, H

After the sample loading is complete (Section 4.5), the user may begin sample analysis by pressing the start button. If connected to Ellvin™, click the start button in the software. If not connected to Ellvin™, press the black toggle button on the instrument.



Start Button in Ellvin^{TM}

Continued next page.

4.6. Running a Sample Continued

During an analysis cycle, the FROG screen displays the analysis steps in sequence as illustrated below and on the following pages. This information is only visible on the instrument screen (not the Ellvin™ screen).

Each sequence has a clock counting down the duration of the current analysis step. The duration of the analysis step is determined by the instrument settings.

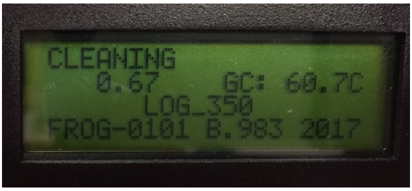
(See Section 4.3)

The GC TEMP may vary slightly from the set point.

Analysis Sequence

1. Cleaning Prior to Sparging:

The PC is heated to drive off contaminants (analytes from previous runs).



```
CLEANING
   0.67      GC: 60.7C
        LOG_350
FROG-0101 B.983 2017
```

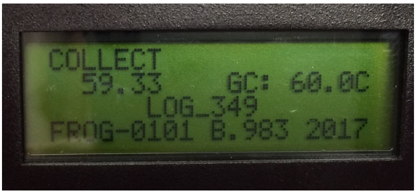
2. Settle:

The PC cools before sparge begins.

```
PRESETTLE
   3.33      GC: 60.9C
        LOG_349
FROG-0101 B.983 2017
```

3. Collect:

VOCs are sparged and collected on the PC.



```
COLLECT
  59.33      GC: 60.0C
        LOG_349
FROG-0101 B.983 2017
```

Continued next page.

4. Release and Analyze, Settle:
The sample flow is switched to the analysis channel. The pressure is allowed to stabilize before the PC fires.

```
SETTLE
  0.67     GC: 60.0C
      LOG_349
FROG-0101 B.983 2017
```

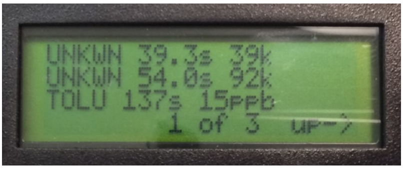
5. PC Fire:
The PC is heated and analytes are injected (released) into the GC column and continue through to the PID.

```
PC FIRE
  4.67     GC: 60.2C
      LOG_349
FROG-0101 B.983 2017
```

6. Analyzing:
The PID measures analytes as they emerge sequentially from the GC.

```
ANALYZING
 420.67    GC: 60.1C
      LOG_349
FROG-0101 B.983 2017
```

7. Results:
If the analysis was started by pressing the black toggle button on the FROG, the results will be provided on the screen.



```
UNKWN 39.3s 39k
UNKWN 54.0s 92k
TOLU 137s 15ppb
        1 of 3  UP->
```

Continued next page.

4.6. Running a Sample Continued

Analysis Sequence Continued

8. Instrument Estimation:
When the instrument is not connected to Ellvin™, it makes an estimate of the analytes' concentrations based on calibration data.

```
UNKWN 39.3s 39k
UNKWN 54.0s 92k
TOLU 137s 15ppb
      1 of 3  up->
```

Click at the top of the black toggle button to scroll through results. Press bottom of toggle to go backwards. The two estimates shown in this example are 15 ppb Toluene and 53 ppb o-xylene. The GC retention time for Toluene is displayed as 137 s.

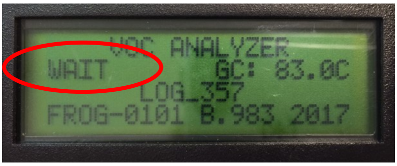
Press in top of Black Toggle Button to see analyte results

```
OXY 409s 53ppb

<-down  3 of 3  up->
```

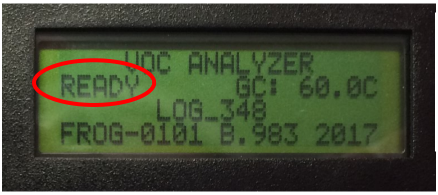
NOTE: The instrument estimates are only available immediately after the corresponding analysis. They are NOT stored on the instrument's SD card. Complete analysis chromatogram data *are* stored on the SD card and can be imported to Ellvin for further analysis.

9. Log File/WAIT:
The screen returns to the original display and shows the Log File # for the NEXT analysis. WAIT indicates that the GC temperature is above the lower GC set point.

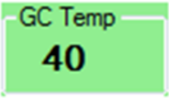


```
        VOC ANALYZER
WAIT         GC: 83.0C
          LOG_357
FROG-0101 B.983 2017
```

The FROG is ready for another sample loading and analysis once the GC Temperature indicator appears green and READY is displayed on the FROG screen.



```
VOC ANALYZER
READY      GC: 60.0C
   LOG_348
FROG-0101 B.983 2017
```



Samples of the same analyte may be run consecutively from low concentration to high without rinsing the instrument and creating a clean baseline.

NOTE: If the user has run a high-concentration sample, it is advisable to complete the following procedures:

⇒ Liquid or Air Sample, perform:

4.4: Instrument Preparation

⇒ Soil Sample: Remove sparge bottle from instrument and fill it with deionized water. Rinse it thoroughly to remove all dirt from bottle. Then, perform:

4.4: Instrument Preparation

Continued next page.

Final Step: If desired, use Ellvin™ for detailed results analysis after completing the analysis run.

- If the sample was run while connected to Ellvin™, open the data file in Analyze Window and use Integrator 2.
  (See Sections 5.2.1 and 5.2.3)
- If the sample was *not* run while connected to Ellvin, import the data to Ellvin™ (Section 4.7), then open the file in Analyze Window and use Integrator 2.

4.7. Importing Data to Ellvin

Ellvin™ allows the user to view live results, change operating parameters, re-plot stored data and overlay data for comparison. It also has tools for integrating peak areas, measuring retention times , and calibrating the instrument.

The FROG-5000™ stores data from every analysis on a micro-SD card. The following steps describe the process for extracting data from FROG-5000™ for analysis with Ellvin™.

1. Locate the micro-SD slot in the head of the FROG.
2. Press in on the card and release to eject the card.
3. Use a micro-SD adapter to plug the card into a USB or SD slot on a computer.
4. The micro-SD card performs as a thumb drive, and any file management program (such as Windows Explorer) can be used to move files.

4.7. Importing Data Continued

3. The computer screen will display an option to “Open folder and view files”. Open the folder.

4. The computer screen now displays a list of sequential files named “LOG_XXX”. The file names are created and assigned by the instrument. They appear on the instrument screen at the *beginning* of each analysis cycle as shown in Figure 4.7-1.

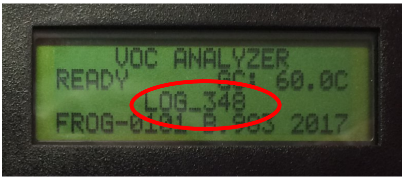


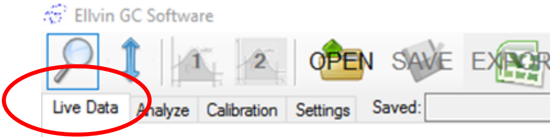
Figure 4.7-1: FROG-5000™ display screen at the beginning of a sample run.

NOTE: If the instrument is NOT connected to Ellvin™ when running analyses, the user must record the LOG file numbers of sample runs intended for future analysis. The LOG file numbers, as well as the instrument estimates, are only available on the instrument's screen at the time the sample is run.

5. Select the LOG file of interest and drag/copy it to the computer desktop or other location of user's choice.

6. Open Ellvin™.

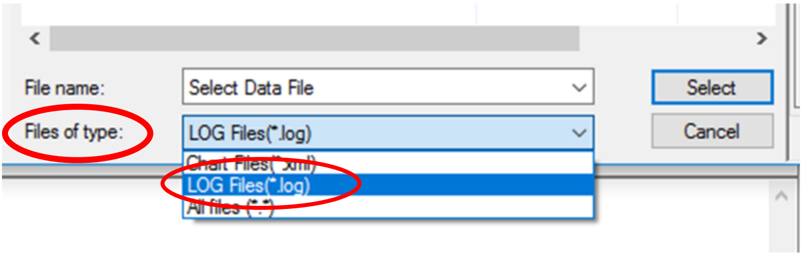
7. Select Live Data Tab.



8. Click on the OPEN button.

9. Browse to the location where the LOG file of interest was dragged/copied.

10. At the bottom of the "Select Data File" window, change "Files of Type" to LOG Files.

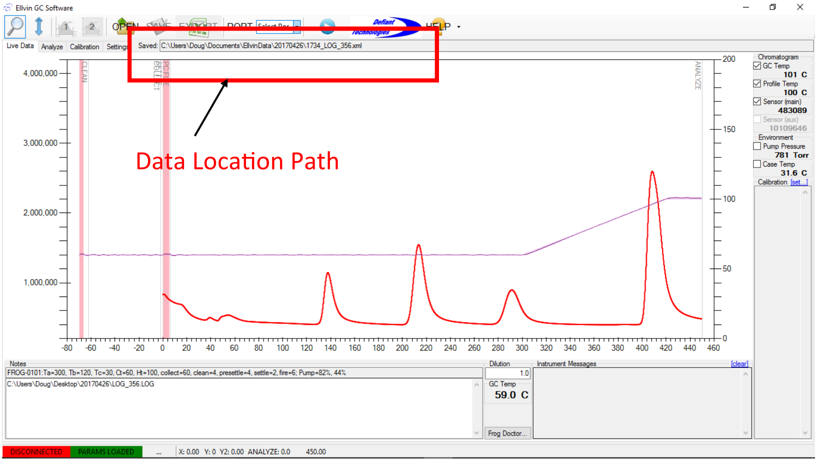


File name: Select Data File

Files of type: LOG Files(*.log)

11. Select the LOG file of interest and open it.

12. The computer screen now displays a chromatogram of the file data as it is imported into Ellvin™. At this time, Ellvin™ also converts the data to an XML format and stores it. The location path of the stored data is displayed at the top of the chromatogram in the Live Data Window (Figure 4.7-2). The data can now be opened in the Analyze Window.



Saved: C:\Users\Doug\Documents\EllvinData\20170426\1734_LOG_356.xml

Notes: FROG-0101:Ta=300, Tb=120, Tc=30, Ct=60, Ht=100, collect=60, clean=4, presettle=4, settle=2, fire=6; Pump=82%, 44%

C:\Users\Doug\Desktop\20170426\LOG_356.LOG

Dilution: 1.0

GC Temp: 59.0 C

☑ GC Temp: 101 C

☑ Profile Temp: 100 C

☑ Sensor (main): 483089

☐ Sensor (aux): 10109646

☐ Pump Pressure: 781 Torr

☐ Case Temp: 31.6 C

X: 0.00 Y: 0 Y2: 0.00 ANALYZE: 0.0 450.00

Figure 4.7-2: Live Data Window with chromatogram and data location path.

4.7. Exporting Data Continued

12. Click on the OPEN icon.

13. Follow the location path displayed in the Live Data Window to the folder that contains the data file of indicated.

14. Location Path Example:

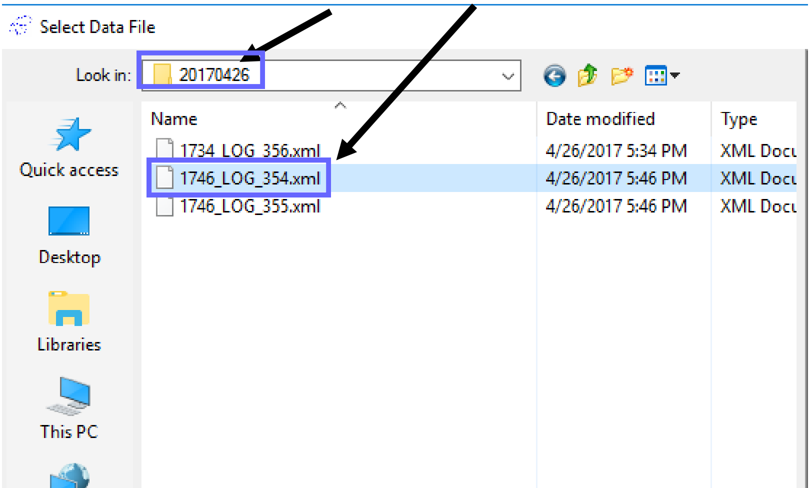
C:\Users\.....\......\EllvinData\20170426\1734_LOG_xxx.xml

16. The highlighted numbers correspond to the *date* the storage folder and data file were created by Ellvin™. In this example, April 26, 2017.

    The folder contains a list of files. The file names are derived from the *time* Ellvin™ converted the data. In the example in Figure 4.7-3, the file named "1734" was converted at 5:34 PM on 4/26/2017.

Folder name is the *Date*

File name is the *Time and Log#*

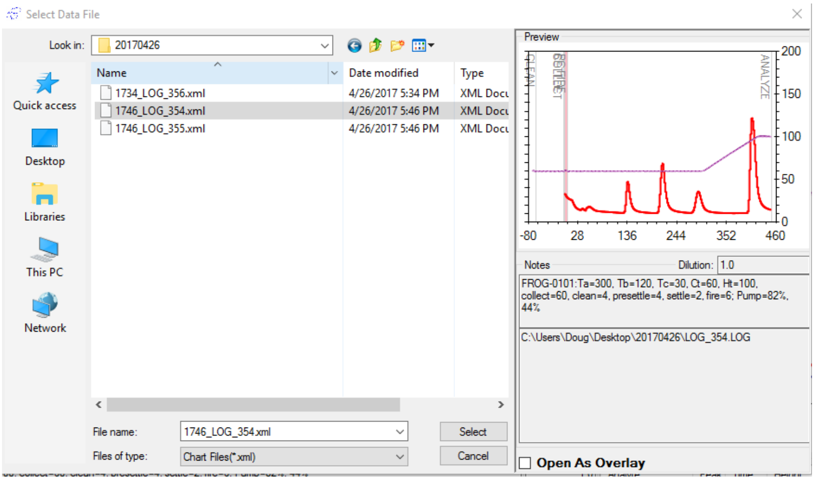


Select Data File

Look in: 20170426

Name	Date modified	Type
1734_LOG_356.xml	4/26/2017 5:34 PM	XML Docu
1746_LOG_354.xml	4/26/2017 5:46 PM	XML Docu
1746_LOG_355.xml	4/26/2017 5:46 PM	XML Docu

Figure 4.7-3: Data files named and stored by Ellvin™.



Look in: 20170426

Name	Date modified	Type
1734_LOG_356.xml	4/26/2017 5:34 PM	XML Docu
1746_LOG_354.xml	4/26/2017 5:46 PM	XML Docu
1746_LOG_355.xml	4/26/2017 5:46 PM	XML Docu

File name: 1746_LOG_354.xml

Files of type: Chart Files(*.xml)

Notes

Dilution: 1.0

FROG-0101:Ta=300, Tb=120, Tc=30, Ct=60, Ht=100, collect=60, clean=4, presettle=4, settle=2, fire=6; Pump=82%, 44%

C:\Users\Doug\Desktop\20170426\LOG_354.LOG

☐ **Open As Overlay**

Figure 4.7-4: File Selection Screen

17. A preview chromatogram of the selected file appears to the right of the file list (Figure 4.7-4).

18. Click "Select" to open the file of interest. *Ellvin™ will automatically transfer to the Analyze tab and display the data.* Proceed to analyze the data with Ellvin™ Integrator 1 or 2. (See Section 5.2.3)

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SECTION 5: ELLVIN™ SOFTWARE

The chromatogram software, Ellvin™, is primarily used to perform detailed analyses of sample data. Ellvin™ uses calibration data to:

- Assign analytes to chromatogram peaks based on GC retention times.
- Report the analytes’ concentrations based on peak heights and integrated peak areas.

Ellvin™ also manages the instrument settings and loads calibrations to the instrument.

Several general features of Ellvin™, as well as a few features specific to Analyze Window, are described in the following pages. The user should be familiar with all the features to use the system proficiently and look knowledgeable.

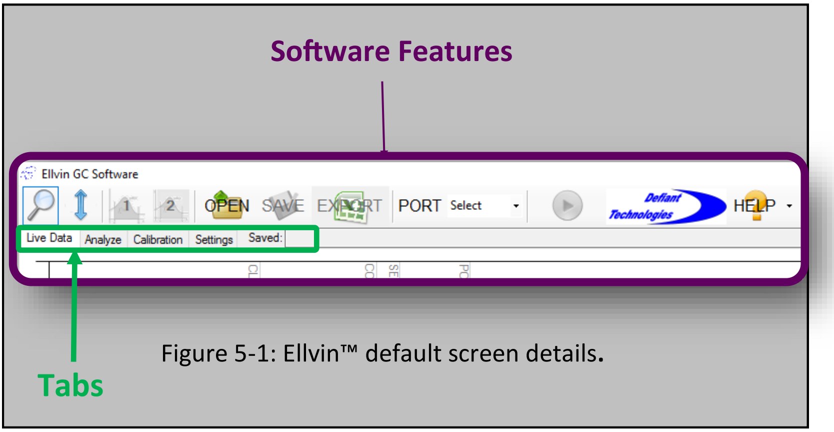


Figure 5-1: Ellvin™ default screen details.

To start using Ellvin™, refer to:

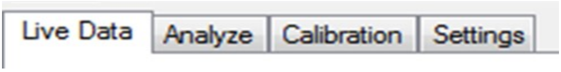
4.2: Connecting to Computer/Ellvin™

Continued next page.

5.1. FEATURES OF ELLVIN™

WINDOWS

The Ellvin Software has four windows that are accessed with tabs when the software is open.



Window Tabs in Ellvin™

- **Live Data Window**: This is the default window for Ellvin™. In Live Data Window, Ellvin™ creates a chromatogram from sample analysis data. The data source may be:
    - a. From a sample run on the FROG while connected to Ellvin™ and simultaneously imported to Ellvin™.
    - b. From sample data previously recorded on the instruments SD card, then imported to Ellvin™.
- **Analyze Window:** As in Live Data Window, Ellvin™ creates a chromatogram from sample analysis data. In this window, Ellvin™ retrieves analysis data that was previously stored on a computer. In Analyze Window the user can examine chromatograms closely, integrate chromatogram peaks, and export data to Excel.
- **Calibration Window:** In this window, Ellvin™ uses analysis data from chemical standards to calibrate the FROG.
- **Settings Window:** In this window, Ellvin™ manages the settings for the FROG. The settings define temperature and duration parameters for various phases of the instrument's analysis cycle. Refer to:

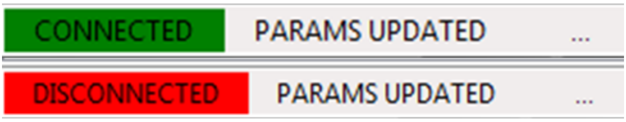
4.3: Instrument Settings

PORT

Use this feature to select the correct data port connection from the FROG-5000™. The user selects a COM# to connect to the FROG.

Connection Port

Based on the selection of COM, the Connection Port will notify the user if the FROG is CONNECTED or DISCONNECTED, and if the parameters have been updated. (Bottom left corner of the software display screen).



GC Column Temperature Indicator

This feature monitors and displays the GC temperature.

The icon is **GREEN** when instrument is ready for Loading.

It turns **GRAY** during sample analysis, and **RED** when the GC is cooling.

5.1. Features of Ellvin™ Continued

Start/Stop Button

Clicking on this button causes the FROG-5000™ to start an analysis cycle. Once the analysis has begun, the red stop sign appears. Clicking the stop button will stop the analysis and save the chromatogram to the point that the run was halted.

OPEN Button

Click on this button to open saved files. The files can be from data stored on a computer or on the instrument's internal micro-SD card.

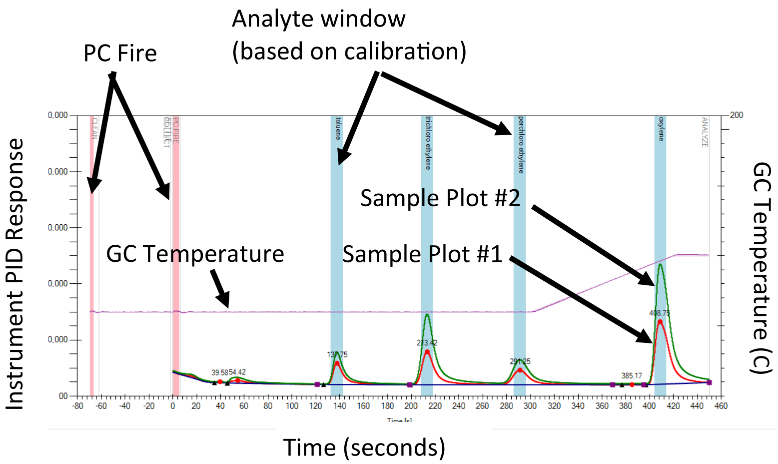
EXPORT

Export only works when Ellvin™ is in Analyze Window. The user can export an opened file into Microsoft Excel program for further analysis.

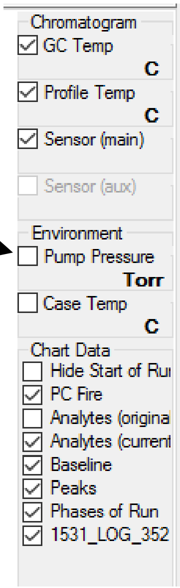
Chromatogram Display Screen

The software display screen shows sample analysis data.

- The X-axis is time in seconds.
- The Y-axis shows the instrument's PID response and GC temperature (°C).
- The peaks correspond to separated analytes.



Plots of other run variables can be toggled on and off by checking boxes in the panel on the right portion of the screen. Information such as the analysis pump pressure and internal case temperature are stored for every run.



Chromatogram
☑ GC Temp
C
☑ Profile Temp
C
☑ Sensor (main)
☐ Sensor (aux)

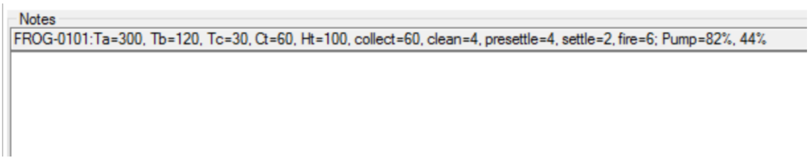
Environment
☐ Pump Pressure
Torr
☐ Case Temp
C

Chart Data
☐ Hide Start of Rui
☑ PC Fire
☐ Analytes (origina
☑ Analytes (current
☑ Baseline
☑ Peaks
☑ Phases of Run
☑ 1531_LOG_352

5.1. Features of Ellvin™ Continued

Notes

This tool allows the user to records notes about samples while in Live Data or Analyze Window. The notes are saved when the sample analysis is completed. It is important to record the date and time that data files are created in order to locate and retrieve them for further analysis.



FROG-0101:Ta=300, Tb=120, Tc=30, Ct=60, Ht=100, collect=60, clean=4, presettle=4, settle=2, fire=6; Pump=82%, 44%

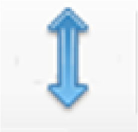
Magnifying Glass

Use this tool to zoom into a chromatogram while data is being collected in Live Data Window, or while in Analyze Window to help with integration.

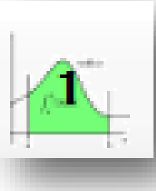
Detailed instructions for using Magnifying Glass follow in Section 5.2.2.

MOVE

Use this tool to move the chromatogram up and down the Y-axis.

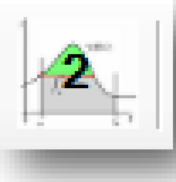


Integrator 1



This feature only operates while in Analyze Window. The user creates a baseline and integrates peaks, then calculates the peak height and area. The baseline integration limits are set by clicking the left mouse button.

Integrator 2

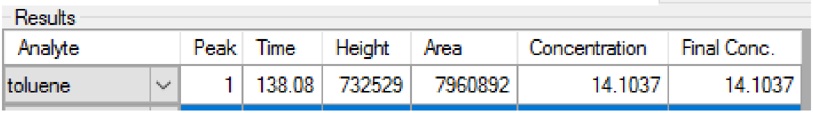


This feature only operates while in Analyze Window. Ellvin™ creates a baseline by snapping vertically from the left mouse click position to the data line. Ellvin™ then calculates the peak height and area. Integrator 2 is recommended for the most consistent analysis results. Detailed instructions for using Integrator 2 follow in Section 5.2.3.

Data Grid

Use with Integrator 1 and 2. The Data Grid shows:

- Analyte (Toluene) *Based on calibration retention times.*
- Peak Reference Number (1)
- Retention Time (138.08s)
- Peak Height (732529)
- Peak Area (7960892)
- Calculated concentration (14.1037) *Based on calibration concentrations.*



Results

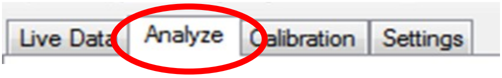
Analyte	Peak	Time	Height	Area	Concentration	Final Conc.
toluene	1	138.08	732529	7960892	14.1037	14.1037

5.2. APPLYING ELLVIN™ FEATURES

5.2.1. OPEN BUTTON

To open stored files in Analyze Window:

- Click on the Analyze Tab.



- Click the OPEN button.

- A file selection screen appears.
  (Figures 5.2.1-1 and 5.2.1-2)

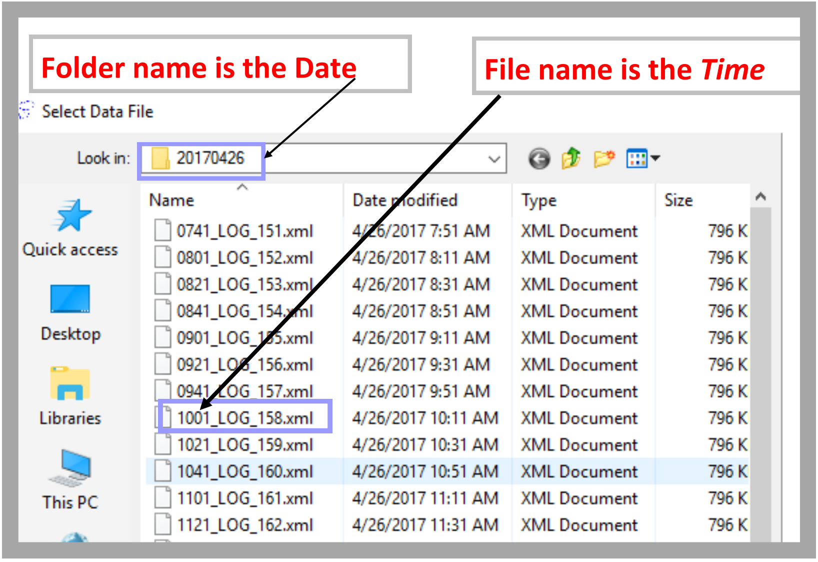
NOTE: Ellvin™ automatically labels folders and files as they are created.

⇒ Folders of data files are labeled by the *DATE* they were created.

⇒ Data files are labeled by the *TIME* they were created and the LOG number.

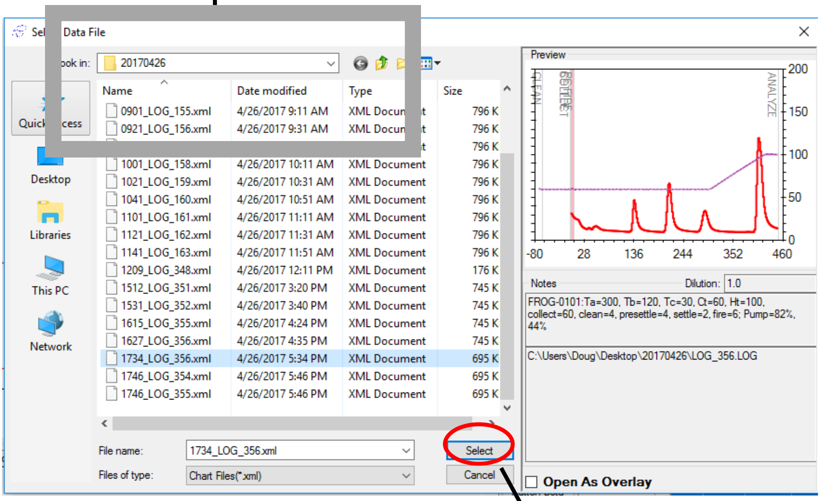
In the example shown in Figure 5.2.1-1, the data file was created at 10:01 AM on April 26, 2017.

- To locate the data file of interest, browse to the folder labeled with the *date* the sample was ran, or the *date* the data file was imported from the FROG to Ellvin™. Double click to open the folder.
- Click on a data file of interest. A preview of the data chromatogram appears to the right of the list.
- Click “Select” to open the file for analysis with Integrator 2.



Name	Date modified	Type	Size
0741_LOG_151.xml	4/26/2017 7:51 AM	XML Document	796 K
0801_LOG_152.xml	4/26/2017 8:11 AM	XML Document	796 K
0821_LOG_153.xml	4/26/2017 8:31 AM	XML Document	796 K
0841_LOG_154.xml	4/26/2017 8:51 AM	XML Document	796 K
0901_LOG_155.xml	4/26/2017 9:11 AM	XML Document	796 K
0921_LOG_156.xml	4/26/2017 9:31 AM	XML Document	796 K
0941_LOG_157.xml	4/26/2017 9:51 AM	XML Document	796 K
1001_LOG_158.xml	4/26/2017 10:11 AM	XML Document	796 K
1021_LOG_159.xml	4/26/2017 10:31 AM	XML Document	796 K
1041_LOG_160.xml	4/26/2017 10:51 AM	XML Document	796 K
1101_LOG_161.xml	4/26/2017 11:11 AM	XML Document	796 K
1121_LOG_162.xml	4/26/2017 11:31 AM	XML Document	796 K

Figure 5.2.1-1 Data files



Name	Date modified	Type	Size
0901_LOG_155.xml	4/26/2017 9:11 AM	XML Docun t	796 K
0921_LOG_156.xml	4/26/2017 9:31 AM	XML Docun t	796 K
		t	796 K
1001_LOG_158.xml	4/26/2017 10:11 AM	XML Document	796 K
1021_LOG_159.xml	4/26/2017 10:31 AM	XML Document	796 K
1041_LOG_160.xml	4/26/2017 10:51 AM	XML Document	796 K
1101_LOG_161.xml	4/26/2017 11:11 AM	XML Document	796 K
1121_LOG_162.xml	4/26/2017 11:31 AM	XML Document	796 K
1141_LOG_163.xml	4/26/2017 11:51 AM	XML Document	796 K
1209_LOG_348.xml	4/26/2017 12:11 PM	XML Document	176 K
1512_LOG_351.xml	4/26/2017 3:20 PM	XML Document	745 K
1531_LOG_352.xml	4/26/2017 3:40 PM	XML Document	745 K
1615_LOG_355.xml	4/26/2017 4:24 PM	XML Document	745 K
1627_LOG_356.xml	4/26/2017 4:35 PM	XML Document	745 K
1734_LOG_356.xml	4/26/2017 5:34 PM	XML Document	695 K
1746_LOG_354.xml	4/26/2017 5:46 PM	XML Document	695 K
1746_LOG_355.xml	4/26/2017 5:46 PM	XML Document	695 K

File name: 1734_LOG_356.xml

Files of type: Chart Files(*.xml)

Notes

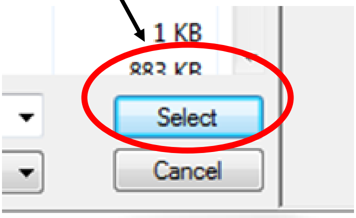
Dilution: 1.0

FROG-0101:Ta=300, Tb=120, Tc=30, Ct=60, Ht=100, collect=60, clean=4, presettle=4, settle=2, fire=6; Pump=82%, 44%

C:\Users\Doug\Desktop\20170426\LOG_356.LOG

☐ **Open As Overlay**

Figure 5.2.1-2: File Selection Screen



5.2. Applying Ellvin Features Continued

5.2.2. MAGNIFYING GLASS

The Magnifying Glass can be used in Live Data Window during data import, or while in Analyze Window.

Click on the magnifying glass icon to start.

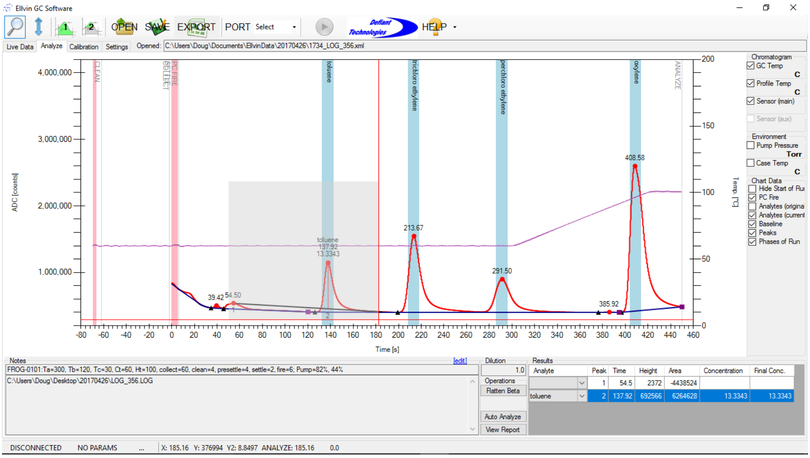
To Magnify:

- Left click and hold
- Drag mouse over desired magnified area. (Figure 5.2.2-1)
- Release the mouse button.
- The area being magnified is highlighted light blue.
- The display screen then readjusts to show the magnified area. (Figure 5.2.2-2).

To De-Magnify:

- Click the circle on the scroll bars.
- OR double click the magnifying glass icon.

Figure 5.2.2-1: Desired Magnified Area



Opened: C:\Users\Doug\Documents\EllvinData\20170426\1734_LOG_356.xml

Notes

FROG-0101:Ta=300, Tb=120, Tc=30, Ct=60, Ht=100, collect=60, clean=4, presettle=4, settle=2, fire=6; Pump=82%, 44%

C:\Users\Doug\Desktop\20170426\LOG_356.LOG

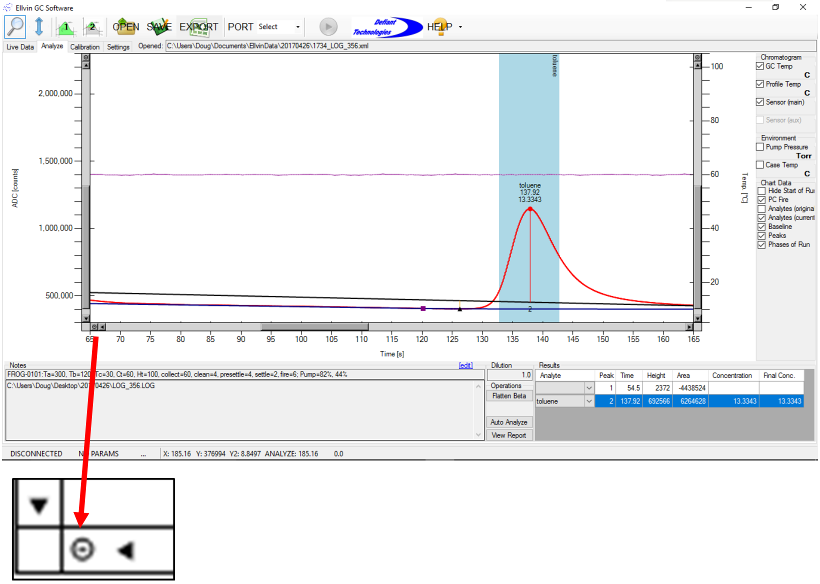
Dilution: 1.0

Results

Analyte	Peak	Time	Height	Area	Concentration	Final Conc.
	1	54.5	2372	-4438524		
toluene	2	137.92	692566	6264628	13.3343	13.3343

DISCONNECTED NO PARAMS ... X: 185.16 Y: 376994 Y2: 8.8497 ANALYZE: 185.16 0.0

Figure 5.2.2-2: Magnified Area



Opened: C:\Users\Doug\Documents\EllvinData\20170426\1734_LOG_356.xml

Notes

FROG-0101:Ta=300, Tb=120, Tc=30, Ct=60, Ht=100, collect=60, clean=4, presettle=4, settle=2, fire=6; Pump=82%, 44%

C:\Users\Doug\Desktop\20170426\LOG_356.LOG

Dilution: 1.0

Results

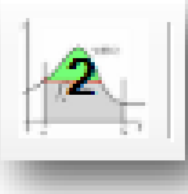
Analyte	Peak	Time	Height	Area	Concentration	Final Conc.
	1	54.5	2372	-4438524		
toluene	2	137.92	692566	6264628	13.3343	13.3343

DISCONNECTED NO PARAMS ... X: 185.16 Y: 376994 Y2: 8.8497 ANALYZE: 185.16 0.0

5.2.3. INTEGRATOR 2

Integrator 2 can be used only in Analyze Window. This tool calculates the area under a peak and the peak height. The area or peak height helps determine the concentration of the analyte.

Click on the Integrator 2 button to start.



Technique to Integrate:

(Refer to Diagrams 5.2.3-1 and 5.2.3-2)

1. Begin at the lowest point, Valley 1.
2. Drag the mouse to draw an integration line, past the peak, to the second lowest point, Valley 2.
3. The integration line should NOT cross the data line. Avoiding this ensures the correct calculation for the peak area. (Figure 5.2.3-2).

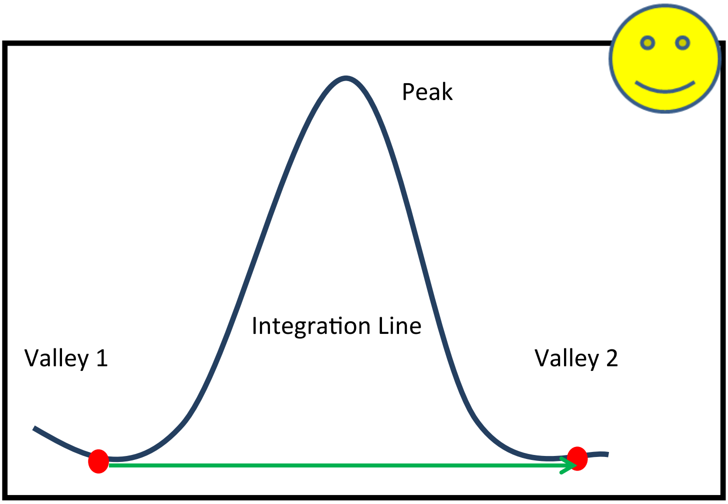


Diagram 5.2.3-1: Valleys and Peaks

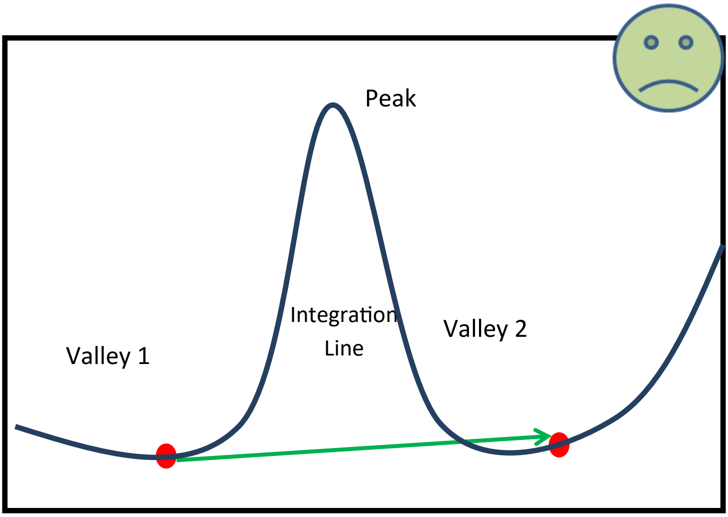


Diagram 5.2.3-2: Crossing Data Line

5.2.3. Integrator 2 Continued

Integrating a Single Peak

Using the correct technique illustrated on the previous page, select the desired peak for integration.

1. Select Integrator 2.

2. Left click the mouse and hold at Valley 1.
3. Drag to Valley 2 and release.
4. The Integrator 2 tool uses the software to select the baseline on which the integration line is drawn.
5. The gray shadowed area in Ellvin™ will show which area is being integrated. (Figure 5.2.3-3)
6. The integration is complete when a solid black line appears.
7. The Data Grid shows the data that corresponds to the related peak number near the base of the peak. The user can continue integrating peaks.

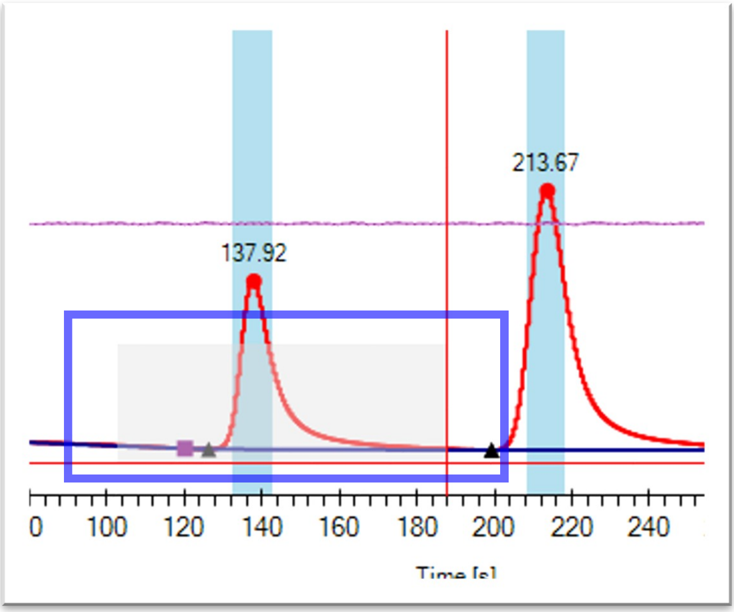
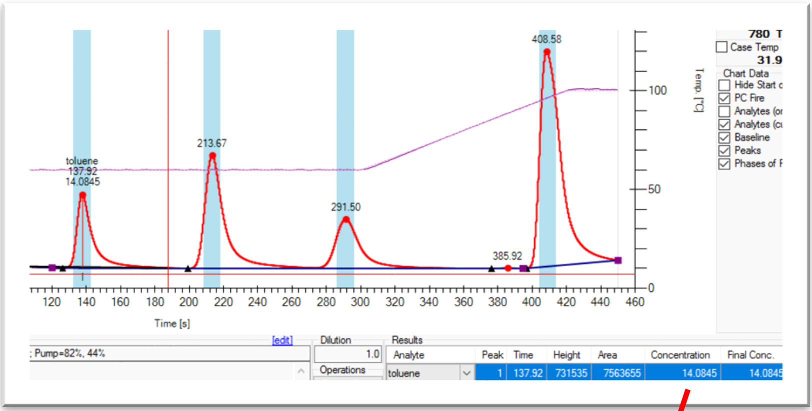


Figure 5.2.3-3: Desired Peak Integrated Area



780 T

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31.9

Chart Data

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☑ PC Fire

☐ Analytes (or

☑ Analytes (cu

☑ Baseline

☑ Peaks

☑ Phases of F

[edit]

: Pump=82%, 44%

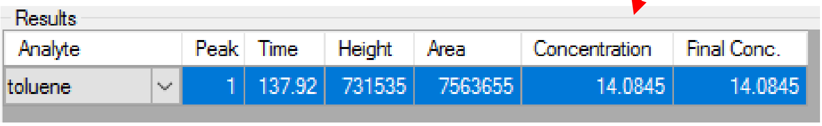
Dilution 1.0

Operations

Results

Analyte	Peak	Time	Height	Area	Concentration	Final Conc.
toluene	1	137.92	731535	7563655	14.0845	14.0845

Figure 5.2.3-4: Integration Line



Results

Analyte	Peak	Time	Height	Area	Concentration	Final Conc.
toluene	1	137.92	731535	7563655	14.0845	14.0845

Data Grid

5.2.3. Integrator 2 Continued

Integrating Multiple Peaks

To integrate multiple peaks, follow the same procedures for integrating a single peak using Integrator 2.
Click on the Integrator 2 button to start.

1. Right click and hold the mouse at Valley 1.
2. Drag to Valley 3 and release.
3. The integrator uses Ellvin to select the baseline on which the integration line is drawn.
4. The integration is complete when a solid black line appears. The result shows the integration line and the splits placed between joined peaks. (Figure 5.2.3-5)
5. To integrate the remaining peak (in Figure 5.2.3-5, Peak 3). Click and hold at Valley 3 and drag to Valley 4.
6. The Data Grid shows the data that corresponds to the related peak. The user can continue integrating peaks.

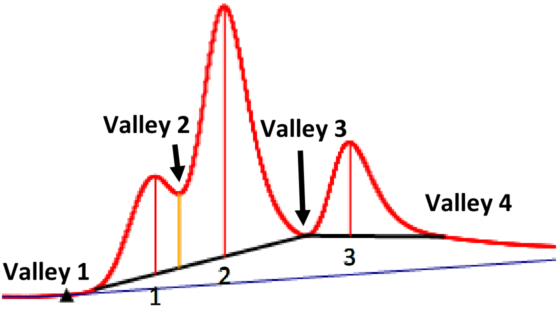
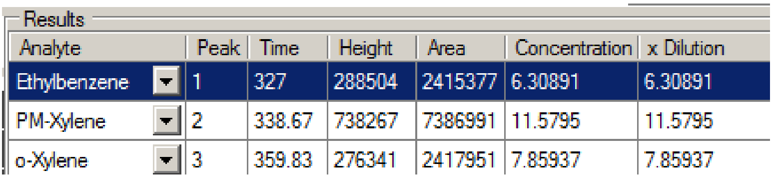


Figure 5.2.3-5: Integration of multiple peaks complete.


Results

Analyte	Peak	Time	Height	Area	Concentration	x Dilution
Ethylbenzene	1	327	288504	2415377	6.30891	6.30891
PM-Xylene	2	338.67	738267	7386991	11.5795	11.5795
o-Xylene	3	359.83	276341	2417951	7.85937	7.85937

Data Grid

When integrating multiple peaks it is necessary to follow the baseline as closely as possible. It is recommended that each peak be carefully assessed before integration. It is usually best to integrate each peak separately unless the valley between the peaks does not reach the baseline as in the case of peaks 3 and 4 in the figures below (Figure 5.2.3-6 and Figure 5.2.3-7).

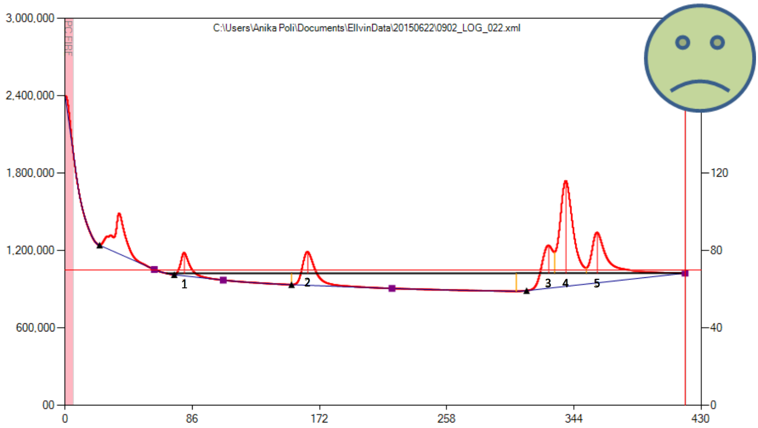


Figure 5.2.3-6: Improper integration of Multiple Peaks

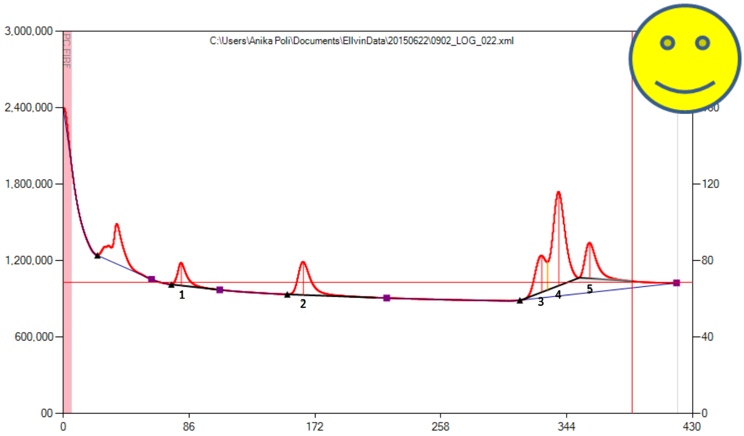


Figure 5.2.3-7: Proper integration of Multiple Peaks

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SECTION 6: CALIBRATION

This section provides detailed instructions for calibrating the instrument.

The system is calibrated by testing a series of analytes at varying, known concentrations. As with all GC work, these analytes are selected from an established list of chemicals that are of foremost interest in the environment under investigation.

- Before beginning a calibration, it is recommended that the user become familiar with Ellvin™. Refer to Section 5.
- The user should also be familiar with analytical techniques for GC calibration.
- The preparation and use of standards for calibrating the instrument differs for air, liquid, and soil samples. Section 6.1 introduces the procedure for preparing standards.
- Section 6.2 provides detailed instruction for using the features found in Calibration Window.
- Section 6.3 provides detailed instructions for calibrating the instrument.

6.1. CALIBRATION STANDARDS

NOTE: The instruction in Sections 6.1.1 and 6.1.2 correspond to Step B-3 in Section 6.3.

6.1.1. STANDARDS FOR LIQUID OR SOIL SAMPLES

For screening purposes, a calibration can be created with a single known sample. However, it is best to run at least four calibration samples from low to high concentrations.

General concepts to calculate the dilutions

Traditionally, ppb concentrations of analytes in water are expressed in micrograms of analyte per liter of water (=1 Kg water). Calibration standards come pre-diluted in methanol. Methanol cannot be ionized (and therefore not detected) by the instrument's PID.

The standards are frequently referred to in terms of ppm, but if you carefully look at the packaging, somewhere, it should say x.x-mg analyte/mL-Methanol. For example, a common fuel mixture, BTEX, will be provided as 2.0-mg/mL-methanol and often this is referred to as a 2000-ppm standard because it is 2000 μg BTEX/mL methanol.

The important thing to follow is the mass of the analyte in the sample. If you draw 5-μL of the 2000 ppm BTEX solution into a syringe, the syringe contain 0.005-mL x 2000-μg/mL (or 10 μg) of benzene, 10 μg of toluene, 10 μg of ethylbenzene, and so on. If you inject this 5-μL syringe BTEX standard into 5-mL of water, there will be 10-μg of benzene in the 5-g of water, In other words, the benzene contamination is 2-μg benzene/1-g water = 2000 ppb.

Handy things to know:

1 µg/mL = 1 mg/L = 1 ppm (mass) 1 µg /L = 1 ppb (mass)

BTEX = Benzene, Toluene, Ethylbenzene, p/m-Xylene, o-Xylene

Diluting 5mL Water with Standard

The density of water is 1 g/mL, so if a syringe contains 5 mL of water, it means that there are 5 g of water in the syringe.

If you have a 200ppm benzene standard, what is the resulting concentration from injecting 2µL (=0.002 mL) of the 200ppm benzene standard into the 5-mL water filled syringe?

$$\frac{200\,\mu g\ Benzene}{mL\ Methanol} \times \frac{0.002\ mL\ Methanol}{5\ g\ H_2O} =$$

$$= \frac{0.08\,\mu g\ Benzene}{1\ g\ H_2O} = \frac{80\,\mu g\ Benzene}{1\ kg\ H_2O} = 80\ ppb\ Benzene$$

There will be a concentration of 80 ppb benzene in the water.

Diluting from a Standard

Let C_A = original concentration of an analyte in a solvent, and F = desired dilution factor so $C_B = C_A / F$. Find V_A = volume of mix C_A that must be added to a solvent volume V_B to achieve concentration C_B, where m_A is the mass of analyte in V_A.

$$m_A = C_A V_A$$

$$C_B = \frac{C_A}{F} = \frac{m_A}{V_B + V_A(1 - C_A)} = \frac{C_A V_A}{V_A + V_B} \quad \text{(approx. for low } C_A\text{)}$$

Solving for V_A yields:

$$V_A = \frac{V_B}{F - 1}$$

Example: Using C_A = 2000 µg/mL BTEX in MeOH standard to make a C_B = 200 µg/mL BTEX in MeOH standard (that is F = 10), you must add 0.1 mL of C_A to 0.9 mL MeOH to make a 1 mL standard of 200 µg/mL BTEX in MeOH.

6.1.1. Standards for Liquid and Soil Samples Continued

Preparation Continued:

2. Fill a syringe with 5 mL deionized water.
3. Load a known volume, as calculated on the previous pages, of a liquid standard into the syringe.
4. Connect to Ellvin™ and follow the sample loading instructions in Section 4.5.

4.5: Loading a Sample

6.1.2. STANDARDS FOR AIR SAMPLES

Gas calibration standards are available from several sources, and we recommend searching the internet with the term "Calibration Gas Standards." The standard typically comes in a pressurized cylinder with a mixture of analytes in nitrogen to achieve the proper dilution. A typical mix for calibration would be 100 ppbv BTEX in N2. Concentrations are typically in parts per billion by volume.

A regulator on the bottle controls the flow and pressure at the exhaust. Because sample will be collected directly from the atmosphere, we suggest connecting the FROG's sample tube to the bottle with a Tee. One port on the tube should vent to the atmosphere and flow of the sample gas should exceed the collection flowrate of the FROG (~60 mL/min).

The FROG permits the creation of a single point calibration, and this is adequate for many applications. Results will be good near the calibration gas concentration, but less reliable further from that concentration. Multiple point calibrations are preferred.

6.1.2. STANDARDS FOR AIR SAMPLES (CONTINUED)

Run at least four calibration standards from low to high concentrations. Defiant Technologies sells a portable gas diluter accessory to be used with the FROG for air calibrations.

Tools Needed:

- Portable Gas Diluter
- Calibration Gas
- Air Sampler

Gas Diluter attached to Calibration gas and FROG

Instrument Preparation:

- Connect Air Sampler to instrument and then connect air sampler to the gas diluter. Place load/analyze-valve in the load position (open). (See Section 4.4.3 Connecting the Air Sample Adapter).
- Connect the calibration gas to the gas diluter.

Continued next page.

6.1.2. Standards for Air Samples Continued.

Standard Preparation and Loading:

1. Use the spreadsheet provided with the Gas Diluter. This will allow for the calculation of sample concentration using the starting concentration of the calibration gas.
2. Adjust the flow rates on the gas diluter until stable at the desired rates.
3. Press the start button and run sample.

   Refer to:

   4.6: Running A Sample

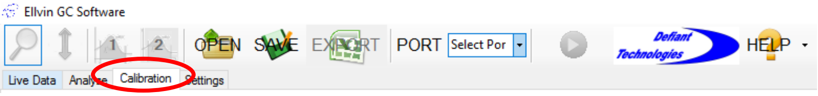
4. Repeat for other sample concentrations.

For more detail on the air calibration procedure using the Gas Diluter please refer to the Gas Diluter User's Manual.

Another method to perform multiple point calibrations is to buy multiple compressed standards, or alternatively, to prepare multiple concentrations in Tedlar™ gas sample bags. We will not go into details on these procedures. We will point out, however, that it can be difficult to achieve accurate concentrations much below 20 ppbv. Low concentration samples tend to degrade in compressed cylinders, and sample bags often have contaminants that appear as large peaks in the chromatography. It is still possible to achieve reasonable results, and a Frog user is welcome to call Defiant Technologies for further discussions. Contact information can be found at www.defiant-tech.com.

6.2. ELLVIN™ CALIBRATION WINDOW FEATURES

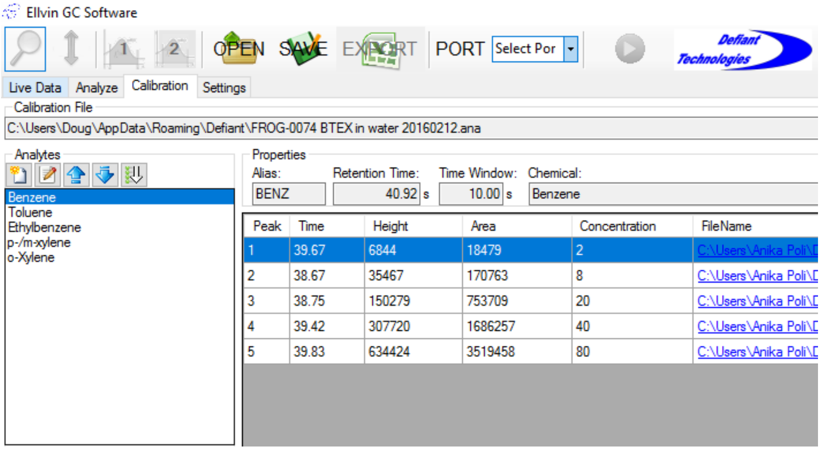
- To start using Calibration Window, open Ellvin™ and click on the Calibration Tab.



6.2.1. LIST OF ANALYTES

This feature allows the user to create a List of Analytes that may be used to calibrate the instrument. The analyte names in the List of Analytes will later be associated with analyte peaks from calibration standard runs. (See Figure 6.2.1)

The Retention Time, Peak Height, and Peak Area in Figure 6.2.1 are generated from previous analyses of standard solutions with known concentrations.



Calibration File: C:\Users\Doug\AppData\Roaming\Defiant\FROG-0074 BTEX in water 20160212.ana

Benzene
Toluene
Ethylbenzene
p-/m-xylene
o-Xylene

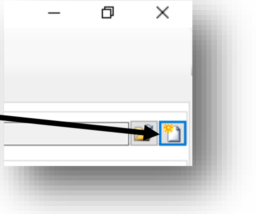
Alias: BENZ
Retention Time: 40.92 s
Time Window: 10.00 s
Chemical: Benzene

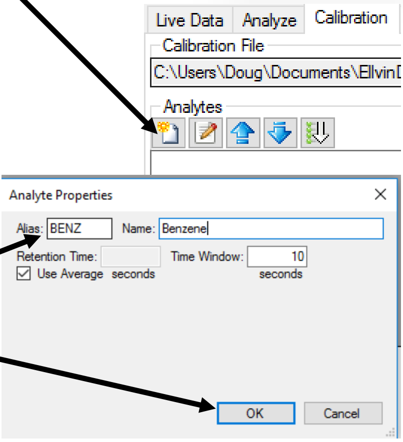
Peak	Time	Height	Area	Concentration	FileName
1	39.67	6844	18479	2	C:\Users\Anika Poli\D
2	38.67	35467	170763	8	C:\Users\Anika Poli\D
3	38.75	150279	753709	20	C:\Users\Anika Poli\D
4	39.42	307720	1686257	40	C:\Users\Anika Poli\D
5	39.83	634424	3519458	80	C:\Users\Anika Poli\D

Figure 6.2.1: Typical entries used to build a calibration file.

Creating a new calibration

1. Click on the New File Icon
2. Click on the New Analyte Icon
3. At this point, a pop-up window appears requesting an analyte name and an alias that will appear on the FROG display after a run. In this example, the alias BENZ is given for benzene.
4. Click OK and this analyte will be added to a list of analytes.
5. Add as many analytes as needed for the calibration. If you want to delete one, just click on the name, and use the delete button on the computer.



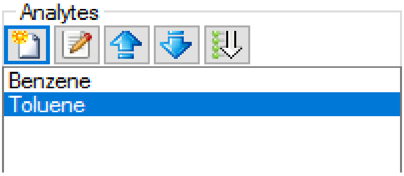


Calibration File: C:\Users\Doug\Documents\Ellvin

Alias: BENZ Name: Benzene

Retention Time: Time Window: 10 seconds

☑ Use Average seconds



Benzene
Toluene

At this point, you are ready to run calibration standards to produce the calibration data. That data will be peak heights and integrated peak areas for multiple concentrations for each analyte. Because the samples are separated in the chromatogram, multiple analytes can be tested in a single sample run.

For each analyte, the peak area (or height) will be correlated with the concentration through a linear or quadratic equation.

6.2. Calibration Window Features Continued

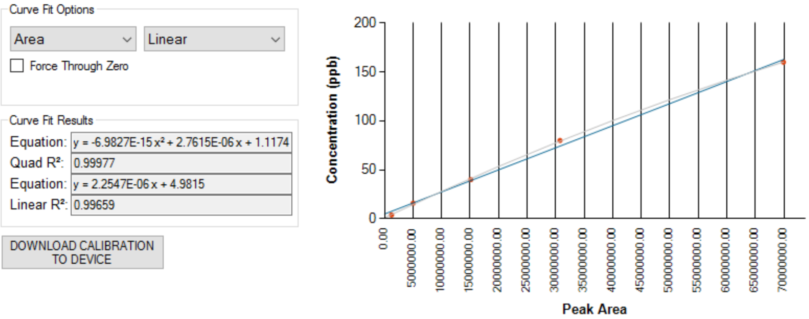
6.2.2. CORRELATION CHART AND EQUATIONS

This feature in the Calibration Window displays the degree of correlation between analyte standards of varying concentrations and the instrument's response to them.
(See Figure 6.2.2)

The correlation is calculated as both a linear equation and a 2nd order quadratic equation.

The user may choose to view the equations and a chart for either Peak Area correlation or for Peak Height correlation.

This correlation is important because Ellvin uses these parameters to calculate concentrations for future samples.



Curve Fit Options

Area

Linear

☐ Force Through Zero

Curve Fit Results

Equation: y = -6.9827E-15 x² + 2.7615E-06 x + 1.1174

Quad R²: 0.99977

Equation: y = 2.2547E-06 x + 4.9815

Linear R²: 0.99659

Figure 6.2.2: Correlation Equations and Chart

6.3. CALIBRATION PROCEDURE

The Calibration Procedure consists of running a series of analysis cycles with standards of varying concentrations for a given analyte. Ellvin™ then uses the analysis data for the standard solutions to calibrate the instrument.

Before beginning a calibration, the user should be familiar with:

4.3: Instrument Settings

4.4: Instrument Preparation

4.5: Loading a Sample

4.6: Running A Sample

5.1-5.2: ELLVIN™ Software

It is recommended to run a minimum of four standards, from low to high concentration, to create data points for calibrating the instrument.

The concentration range for calibration standards depends on the analyte and its unique retention time.

Example standard concentrations for a calibration: 2 ppb, 10 ppb, 50 ppb, 100 ppb

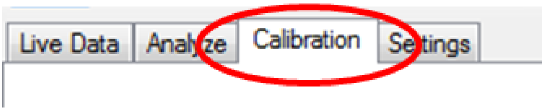
Calibration Procedure Steps

A. Add the Calibration Analytes to the List of Analytes.

(See Section 6.2.1)

The steps in this section prepare the software to calibrate using selected analytes.

1. Open the Calibration Window.



2. Begin by adding each of the analytes chosen for calibration, one at a time, to the Analyte List.
   (See Section 6.2.1)

- No data will be displayed and the chart display area will be blank. Disregard any equations displayed.

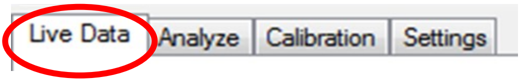
Continued next page.

6.3. Calibration Procedure Continued

B. Run the Calibration Standards

In this section, the calibration samples are loaded and instrument response data is stored.

1. Open the Live Data Window



2. Create a clean baseline before running any calibration samples. Refer to:

4.4: Instrument Preparation

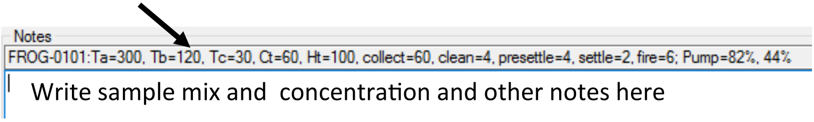
3. To begin the calibration, load and run a sample containing only deionized water. Refer to:

4.5: Loading a Sample

4.6: Running A Sample

3. Load and run a minimum of four calibration standards of the selected analytes. The samples should be of varying concentrations and should be run in order from low to high concentrations. See Section 6.1 for sample preparation.

4. For each of the calibration standards, record the concentrations in the Notes window. This will help identify the files during analysis and calibration. All of the system configuration parameters are automatically stored.



Notes

FROG-0101:Ta=300, Tb=120, Tc=30, Ct=60, Ht=100, collect=60, clean=4, presettle=4, settle=2, fire=6; Pump=82%, 44%

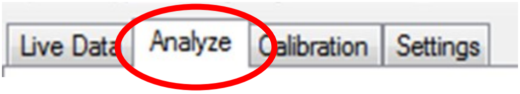
Write sample mix and concentration and other notes here

After the instrument has completed running the four (or more) calibration standards, go to the Analyze Window in Ellvin™ to analyze the instrument response data.

C. Analyze the Data

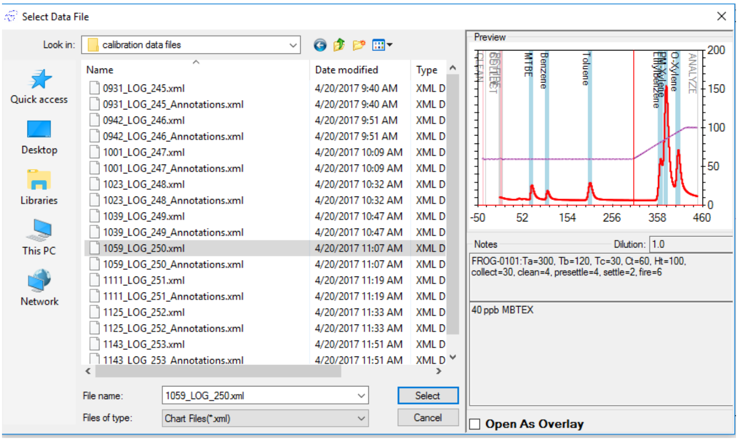
In this window Ellvin™ analyzes the stored instrument response data to create the information needed for calibration.

1. Open the Analyze Window



2. Click on the OPEN button to access a list of previously run sample files. (Figure 6.3-1)
   (See Section 5.2.1 for details)

3. Select the calibration sample file desired for data analysis. The files are labeled by the *time* they were created and the LOG number.



Look in: calibration data files

Name	Date modified	Type
0931_LOG_245.xml	4/20/2017 9:40 AM	XML D
0931_LOG_245_Annotations.xml	4/20/2017 9:40 AM	XML D
0942_LOG_246.xml	4/20/2017 9:51 AM	XML D
0942_LOG_246_Annotations.xml	4/20/2017 9:51 AM	XML D
1001_LOG_247.xml	4/20/2017 10:09 AM	XML D
1001_LOG_247_Annotations.xml	4/20/2017 10:09 AM	XML D
1023_LOG_248.xml	4/20/2017 10:32 AM	XML D
1023_LOG_248_Annotations.xml	4/20/2017 10:32 AM	XML D
1039_LOG_249.xml	4/20/2017 10:47 AM	XML D
1039_LOG_249_Annotations.xml	4/20/2017 10:47 AM	XML D
1059_LOG_250.xml	4/20/2017 11:07 AM	XML D
1059_LOG_250_Annotations.xml	4/20/2017 11:07 AM	XML D
1111_LOG_251.xml	4/20/2017 11:19 AM	XML D
1111_LOG_251_Annotations.xml	4/20/2017 11:19 AM	XML D
1125_LOG_252.xml	4/20/2017 11:33 AM	XML D
1125_LOG_252_Annotations.xml	4/20/2017 11:33 AM	XML D
1143_LOG_253.xml	4/20/2017 11:51 AM	XML D
1143_LOG_253_Annotations.xml	4/20/2017 11:51 AM	XML D

File name: 1059_LOG_250.xml

Files of type: Chart Files(*.xml)

Dilution: 1.0

FROG-0101:Ta=300, Tb=120, Tc=30, Ct=60, Ht=100, collect=30, clean=4, presettle=4, settle=2, fire=6

40 ppb MBTEX

☐ **Open As Overlay**

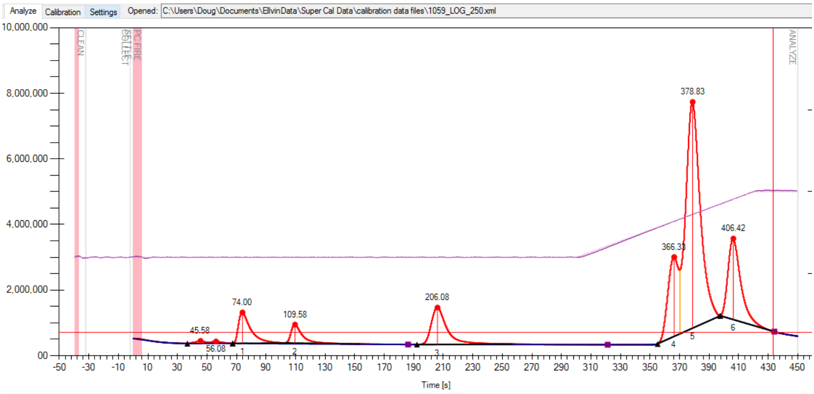
Figure 6.3-1: Open Sample Files

6.3. Calibration Procedure Continued

4. In the Analyze Window, click on the Integrator 2 button to integrate the sample peaks in the chromatogram.
   (Refer to Section 5.2.3 for detailed instructions on using the Integrator 2)

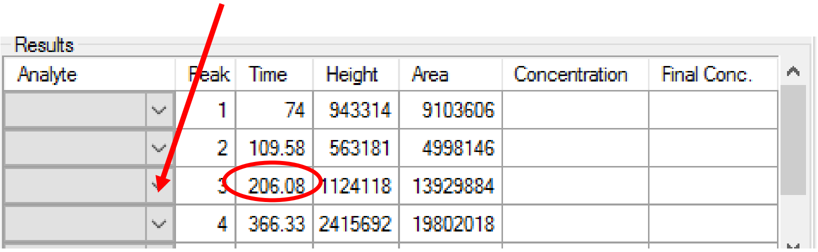
The results of the data analysis are displayed on the chromatogram and in the Data Grid. (See Figure 6.3-2).

The example shown in Figure 6.3-2 is for a sample of MBTEX. Each peak corresponds to an analyte in the MBTEX mix. Analytes may be run one at a time to determine or confirm retention times. (In this figure, Peak #1 is MTBE which was included in the mix). The third peak at 206 seconds is toluene. This could be confirmed by running toluene by itself.



Opened: C:\Users\Doug\Documents\EllvinData\Super Cal Data\calibration data files\1059_LOG_250.xml

Double left click mouse here and your list of analytes will appear.



Results

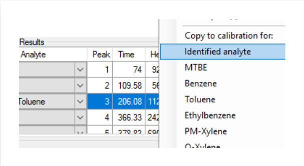
Analyte	Peak	Time	Height	Area	Concentration	Final Conc.
	1	74	943314	9103606		
	2	109.58	563181	4998146		
	3	206.08	1124118	13929884		
	4	366.33	2415692	19802018		

Figure 6.3-2: Analysis Chromatogram and Data Grid

D. Calibrate the Instrument

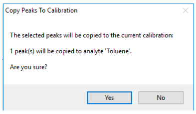
In this section, the data analyzed in Section C is transferred to the Calibration Window. Ellvin™ uses the data to calibrate the instrument for each analyte.

1. To assign peak data to an analyte name, double left click the drop-down arrow under Analyte on the Data Grid. A List of Analytes previously recorded in the Section A of the Calibration Procedures appears.
2. Left click on the analyte to assign that name to the corresponding peak.
3. Left click to highlight a row then right click, and a pop-up appears. Left clicking the Identified Analyte will copy the peak information to the calibration table. A pop-up window will appear asking if the selected data is to be copied to the calibration file. Click 'yes'. Continue to match all the peaks with an analyte to the calibration file. Holding the shift key down will allow multiple analytes to be selected and copied to calibration simultaneously.



Results

Analyte	Peak	Time	He
	1	74	92
	2	109.58	56
Toluene	3	206.08	112
	4	366.33	242



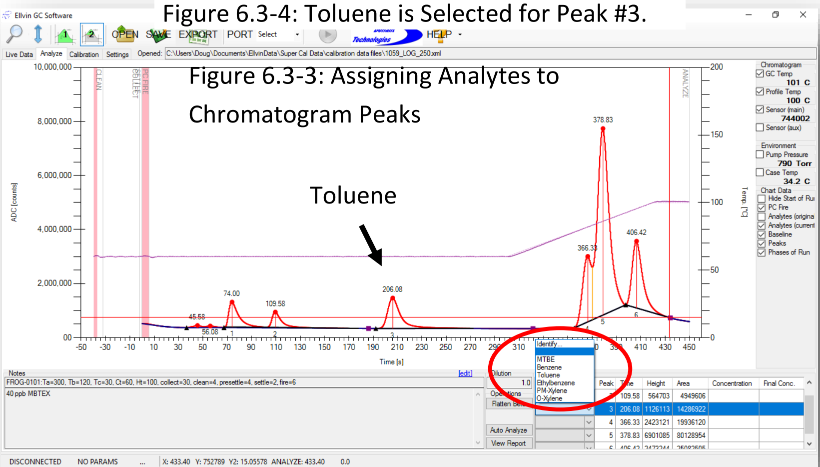
Copy Peaks To Calibration

The selected peaks will be copied to the current calibration:

1 peak(s) will be copied to analyte 'Toluene'.

Are you sure?

Figure 6.3-4: Toluene is Selected for Peak #3.



Notes

FROG-0101:Ta=300, Tb=120, Tc=30, Ct=60, Ht=100, collect=30, clean=4, presettle=4, settle=2, fire=6

40 ppb MBTEX

Peak	Time	Height	Area	Concentration	Final Conc.
	109.58	564703	4949606		
3	206.08	1126113	14286922		
4	366.33	2423121	19936120		
5	378.83	6901085	80128954		

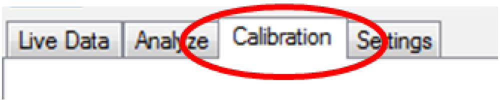
DISCONNECTED NO PARAMS ... X: 433.40 Y: 752789 Y2: 15.05578 ANALYZE: 433.40 0.0

Figure 6.3-3: Assigning Analytes to Chromatogram Peaks

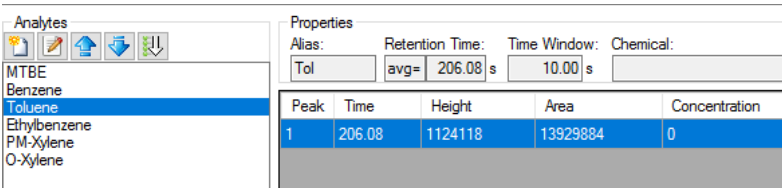
Toluene

6.3. Calibration Procedure Continued

4. To view the imported data, open the Calibration Window, click on List of Analytes, and select the desired analyte. The imported data for this analyte will be displayed



In the example in Figure 6.3-5, Toluene has been selected.

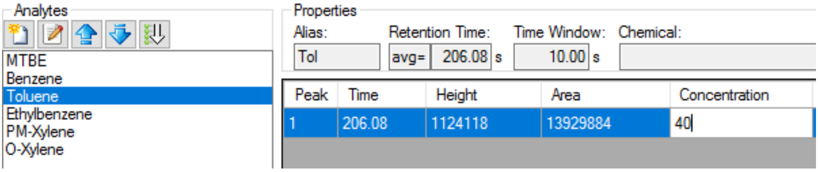


MTBE
Benzene
Toluene
Ethylbenzene
PM-Xylene
O-Xylene

Alias: Tol
Retention Time: avg= 206.08 s
Time Window: 10.00 s
Chemical:

Peak	Time	Height	Area	Concentration
1	206.08	1124118	13929884	0

Figure 6.3-5: Select the Desired Analyte from the List of Analytes



MTBE
Benzene
Toluene
Ethylbenzene
PM-Xylene
O-Xylene

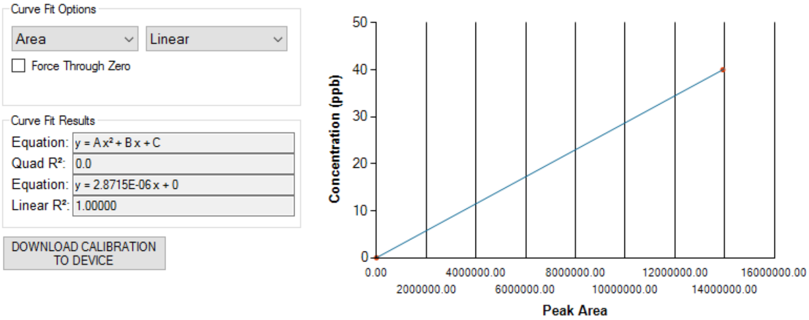
Alias: Tol
Retention Time: avg= 206.08 s
Time Window: 10.00 s
Chemical:

Peak	Time	Height	Area	Concentration
1	206.08	1124118	13929884	40

5. In the Calibration Window, enter in the corresponding concentration for the calibration standard in the column titled “Concentration”. In this case, the toluene concentration was edited to be 40 because a 40 ppb standard was used in creating the chromatogram.
Standard concentrations were recorded in the Notes window in Section B of the Calibration Procedures.
(See B-4.)

Repeat Steps C-1. through D-5. of the Calibration Procedures to import and enter all the standard data to the Calibration Window.

The Correlation Chart and Equations (Section 6.2.2) will appear after the first point is imported into the Calibration Window. The single linear point fit will be automatically forced through zero.


Curve Fit Options

Area | Linear

☐ Force Through Zero

Curve Fit Results

Equation: y = Ax² + Bx + C
Quad R²: 0.0
Equation: y = 2.8715E-06x + 0
Linear R²: 1.00000

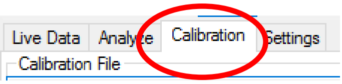
As data points are added, correlation equations are generated by the Ellvin™. A graph of the data points and the curve fit will be displayed in the calibration window. The user can now inspect the fit equation.

Downloading the Calibration to the Instrument

Connect the instrument to Ellvin™ with the USB cable. Refer to:

4.2: Connecting to Computer/Ellvin™

1. All analytes listed in the calibration should show a R^2 correlation close to 1.0. The closer the R^2 value is to 1.0, then the better the software can calculate the concentration of an unknown sample.

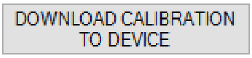


2. Open the Calibration Window.

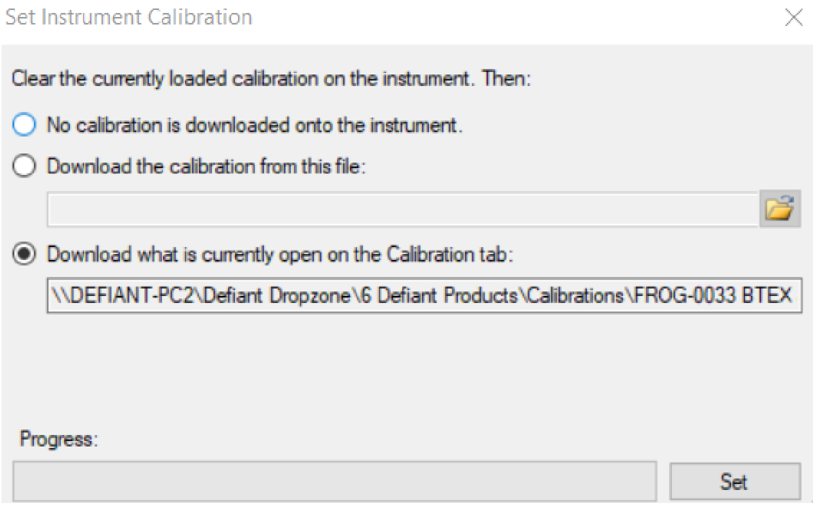
Continued next page.

6.3. Calibration Procedure Continued

3. Click on 'Download Calibration to Device'



4. A popup with several different options will appear. By default the software will set to download the calibration file currently loaded in the calibration tab. Select the appropriate option and then click "set" to download the calibration to the FROG.


Set Instrument Calibration

Clear the currently loaded calibration on the instrument. Then:

○ No calibration is downloaded onto the instrument.

○ Download the calibration from this file:

● Download what is currently open on the Calibration tab:

\\DEFIANT-PC2\Defiant Dropzone\6 Defiant Products\Calibrations\FROG-0033 BTEX

Progress:

5. This will allow the instrument to estimate the concentration of analytes uploaded into the calibration using the <u>peak height linear function</u>.

NOTE: The Ellvin™ software can compute concentrations using either peak height or area under the peak. However, when the instrument is running independently, its processing power is more limited, so peak height and a linear data fit are used in calculating concentrations.

SECTION 7: MAINTENANCE

7.1. ROUTINE CLEANING

It is important to clean the FROG-5000™ after analyzing samples in order to prevent cross-sample contamination.

The FROG-5000™ **does** need to be cleaned if:

- **More than one type of analyte** is being tested. The user must clean the instrument between sets of the different analytes.
- **A high concentration is introduced.** If the user observes large peaks in the chromatogram, the instrument should be cleaned prior to analyzing a sample.

The FROG-5000™ **does NOT** need to be cleaned immediately if:

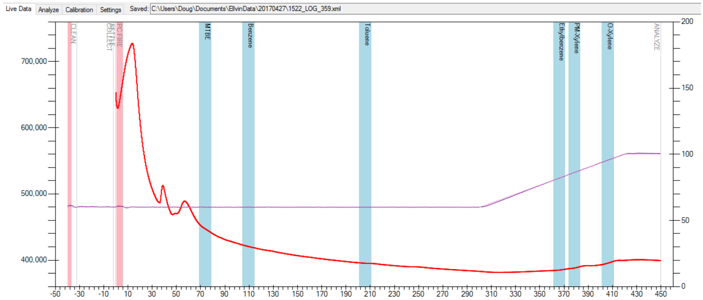
- **Same analyte** is being tested. The user can run a set of samples of the same analyte from a LOW concentration to a HIGH concentration, consecutively. The user cleans the instrument at the end of the set.
- Rinsing the sparge bottle and syringe between uses is always recommended.
- **The baseline is clear.** If no peaks are observed in the chromatogram, cleaning is not necessary.

To clean the instrument, perform the following procedures:

4.4: Instrument Preparation

The instrument is clean when a clean baseline has been achieved. This means that only small waves appear in the chromatogram (see Figure 7.1-1 on next page)

Section 7.1: Maintenance Continued



Saved: C:\Users\Doug\Documents\EllvinData\20170427\1522_LOG_359.xml

Figure 7.1-1: Chromatogram of a clean baseline. The small peaks around 40 and 60 seconds will not matter if chemicals of interest do not elute at these times. Even if a chemical in the sample elutes at say 60 seconds, the peak would be subtracted in the calibration if this small peak is a constant area between runs.

7.2 CLEANING THE SCRUBBER

It is recommended to clean the carrier gas scrubber every three months, or as needed to create a clean baseline.

Supplies needed to clean the scrubber include:

1. *Clean Activated Carbon
2. *Clean Molecular Sieves
3. 3/32" allen wrench

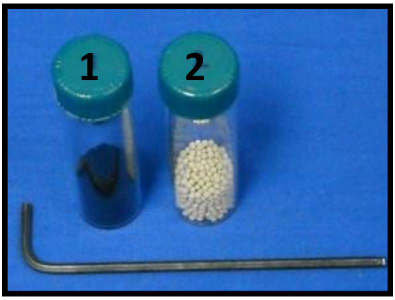


Figure 7.3-1: Supplies needed.

***NOTE:** Replacement activated carbon and molecular sieves may be purchased, premeasured and cleaned, through Defiant Technologies, Inc.

Activated Carbon, Part # DT-FG4K-AC-1
Molecular Sieves, Part # DT-FG4K-MS-1

1. Remove the four corner 4-40 screws with the 3/32" allen wrench.
2. Lightly pull the scrubber off the FROG; place any O-rings back in place if they come out.

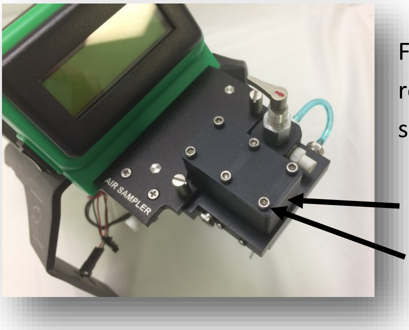


Figure 7.3-2: Carrier gas scrubber is removed by taking out the 4 corner screws with the 3/32" allen wrench.

3. The Carrier Gas Scrubber only goes on in one orientation.
   - The small screw in the side of the block faces the display when the block is properly oriented.
   - There are two chambers in the block. The back chamber (closest to the display) contains molecular sieve. The front chamber holds activated carbon.

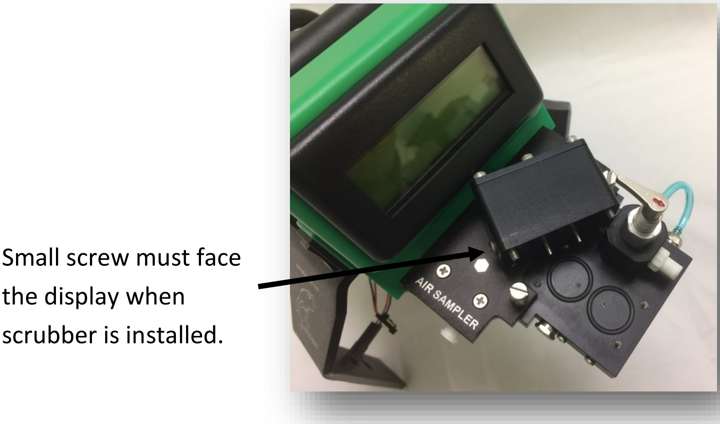
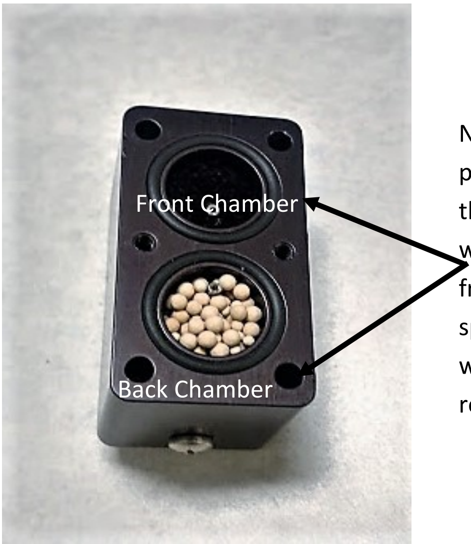


Figure 7.3-3: Carrier Gas Scrubber removed from the Sparge Block.

7.2 Cleaning the Scrubber Continued

4. Hold the scrubber lid-side up and remove the two, center position, 4-40 screws with the 3/32" allen wrench.

Figure 7.3-4: Two Center Screws hold the lid on the scrubber block.



Note: Glass wool packing is in each of these tubes. The wool prevents carbon from entering the sparge manifold. The wool should not be removed.

Figure 7.3-5 Open scrubber

5. Remove the scrubber lid; put any O-rings back in place if they come out.

6. Dispose of dirty activated carbon and molecular sieves.
7. Use a paper funnel to put new activated carbon into the front chamber.
8. Use a paper funnel to put new molecular sieves into back chamber.
9. Replace the lid.
10. Replace the two, center position, 4-40 screws and snug them tight with the 3/32" allen wrench.
11. Place the scrubber back onto FROG. Make sure small screw in the side faces the display and the bottom tubes slide into the proper holes in the sparge manifold.
12. Replace the four corner 4-40 screws and snuggly tighten with the 3/32" allen wrench.
13. There should be NO gap between the sparge manifold and the scrubber block! (Figures 7.3-6 and 7.3-7)
14. To fix space in between, remove the block and make sure O-rings are in the proper position.

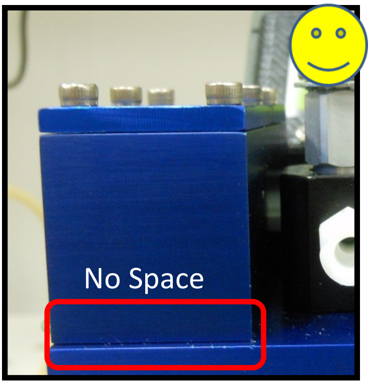


Figure 7.3-6:
Correct scrubber position.

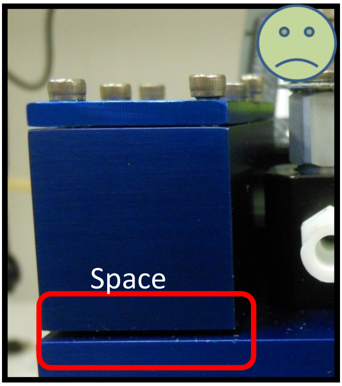


Figure 7.3-7:
Incorrect scrubber position.

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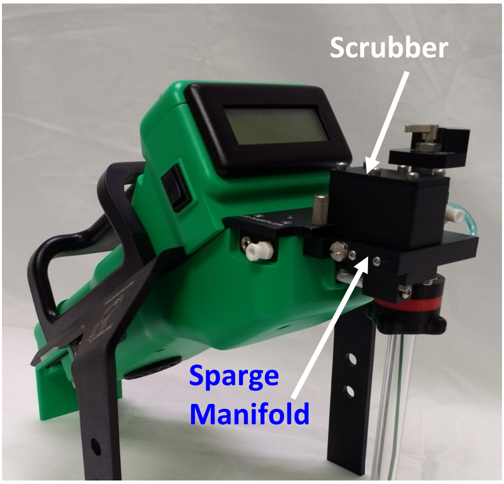
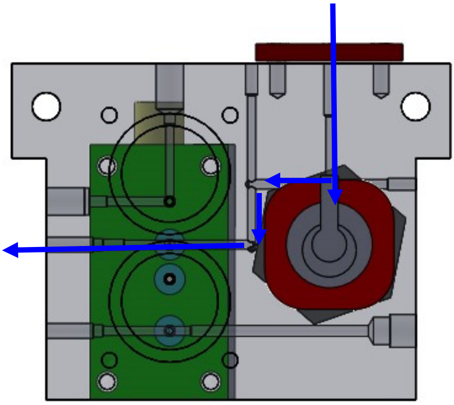
SECTION 8: TROUBLE SHOOTING

8.1. INVERTING THE FROG WITH WATER IN THE SPARGE BOTTLE

If the FROG has been inverted with water in the sparge bottle, it is likely that water will enter the sparge manifold.



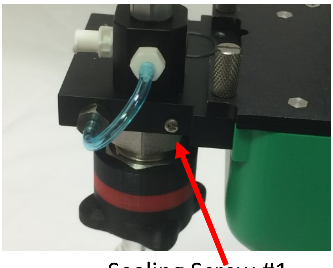
If the FROG was not running at the time, it is unlikely that the water went very far through the manifold. Below is a transparent view of the sparge block that may aid in performing steps on the following page.


This path must be cleared of water.

8.1. Inverting the FROG Continued

1. Remove the sparge bottle and turn the load/analyze valve handle to RUN AIR. Connect a clean, dry syringe to the exhaust port from the gas module and push air through the port. DO NOT use a compressed gas can.

Figure 8.1-2: Pushing water from the plumbing.



Sealing Screw #1

2. Remove sealing screw #1 and re-install an empty sparge bottle. Push air again through the exhaust port with the clean, dry syringe.

3. Replace sealing screw #1 and remove sealing screw #2 on the opposite side of the sparge manifold. Push air again through the exhaust port with the syringe.

3. Replace sealing screw #2 and remove the scrubber block. Look for water. Push air again through the exhaust port with the syringe.

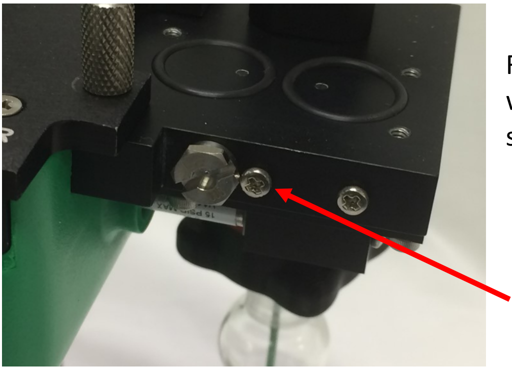


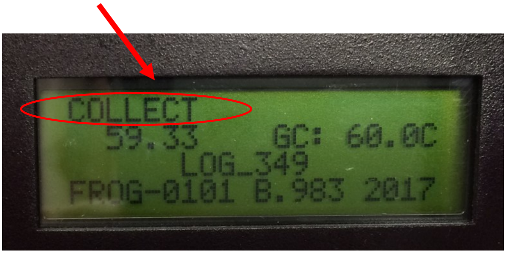
Figure 8.1-3: Pushing water out of the sparge manifold.

Sealing screw #2.

5. If there was water under the carrier gas scrubber block, the scrubber materials will need to be removed and replaced.

   Re-install the carrier gas scrubber block and remove the syringe from the exhaust port. Remember that the small screw in the side of the scrubber block must face the display. (See Section 8.1.3, Cleaning the Scrubber for procedure details)

6. Press the start button on the FROG and allow the system to run 20 seconds through the collect then turn the FROG off . If you do not see water coming from the exhaust port, everything is probably fine.



```
COLLECT
  59.33      GC: 60.0C
       LOG_349
FROG-0101 B.983 2017
```

7. Load a blank sample (deionized water) and run a Collect Cycle (make sure the Load/Analyze Valve is turned to RUN WATER).

Look for bubbles in the sparge bottle.

- If bubbles appear, the liquid was successfully removed from the sparge manifold.
- If bubbles do not appear, then contact Defiant Technologies for consultation.

Figure 8.1-4: Look for Bubbles in the sparge bottle.

8.1. Inverting the FROG Continued

8. Perform some analyses with clean water and see if the chromatograms look normal.

Refer to: 4.6: Running A Sample

9. Contact Defiant technologies or your local representative for further assistance if the chromatograms continue to look erratic. Let us know what happened, we cam fix it much quicker that way. Contact information is at www.defiant-tech.com.

Email: info@defiant-tech.com
Phone: 505-999-5880

8.2. DEGRADING CHROMATOGRAPHY :
SCRUBBER IS NOT SECURED PROPERLY

If the Chromatography is degrading over time:

Check the scrubber block.

The scrubber block may NOT be sealed correctly.

There should be no space in between the scrubber block and the scrubber holder.
(Figures 8.2-1 and 8.2-2)
(Refer to Section 8.1.3, Cleaning the Scrubber)

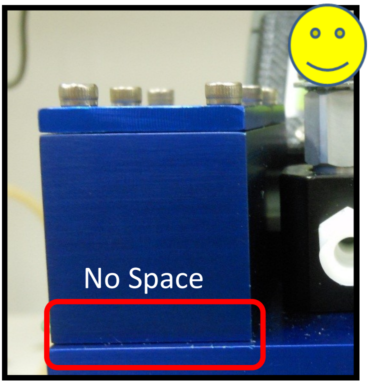


Figure 8.2-1:
Correct scrubber position.

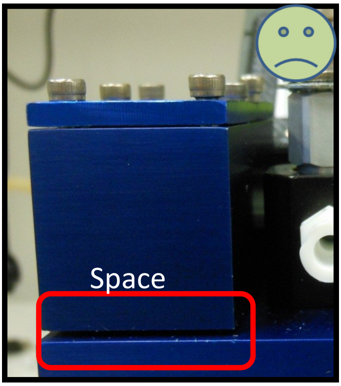


Figure 8.2-2:
Incorrect scrubber position.

Performance can also be affected by high concentrations of analytes, or high background concentrations in the surrounding environment (See next section).

8.3. CANNOT ACHIEVE A CLEAN BASELINE

If a clean baseline cannot be achieved after **repeatedly** following the procedures in Sections 4.4.1 and 4.4.2 (Rinsing the Instrument and Creating a Clean Baseline), contamination problems may stem from having loaded a sample with a high concentration of analyte, or from the presence of airborne contaminants.

NOTE: A small peak at the beginning of the chromatogram is normal for a clean baseline.

Complete the following procedures to eliminate contamination interfering with a clean baseline.

Perform procedure 4.4 while *connected to Ellvin™* and using *warm* deionized water. Refer to:

4.4: Instrument Preparation

Repeat this procedure up to three times if necessary to achieve a clean baseline.

Airborne Contaminants

If it is still NOT possible to achieve a clean baseline when running water samples, there may be contaminants present in the ambient air. An airborne contaminant can enter the sparge bottle when it is lowered. This volume of air cannot be scrubbed and will be collected by the PC.

Airborne contaminants can also enter through the pump with the sparge and carrier gas though these are largely removed by the scrubbers.

Solutions:

1. Either circulate air in the testing environment, or move to a new location, then perform:

4.4: Instrument Preparation

If a clean baseline is still not achievable,

2. Clean the scrubber.
   (See Section 7.3)

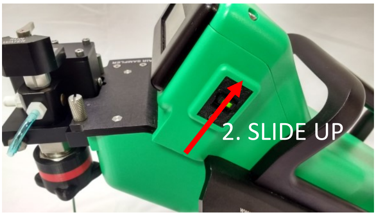
If a clean baseline is still not achievable,

3. Provide an activated charcoal trap at the pump inlet (V).

8.4. COOL FEATURES (CONTINUOUS OPERATION)

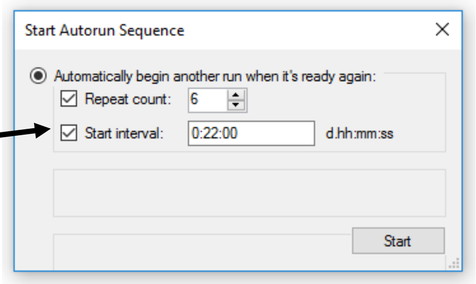
Continuous Sampling and Analysis Mode

If the FROG-5000$^{\text{TM}}$ is not connected to a computer, a continuous run cycle can be initiated depressing the upper part of the black toggle switch when the power switch is simultaneously turned on. The next time the toggle is depressed, the unit will begin continuous cycling. No chromatography results will be displayed on the screen. End the cycle by switching the power off. All chromatographs can be recovered from the internal micro-SD card.



When the FROG is connected to Ellvin$^{\text{TM}}$, it can be set to cycle continuously by simply holding the shift key down when the start button is pressed. If this action is initiated, a pop-up window appears where cycle numbers and time delays can be set. Remember to account for the cooldown time in setting interval times.

If an interval is not set, the cycle will restart when the GC cools to its low temperature setting


Start Autorun Sequence

● Automatically begin another run when it's ready again:

☑ Repeat count: 6

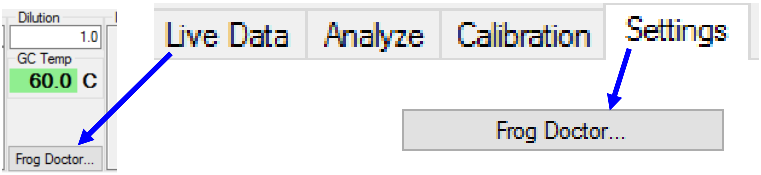
☑ Start interval: 0:22:00 d.hh:mm:ss

Continuous cycling is particularly useful in monitoring air or running water blanks for cleaning the instrument.

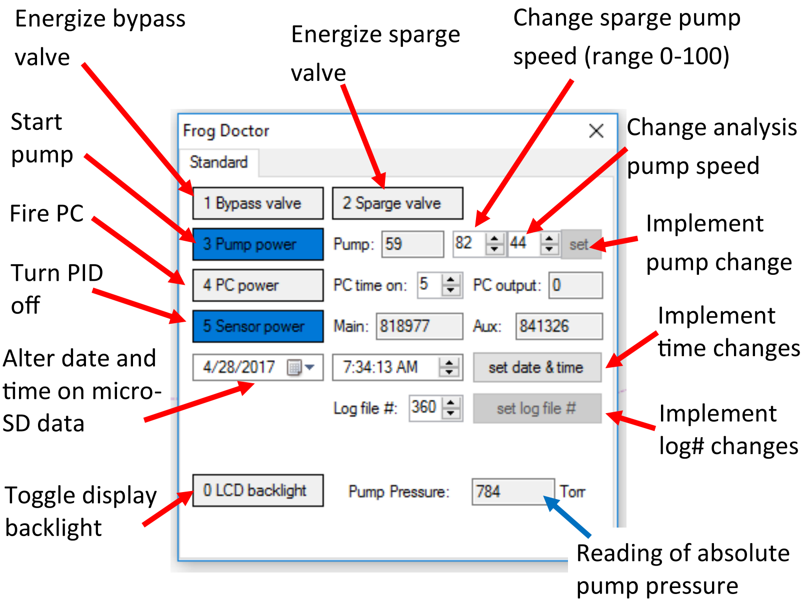
8.5. REALLY USEFUL FEATURES

Frog Doctor

Frog-Doctor provides the ability to turn valves and pumps on and off without performing sample runs. The Frog Doctor button appears in both the live data and the Settings windows.



The FROG must be communicating through ELLVIN for Frog Doctor to work. If the FROG is connected and the Frog Doctor button is clicked, a pop-up menu is displayed with several options as displayed in Figure 8.5.1.



Pump: 59 82 44

PC time on: 5

PC output: 0

Main: 818977

Aux: 841326

4/28/2017

7:34:13 AM

Log file #: 360

Pump Pressure: 784 Torr

Energize bypass valve

Energize sparge valve

Change sparge pump speed (range 0-100)

Start pump

Change analysis pump speed

Fire PC

Implement pump change

Turn PID off

Implement time changes

Alter date and time on micro-SD data

Implement log# changes

Toggle display backlight

Reading of absolute pump pressure

Figure 8.5.1. Features of Frog Doctor

SECTION 9: CARE OF THE LI-PO BATTERY

The FROG-5000 uses 10.8 volt lithium polymer batteries that are manufactured by Inspired Energy. Check their website for additional information on the battery, www.inspired-energy.com. In particular, check the website at www.inspired-energy.com/shipping.html for up to date information on shipping the battery. The exact part number for the battery is NF2040HD34.

9.1.1. Handling

- Avoid shorting the battery and do not immerse in water.
- Do not disassemble or deform the battery
- Do not expose to, or dispose of the battery in fire.
- Avoid excessive physical shock or vibration.
- Keep out of the reach of children.
- Never use a battery that appears to have suffered abuse

9.1.2. Storage: Store in a cool, dry and well-ventilated area.

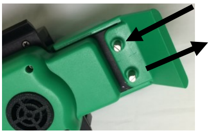
9.1.3. Disposal: Dispose of in accordance with local regulations.

9.2. General Specifications: Nominal Voltage: 10.8V, Rated Capacity: Initial capacity is 6460mAh

9.3.1 Shipping: check www.inspired-energy.com/shipping.html for up to date shipping information. As of this time this manual was written, the guidance is:

- Battery may be shipped in the equipment by ground or cargo aircraft with no special packaging labels
- Battery cannot be shipped on passenger aircraft as checked baggage. It must be removed from the Frog , packed so it cannot crush or short, and hand carried by the passenger on the aircraft.
- If the battery is shipped outside of a unit it should have less than a 30% charge before transport. Run unit until only one bar shows on charge indicator, then remove the battery and pack for shipping.

- These guidelines may not apply for all countries and the user should check for local requirements for shipping lithium polymer batteries.

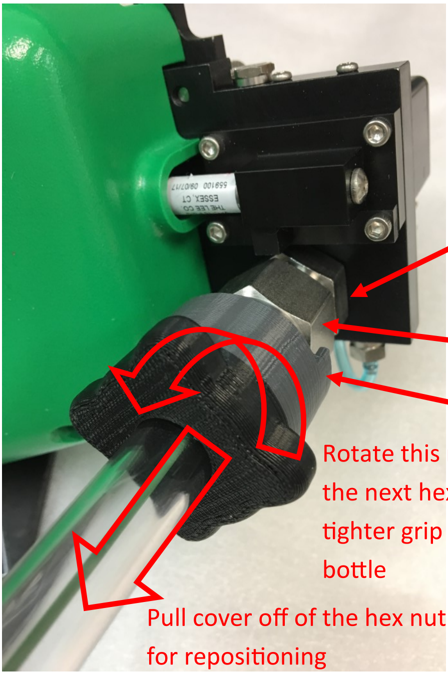


Remove both thumbscrews then slide heel straight back to remove

Battery slips out back

SECTION 10: POSITIONING OF THE SPARGE NUT

There is a stop on the sparge bottle nut cover that prevents the nut from being completely removed or overtightened. This prevents the accidental loss of the Teflon™ ferrule parts that seal the sparge bottle to the system. The ferrule parts will compress over time and it will be necessary to reposition the nut stop to allow the ferrule to seal better against the sparge bottle or air sample adapter. To reposition the nut stop, simply slide the plastic sparge nut cover off of the hex nut and rotate it one or two positions counter-clockwise. Press the cover back on the hex nut and check that the nut will tighten better on the sparge bottle. The Teflon™ ferrule is compliant so it is not necessary to tighten hard against the glass sparge bottle. The nut should provide a snug fit to prevent gas from leaking from the system when the unit is running. If the chromatography peaks appear to have shifted to the right (later in time), it is possible that gas is leaking from the system at the sparge bottle nut.



Never try to rotate this hex cap

Hex Nut

Nut Stop Tab

Rotate this nut cover CCW to the next hex position for a tighter grip on the sparge bottle

Pull cover off of the hex nut for repositioning

Repositioning the sparge nut stop.

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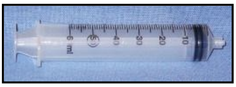
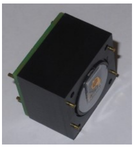
APPENDIX I: AVAILABLE ACCESSORIES/SPARE PARTS

Item	Defiant Part #	Description
FROG-5000 Warranty and Service Contract	DT-FG-SERV-1	One year service contract / maintenance program.
Activated Carbon 	DT-FG-AC-1	Replacement Activated Carbon for FROG air scrubber. Pre-measured and pre-cleaned.
Molecular Sieves 	DT-FG-MS-1	Replacement Molecular Sieves for FROG air scrubber. Pre-measured and pre-cleaned.
Sparge Bottle 	DT-FG-SBGN-1	Sparge Bottle with globe neck.
Sparge Bottle Nut 	DT-FG-SBN-1	Nut to connect Sparge Bottle to instrument.
5 mL Glass Syringe 	DT-SYGG-1	5mL glass syringe with Luer Lock tip.

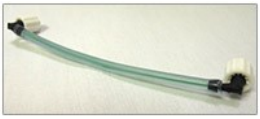
APPENDIX I: AVAILABLE ACCESSORIES/SPARE PARTS

Item	Defiant Part #	Description
5mL Plastic Syringe 	DT-FG-SYGP-1	5mL plastic syringe with Luer Lock tip.
60mL Rinsing Syringe 	DT-FG-SYGN-1	60mL syringe with Luer Lock tip for rinsing Sparge Needle.
Luer Lock Inlet 	DT-FG-LL-1	Attachment for syringe.
PID Assembly 	DT-FG-PID-1 DT-FG-PID-2 DT-FG-PID-3	PID Assembly for normal sensitivity (1) low sensitivity (2) high sensitivity (3)
Tool Kit 	DT-FG-TK-1	Assorted tools for maintenance of FROG
Sparge Needle Cover 	DT-NEEDCOV-1	Sparge Tube Guard for covering Sparge tube in shipping container

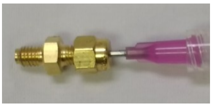
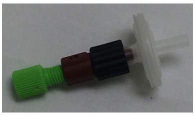
APPENDIX I: AVAILABLE ACCESSORIES/SPARE PARTS

Item	Defiant Part #	Description
Ferrules for Sparge Bottle Nut 	DT-FG-SBNF-1	Replacement ferrules for the Sparge Bottle Nut, 1/2" ferrule set.
Ferrules for Air Sample Bag Adapter for FROG Air Sampler 	DT-FG-SBNF-2	Replacement ferrules for the Air Sample bag adapter for the FROG's air sampler, 3/16" ferrule set, Teflon.
Sparge Line 	DT-FGSL-1	Sparge Line with Connectors.
Valve Assembly 	DT-FG-VLV-1	Replacement valve assembly for FROG-5000.
Air Sampler Wand 	DT-FG-AS-WAND	Replacement air sampler wand.
1/16-3/16 Adapter 	DT-AS-316-ADAPTER	Replacement 1/16-3/16 adapter for connecting the air sampler transfer line to a Tedlar bag.

APPENDIX I: AVAILABLE ACCESSORIES/SPARE PARTS

Item	Defiant Part #	Description
Air Sample Transfer Line 	DT-AS-TRAS-LINE	Replacement transfer line for connecting air sampler.
Air Sampler Coupler Line 	DT-AS-COUP	Replacement couple line for connecting the air sampler box to the Frog.
Battery 	DT-BT-NF2040HD34-1	Rechargeable NiMH Battery 10.8V, 6460 mAhr.
Serial Data Cable 	DT-DC-1	Ellvin (software) communication cable (All-in-one Data Cable)
Power Supply 	DT-FG5K-PS12V-1	Power Supply 12V 6.67A
Pump 	DT-PU-1	Replacement air pump.

APPENDIX I: AVAILABLE ACCESSORIES/SPARE PARTS

Item	Defiant Part #	Description
Activated Carbon Filter Tube 	DT-FG-CFT-1	Replacement air scrubber for cleaning VOCs from sampled air
Activated Carbon Filter Tube Adapter 	DT-FG-CFTAB-1	Brass adapter for connecting carbon trap to FROG air sample tube
Air Sampler Syringe Filter and Adapter 	DT-AS-FIL-1	Air Sampler Particulate Filter and Adapter
Air Sampler Syringe Filter 	DT-AS-FIL-2	Air Sampler Particulate Filter

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APPENDIX II: DETECTABLE CHEMICALS

Common Chemicals Detectable by FROG 4000	CAS Number	IE (eV)
1,1-Dichloroethene	75-35-4	10.0
1,2,4-Trichlorobenzene	120-82-1	9.0
1,2-Dibromoethane	106-93-4	10.4
1,2-Dichlorobenzene	95-50-1	9.1
1,3-Dichlorobenzene	541-73-1	9.1
1,4-Dichlorobenzene	106-46-7	9.0
1,4-Dioxane	123-91-1	9.2
1-Propanol	71-23-8	10.2
2-Butanone (MEK)	78-93-3	9.5
2-Chloroethanol	107-07-3	10.5
2-Hexanone	591-78-6	9.4
2-Pentanone	107-87-9	9.4
2-Picoline	109-06-8	9.4
2-Propanol	67-63-0	10.2
4-Methyl-2-pentanone	108-10-1	9.3
Acetone	67-64-1	9.7
Acrolein	107-02-8	10.1
Allyl alcohol	107-18-6	9.6
Allyl chloride	107-05-1	10.1
Benzene	71-43-2	9.2
Benzyl chloride	100-44-7	9.1
Bromoacetone	598-31-2	9.7
Bromodichloromethane	75-27-4	10.6
Bromoform	75-25-2	10.5
Bromomethane	74-83-9	10.5
Carbon disulfide	75-15-0	10.1
Chlorobenzene	108-90-7	9.1
Chlorodibromomethane	124-48-1	10.6
Chloroethane	75-00-3	10.0
Chloroprene	126-99-8	8.8

APPENDIX II: DETECTABLE CHEMICALS CONTINUED

Common Chemicals Detectable by FROG 4000	CAS Number	IE (eV)
Crotonaldehyde	4170-30-3	9.7
Dibromomethane	74-95-3	10.5
Diethyl ether	60-29-7	9.5
Diisopropyl ether (DIPE)	108-20-3	9.2
Epichlorohydrin	106-89-8	10.6
Ethanol	64-17-5	10.6
Ethyl acetate	141-78-6	10.0
Ethyl tert butyl ether	637-92-3	9.4
Ethylbenzene	100-41-4	8.8
Ethylene oxide	75-21-8	10.6
Iodomethane	74-88-4	9.5
Isobutyl alcohol	78-83-1	10.1
Isopropylbenzene	98-82-8	8.8
Methacrylonitrile	126-98-7	10.3
Methyl methacrylate	80-62-6	9.7
Methyl tert-butyl ether	1634-04-4	9.2
m-Xylene	108-38-3	8.6
Naphthalene	91-20-3	8.1
n-Butanol	71-36-3	10.0
Nitrobenzene	98-95-3	9.9
n-Propylamine	107-10-8	8.8
o-Toluidine	95-53-4	7.4
o-Xylene	95-47-6	8.6
Propargyl alcohol	107-19-7	10.5
p-Xylene	106-42-3	8.5
Pyridine	110-86-1	9.3
Styrene	100-42-5	8.4
t-Butyl alcohol	75-65-0	10.3
Tetrachloroethene	127-18-4	9.3
Toluene	108-88-3	8.8

APPENDIX II: DETECTABLE CHEMICALS CONTINUED

Common Chemicals Detectable by FROG 4000	CAS Number	IE (eV)
trans-1,2-Dichloroethene	156-60-5	9.7
Trichloroethene	79-01-6	9.5
Vinyl acetate	108-05-4	9.2
Vinyl chloride	75-01-4	10.0
β-Propiolactone	57-57-8	9.7

NOTE: This list is by no means exhaustive. The FROG-5000^{TM} uses a 10.6eV lamp, so many analytes with ionization energies below 10.6eV may be detectable with the instrument.

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APPENDIX D

Resumes of Key Project Personnel