



Water & Environmental  
TECHNOLOGIES

480 East Park Street | Butte, Montana 59701

(406) 782-5220

info@waterenvtech.com  
waterenvtech.com



# Groundwater and Vapor Monitoring Work Plan for the Petroleum Release at the Former Vogue Cleaners

1850 Harrison Avenue, Butte, Montana, Facility ID 47-03757 (TID 28385), Release 4368, Work Plan 35120



Prepared for:  
**MDEQ Petroleum  
Tank Cleanup Section**  
P.O. Box 200901  
Helena, Montana 59620

Site Owner:  
**Lauri Wetherell**  
Vogue Cleaners, Incorporated  
10488 W. Arkansas Place  
Lakewood, Colorado 80232

**December 2025**

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## **1 Executive Summary**

Water and Environmental Technologies (WET) presents this Groundwater and Vapor Monitoring Work Plan (WP) for the petroleum release at the former Vogue Cleaners (Facility), as required in the work plan request letter from the Montana Department of Environmental Quality (DEQ), dated December 16, 2025. The Facility is located at 1850 Harrison Avenue, Butte Montana, 59701.

The results of the previous workplan indicate that contamination levels are approaching closure levels. The intent of this workplan is to further evaluate contamination levels in groundwater and soil vapor when the Soil Vapor Extraction (SVE) system is not operating. The SVE system has been powered down since the spring of 2024, and as discussed with DEQ, it is believed that the groundwater and soil vapor concentrations should be at equilibrium. These conditions present a good opportunity to collect samples that are representative of conditions present when there is no remediation system operating.

The proposed scope of work includes:

- Monitoring at the Facility monitoring wells and piezometer (MW-01, MW-02, MW-03, MW-04 and PZ-01) biannually for one year, which includes:
  - Gauging fluid levels at the Facility wells.
  - Collecting groundwater samples by low-flow sampling methodology according to DEQ's Groundwater Sampling Guidance.
  - Analyzing groundwater samples for volatile petroleum hydrocarbons (VPH) extractable petroleum hydrocarbons (EPH) and lead scavengers.
  - Disposing of purge water according to the DEQ Purge Water Disposal flow chart.
- Conducting indoor and outdoor air as well as vapor monitoring at the three existing sub-slab monitoring points at the Facility, biannually for one year.
  - Samples will be analyzed under methods TO-15 SIM and Air Phase Petroleum Hydrocarbons (APH).
  - Three sub-slab samples will be collected as well as an indoor ambient sample from the first and second floor of the Facility and an outdoor air sample will be collected, for six total air samples per sampling event.
- Validating all laboratory analytical data using DEQ's Data Validation Summary Form (DVSF).
- Discussing ongoing WP tasks and results with DEQ's project manager (PM) and submitting written agreed-upon WP modifications as required to complete the WP objectives.
- Preparing and submitting a Monitoring Report detailing the method and results of both groundwater monitoring events completed under this WP, which will include:
  - Discussion of the monitoring method results, deviations from the approved WP, assessment of attenuation rates, recommendations, and conclusions.
  - Cumulative groundwater data tables.
  - Updated site features and potentiometric surface maps.
  - Appended groundwater monitoring field forms, laboratory analytical data, completed DVSFs, and an updated Release Closure Plan.

## **2 Facility History and Release Background**

### **2.1 Facility History**

The Former Vogue Cleaners Facility was identified as a release site in 2004, when free Stoddard Solvent was discovered in the groundwater beneath the facility. Stoddard Solvent, a common dry-cleaning solvent,



was released from the two 300 -gallon underground storage tanks (USTs) onsite. The two tanks were sealed with cement in 1984. WET installed a soil vapor extraction (SVE) system in March of 2018.

Currently the Facility is unoccupied and the SVE system is turned off. The unoccupied facility is being evaluated for future redevelopment as an apartment building. The results of the most recent groundwater and vapor report indicate a decreasing trend of petroleum constituents in both groundwater and soil vapor. The previous workplan evaluated the use of on/off operation intervals of one month. The report concluded that pulsing operation is successfully removing contamination. Free products have not been detected in groundwater since May of 2023. Recent analytical results from groundwater also demonstrated that all concentrations are below applicable risk-based screening levels (RBSLs) and human health standards (HHSs). The most recent air sampling results indicate that indoor air quality is more affected by contributions from the outdoor air than any contributions from beneath the facility slab.

### **3 Objectives of Groundwater Monitoring**

The objectives of groundwater monitoring are to evaluate the status of petroleum contaminated groundwater and identify additional work needed to resolve the Release. These objectives will be achieved through biannual groundwater monitoring, which involves fluid level measurement and sampling. Samples collected will be analyzed for VPH and EPH.

### **4 Minimum Work Plan Tasks**

WET's approach to completing the required work, except work plan preparation (Task 1), is detailed below.

#### **4.1 Project Management (Task 2)**

WET personnel will provide Lauri Wetherell (Owner) and DEQ's project manager with any ongoing WP tasks and relevant results on an as-needed basis. Other duties associated with this task include scheduling field work, project reporting administration, monitoring the project budget and deliverables, and any submitted written agreed-upon WP modifications to complete the objectives.

#### **4.2 Mobilization (Task 3)**

Mobilization will include vehicle mileage and personnel travel time between the WET Butte office and the Facility to perform groundwater and vapor monitoring events. Each round trip is approximately five miles round trip and 10 minutes of drive time. Four mobilizations are planned, one for each groundwater monitoring event and one for the retrieval of the air samples after each event. One hour of loading/unloading is included for each mobilization.

#### **4.3 Groundwater Monitoring (Task 4)**

Two groundwater monitoring events are planned for wells MW-01, MW-02, MW-03, and MW-04 and piezometer PZ-01. The groundwater sampling events will occur during high and low water months of 2026. All monitoring wells on the facility will be monitored so that a complete picture of conditions at the facility can be created.

Fluid levels will be measured with an oil-water interface meter prior to purging the well in accordance with WET standard operating procedure (SOP) SOP-5: Measurement of Fluid Levels. SOPs are included as Appendix A. Any monitoring well containing free product will not be sampled.

Groundwater field parameters to be monitored as specified in SOP-6: Measurement of Groundwater Field Parameters (Appendix A) and are subject to stabilization criteria listed in Table 1. Additionally, temperature and drawdown will also be monitored but are not subject to stabilization criteria. However, drawdown is not intended to exceed 0.3 feet. If pumping rates are lowered to the minimum achievable rate and drawdown still exceeds 0.3 feet, this will be noted in the sampling notes. Turbidity will be measured with a turbidity meter, drawdown will be measured with the oil-water interface meter, and the rest of the field parameters will be measured with a YSI multi-parameter combination meter and flow-through cell. Field parameter readings should be recorded every 3-5 minutes until three consecutive readings are within stabilization range.

**Table 1. Stabilization Parameters**

Water Quality Parameter	Unit	Stabilization Range	Exception
pH	standard units (s.u.)	±0.1 s.u.	
Specific Conductance (SC)	microsiemens per centimeter (µS/cm)	±3%	
Dissolved Oxygen (DO)	milligrams per liter (mg/L)	±10%	<0.50 mg/L
Turbidity	nephelometric turbidity units (NTU)	±10%	<5 NTU
Oxidation/Reduction Potential (ORP)	millivolts (mV)	±10 mV	

Once parameters have stabilized, a groundwater sample will be collected and preserved for laboratory analysis of VPH and EPH. Sample collection will include the collection of one duplicate and one field blank for quality assurance/quality control (QA/QC) purposes as defined in the relevant sections of SOP-16: Quality Control Sampling (Appendix A). The field duplicate sample will be collected by splitting the natural sample in the field. The field blank will be collected in the field by pouring laboratory-grade deionized water into the containers and preserving accordingly. The field duplicate and blank samples will be submitted to the laboratory for the same analyses as the natural samples.

The oil-water interface probe and bladder pump will be decontaminated between each site using a laboratory-grade detergent and tap water mixture followed by distilled water in accordance with SOP-2: Equipment Decontamination (Appendix A). The oil-water interface probe will be sprayed, while the bladder pump will be flushed with approximately 700 mL of each decontamination media (to cover approximately three bladder volumes and tubing volume).

Following the DEQ disposal of untreated purge water from monitoring guidance dated July 15, 2015, the purge water originates from the shallowest aquifer, is not likely to result in an exceedance of soil screening

levels, is not discharged to a surface water, and is not from a mine audit or long-term pumping test. Therefore, the purge water from the groundwater sampling event will be discharged to pervious Facility ground. All non-reusable sampling equipment and spent personal protective equipment will be disposed of in garbage bags.

#### **4.4 Water Level Measurement (Task 5)**

During each sampling event, in addition to sampling, fluid levels will be measured with an oil-water interface meter in wells MW-01, MW-02, MW-03, MW-04, and PZ-01. The well locations are shown in Figure 2. The water levels will be measured in accordance with WET standard operating procedure (SOP) SOP-5: Measurement of Fluid Levels. SOPs are included as Appendix A.

#### **4.5 Soil Vapor Intrusion Sampling (Task 6)**

WET personnel will conduct monitoring of sub slab air, as well as indoor and outdoor air for laboratory analysis at the Vogue Cleaners Building in spring and fall of 2026, in conjunction with the groundwater sampling events. Samples will be collected according to SOP-15E. Indoor air samples will be collected from each floor (upper and lower) of the building, each located in the approximate center of the building. Indoor air samples will be collected over a 24-hour period for laboratory analysis by USEPA Method TO-15 SIM, and APH analysis in accordance with the Massachusetts Department of Environmental Protection's *Method for the Determination of Air-phase Petroleum Hydrocarbons*. All air samples will be collected in six-liter, certified clean stainless-steel Summa canisters. Samples will be submitted to Pace Laboratories in Minneapolis, MN.

WET personnel will conduct monitoring of the outdoor air for laboratory analysis at the Vogue Cleaners Building during each sampling event. The outdoor air sample will be collected on the northern edge of the building. The Summa Canister will be placed approximately 10-ft above the ground on an exterior platform that once served as a drive through canopy. This location is upwind of the building and should provide security against tampering and vandalism. The canister will also be secured with a chain and padlock. Outdoor air samples will be collected over a 24-hour period for laboratory analysis by USEPA Method TO-15 SIM, and APH analysis in accordance with the Massachusetts Department of Environmental Protection's *Method for the Determination of Air-phase Petroleum Hydrocarbons*. All air samples will be collected in six-liter, certified clean stainless-steel Summa canisters. Samples will be submitted to Pace Laboratories in Minneapolis, MN.

Sub-slab vapors will be evaluated as part of the vapor intrusion investigation. The Montana Vapor Intrusion Guide recommends that the slab be sampled in three locations, and that sub-slab sampling be conducted after indoor/outdoor air samples are collected, to avoid cross contamination of the sub-slab vapors released during slab sampling. In accordance with Montana DEQ's Vapor Intrusion Guidance (September 2021) WET has previously installed three vapor sampling pines beneath the sub-slab, located in the center of the building, and near the east and west ends. All air samples will be collected in six-liter, certified clean stainless-steel Summa canisters. Samples will be submitted to Pace Laboratories in Minneapolis, MN.

#### 4.6 Laboratory Analysis (Task 7)

Groundwater samples will be submitted on ice to Energy Laboratories in Helena, Montana for analysis of VPH, EPH, and lead scavengers. If the results of the EPH screen are greater than 1000 µg/L, the sample will be further analyzed for EPH fractions.

A total of six air samples will be collected in six-liter, certified clean stainless-steel Summa Cannisters. Samples will be submitted to Pace Laboratories in Minneapolis, MN, following chain-of-custody protocols for laboratory analysis by USEPA Method TO-15 SIM, and APH.

#### 4.7 Quality Assurance/Quality Control (Task 8)

Quality assurance/quality control (QA/QC) samples including duplicates and field blanks (water) will be collected at a minimum frequency of 1 per 20 natural samples (5%). One duplicate groundwater sample and one field blank sample will be collected in conjunction with natural groundwater samples. The duplicate will be collected simultaneously with its parent sample. The field blank will be collected during representative sampling conditions at the Facility by pouring laboratory provided organic-free deionized water into laboratory provided sample containers. QA/QC samples will be analyzed for the same constituents as the natural samples. WET personnel will validate all laboratory analytical data using DEQ's Data Validation Summary Form (DVSF). This summary form will be included in the final report.

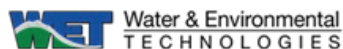
#### 4.8 Reporting (Task 9)

Upon completion of the WP tasks, WET will prepare a Groundwater Monitoring Report in the DEQ guidance format detailing the results of groundwater monitoring, including the following:

- Discussion of the monitoring method results, deviations from the approved work plan, assessment of attenuation rates (on-site and off-site), recommendations, and conclusions.
- Cumulative groundwater data tables.
- Updated site features and potentiometric surface maps.
- Appended groundwater monitoring field forms, laboratory analytical data, completed data validation summaries, and an updated Release Closure Plan.

## 5 Scheduling

WET will begin implementing this work plan upon DEQ approval and funding obligation of this GWM WP. A detailed project cost estimate is included as Appendix B.



**Tim Driscoll PE, MS**

Senior I Engineer

P: (406) 299-9854

C: (406) 498-1568

[tldriscoll@waterenvtech.com](mailto:tldriscoll@waterenvtech.com)

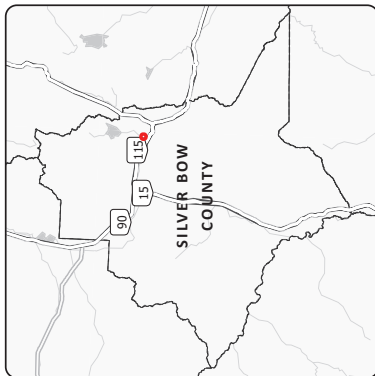
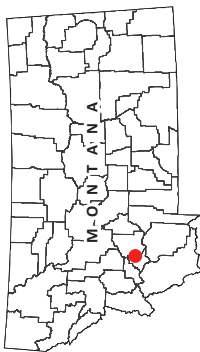


## Figures



NOTES

NO.	DESCRIPTION	DATE	DRAFT	REVIEW
1	MAP CREATION	2/20/24	KK	IS
2				
3				
4				
5				



- Monitoring Well
- Piezometer
- Vogue Cleaners



## Appendix A—WET SOPs

## FIELD LOGBOOK AND FORMS

All pertinent field investigation and sampling information will be recorded in a field logbook, field form, or a Daily Activity Log (DAL) during each day of the field effort and at each sample site. The field crew leader will be responsible for ensuring that sufficient detail is recorded in the field logbook or DAL. No general rules can specify the extent of information that must be entered in the field logbook or form. However, field logbooks, field forms, or DALs must contain sufficient information such that someone could reconstruct all field activities without relying on the memory of the field crew. All entries shall be made in indelible ink, weather conditions permitting. Each day's or site's entries will be initialed and dated at the end by the author.

At a minimum, entries on the field sheet or in field notebook must include:

- Project information and location
- Project and task number
- Date and applicable times
- Name(s) of field personnel
- Environmental, site, or weather conditions
- Safety briefing attendance
- Details of actual work effort, particularly any deviations from the field work plan or standard operating procedures
- Comments or observations regarding any unusual circumstances
- Any field measurements made (e.g., PID readings, pH, temperature)

For sampling efforts, specific details for each sample should be recorded using a standardized field form designed specifically for the sampling activity being conducted (e.g., low-flow groundwater monitoring, soil gas sampling). Sampling field forms contain fill-in-the-blank type information to ensure that all pertinent information will be recorded. In addition to the items listed above, the following information is recorded on field forms during sampling efforts:

- Sample identification
- Date and time samples were collected
- Sampling methods, particularly any deviations from field work plan or standard operating procedures
- Field data and measurements
- Containers used to collect samples
- Sample preparation (filtration, preservation)
- Analyses and methods requested
- Note any QA/QC samples collected (duplicates, blanks)

Strict custody procedures will be maintained with the field forms. Field forms must always remain with the field team while being used in the field. Upon completion of the field effort, the original field forms will be scanned and copied to the project folder. Original field forms will be filed in an appropriately secure manner.



## EQUIPMENT DECONTAMINATION

### INTRODUCTION

The purpose of this section is to describe general decontamination procedures for field equipment. Decontamination will be performed on all non-dedicated and non-disposable sampling equipment that may contact potentially contaminated media. Field personnel must wear disposable latex or nitrile gloves while decontaminating equipment at the project site and change gloves between every sample. Personnel must take every precaution to prevent contaminating themselves with the wash water and rinse water used in the decontamination process.

### EQUIPMENT

- Liquinox (or equivalent laboratory-grade detergent)
- Sufficient volume of tap water
- Sufficient volume of deionized water
- Sufficient volume of methanol or pesticide-grade acetone for organics
- Sufficient volume of any other decontamination solutions specifically required by the project work plan.
- Necessary containers for each decontamination station (totes or tubs, graduated cylinders or similar tubes, spray bottles, etc.)
- Tarp or other platform to form barrier between decontamination stations and ground (if necessary)
- Applicable brushes (if necessary)
- Aluminum foil (for soil sampling devices)
- Latex or nitrile gloves
- Paper towels
- Garbage bags

### PROCEDURES

The following should be done in order to complete thorough decontamination:

1. Set up the decontamination zone downwind from the sampling area to reduce the chances of windborne contamination.
2. Visually inspect sampling equipment for contamination; use brush to remove visible material.
3. The general decontamination sequence for field equipment includes washing with Liquinox (or equivalent laboratory-grade detergent), deionized water rinse, additional solution rinse specified by project work plan, and triple deionized water rinse.
4. Store equipment in clean containment or according to project work plan if not used immediately.
5. All disposable items (e.g., paper towels, latex gloves), as well as rinse and wash water generated during decontamination, should be disposed of in accordance with SOP-17 (Management of Investigation-Derived Waste).

## FIELD MEASUREMENT OF GROUND- WATER LEVELS/LIGHT NON- AQUEOUS PHASE LIQUID LEVELS

### INTRODUCTION

In general, groundwater levels (and LNAPL levels, if applicable) in wells will be measured prior to commencing development, purging, sampling, pumping tests, or other activities that disturb the fluid pressure relationships in the well. Measurements may be taken during such events for purposes other than determining static conditions and may also be taken to determine static conditions after such activities if an appropriate period has elapsed to allow steady-state conditions to return.

### EQUIPMENT

- Electronic water level monitoring probe (for water levels only),
- Electronic multi-phase interface monitoring probe (for measuring water levels and LNAPL levels)
- Keys for well locks
- Tools to open well covers (e.g., socket wrench, spanner wrench, etc.)
- Watch or stopwatch
- Pens and field logbook or other appropriate field forms (e.g., groundwater purge and sample forms)
- Monitoring well construction data (for total depth and screen intervals of well)
- Personnel and equipment decontamination supplies (refer to SOP-2)

### PROCEDURES

1. If more than one well will be measured, conduct measurements in the order of lowest to highest chemical concentrations previously detected in samples from the monitoring wells.
2. Allow the well to equilibrate by removing the protective cap and leaving the well open for a period before beginning taking measurements. Generally, removing all site well caps prior to collecting the first liquid level measurement provides sufficient time to reach equilibrium.
3. Examine the monitoring well for any structural damage, poorly fitting caps, and leaks into the inner casing. Record all well maintenance issues on the appropriate field sampling form or field log book.
4. If LNAPL is not present, use a pre-cleaned water level probe or equivalent to measure depth to water from the indicated survey mark on the well casing. If a mark is not present, measure from the top of the northern side of the well casing.
5. If LNAPL may be present, use a pre-cleaned, electric, multi-phase interface probe to measure depth of the LNAPL and depth to water. Record both measurements on the sampling form or field logbook. Unless otherwise instructed, always measure depths to LNAPL layer and groundwater from the indicated survey mark. If a mark is not present, measure from the top of the northern side of the well casing.
6. Repeat measurements at least once by lifting the probe tape at least one foot out of the well, allowing the measurer to confirm the accurate foot, tenth-of-a-foot, and hundredth-of-a-foot mark on the tape.
7. Follow personnel and equipment decontamination procedures outlined in SOP-2.

## MEASUREMENT OF FIELD

**PARAMETERS:** Temperature, Dissolved Oxygen (DO), Specific Conductance, pH, Oxidation Reduction Potential, and Turbidity

### INTRODUCTION

This guideline describes the procedures typically used to measure the temperature, DO, Specific Conductance (SC), pH, Oxidation Reduction Potential (ORP), also referred to as redox potential, and turbidity of ground- or surface water.

### EQUIPMENT

- Multi-parameter water quality meter
- Flow-through cell or plastic cup
- Transport/calibration cup
- Probe sensor guard
- Operations manual
- Spare batteries
- Standard conductivity calibration solutions [447, 1413, 2074, 8974 microSiemens per centimeter ( $\mu\text{S}/\text{cm}$ )]
- pH buffers (4.00, 7.00, 10.00)
- ORP calibration solution
- Pens, field logbook, and/or appropriate field forms (e.g., groundwater purge and sample form)
- Personnel and equipment decontamination supplies

### PROCEDURES

Calibrate multi-parameter water quality meter at the office prior to commencement of field activities to check instrument is in proper working order. At a minimum, calibrate before use each day (or more frequently as necessary) as indicated below. The initial daily calibration may be performed at the office (if located in proximity to the site), motel, or in the field.

1. Press the On/Off key. Check the battery charge indicator located at the bottom of the liquid crystal display (LCD) screen. Replace batteries if the battery charge indicator is low.
2. Calibrate the meters according to the manufacturer's instructions. *Note: The meter must be calibrated for each field parameter in accordance with the instructions in the operations manual at the beginning of each sampling day. Additional calibrations may be performed during the day if deemed necessary.*
3. If instruments were used in humid or wet environmental conditions, store them in the case open overnight for evaporation so that moisture and mold do not infiltrate sensitive parts.
4. Multi-parameter water quality meter use:
  - a. Connect the probe sensor to the flow-through cell. If the flow cell is not used, make sure the probe sensor guard is installed.
  - b. Begin passing water into the flow-through cell. If the flow-through cell is not used, place the probe module into a sample of the water or directly into the body of water being evaluated. Be sure to completely immerse all sensors into the water.
  - c. Provide a constant flow of fresh water across the probe module to actuate readings.

- d. Observe the meter's LCD display and record the values on the groundwater purge and sample form or field logbook.
- e. Once purging is complete, remove the probe from the sample water and rinse the probes and flow-through cell with distilled water.
5. Place the probe sensor in the transport/calibration cup with 0.5-1 inch of 4.00 pH buffer for short-term/overnight storage for optimal calibration conditions the next day. Place the probe sensor in the transport/calibration cup with 0.5-1 inch of potable water for long-term storage. The transport/calibration cup should be sealed to prevent evaporation.  
*Note: Storing the probes in dry conditions will damage the sensors.*
6. Turbidity meter use:
  - a. Fill a turbidity meter sample vial with water to the fill indication line. Cap the vial securely.
  - b. Dry the outside of the sample vial. Line the arrow or alignment indication line on the vial with the arrow or alignment indication line on the turbidity meter. Push the vial all the way into the sample vial port. Ensure that the cap/cover is closed all the way.
  - c. Ensure that the turbidity meter is on a level surface and will not be disturbed during the analysis process. Press the Read key. Do not disturb the turbidity meter or open the cap/cover during reading.
  - d. Record the value provided. If the reading seems inaccurate, ensure that the sample vial is dry and does not have any streaking or staining and re-read the sample.



## AIR AND VAPOR SAMPLING

US Environmental Protection Agency (EPA) guidance for specific sampling procedures, including quality assurance/ quality control (QA/QC) practices, for both criteria and toxic air pollutants, are found at the following web site: <https://www3.epa.gov/ttnamti1/airtox.html>

### SUMMA™ CANISTERS

An evacuated canister fitted with a calibrated intake flow controller is opened for a predetermined period to collect air potentially containing VOCs. Subsequent laboratory analysis of the air sample is by GC/MS. The sampling procedure presented below for Summa™ canisters fills the canister to atmospheric pressure. Under normal canister use, most VOCs can be recovered in their original concentrations, with little degradation, transformation, or deposition onto the canister walls.

### EQUIPMENT

- Sample labels and pens
- Field logbook or other appropriate field forms
- Chain of custody forms
- Signed access agreements and third-party sample receipts
- Summa™ canisters prepared by the laboratory, filter, and flow controller
- Flexible or stainless-steel tubing of the appropriate diameter to allow sampling in the breathing zone
- Hand pump or personal pump to evacuate tubing, if used
- Support stands, if necessary, to place the inlet in the breathing zone
- Tools and spare parts

### PROCEDURES

1. Obtain tubing, stands (if needed), and canisters with flow controllers. The flow controllers should be pre-set by the vendor to allow continuous sampling through the desired time.
2. Unpack the canister from the shipping container and inspect it for damage.
3. Identify sampling location, place a small table or stand at the sampling location, and place the canister on the table or attach the tubing to the stand.
4. Use a hand pump or personal pump to purge the sample port, filter, flow controller, and any tubing to be used.
5. Before sampling, verify initial vacuum of canister using the following steps. These steps will also be used to verify the final vacuum of the canister after sampling.
  - a. Confirm that the valve is closed (the knob should be tightened clockwise).
  - b. Remove the brass cap.
  - c. Attach gauge.
  - d. Attach the brass cap to the side of the gauge tee fitting.
  - e. Open and close the valve quickly.
  - f. Read the vacuum on the gauge.
  - g. Record the gauge reading in the “initial vacuum” column of the chain-of-custody

- form (or record the gauge reading when beginning sampling).
  - h. Verify that the canister valve is closed and remove the gauge.
  - i. Replace the brass cap.
6. Attach particulate matter filter and flow controller and any tubing to be used.
  7. Open the canister valve one-half turn.
  8. Record date and time. Note weather conditions during sampling period, especially any high wind conditions.
  9. Note the condition of the sampling location and the presence of chlorinated hydrocarbon sources (for example, burning garbage).
  10. At the completion of sampling, close the canister valve.
  11. Record date and time.
  12. Remove the filter and flow controller.
  13. Complete the canister sample tag.
  14. Prepare the canister label.
  15. Complete the chain-of-custody form. It is important to note both the canister and flow controller serial numbers on the chain-of-custody form.
  16. Follow sample packaging and shipping procedures outlined in SOP-15F.
  17. The laboratory concentrations may be reported in volumetric units of parts per million (ppm) or parts per billion (ppb). If required, convert these concentrations to mass concentrations of micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ).

## QUALITY CONTROL SAMPLING

Quality Control (QC) samples are submitted along with natural samples to provide supporting laboratory data to validate laboratory results. QC samples are submitted blind except for matrix spikes and trip blanks, and do not have any unique identifying codes that would enable the lab or others to bias these samples in any way. Usually, the time or sampling location is modified in a way which will separate blank and standard samples from the rest of the sample train. QC samples are identified only on field forms and in field notebooks. The following codes are typically used:

<b>N</b>	Natural Sample	Soil, water, air, or other of interest material from a field site
<b>SP</b>	Split Sample	A portion of a natural sample collected for independent analysis; used in calculating laboratory precision
<b>D</b>	Duplicate Sample	Two samples taken from the same media under similar conditions; also used to calculate precision Two samples taken from the same media under similar conditions; also used to calculate precision
<b>FB</b>	Field Blank	Deionized water collected in sample bottle; used to detect contamination introduced during the sampling process.
<b>RB</b>	Rinsate Blank	Deionized water run through or over decontaminated equipment; used to verify the effectiveness of equipment decontamination procedures
<b>MS/MSD</b>	Matrix Spike/Matrix Spike Duplicate	Certified materials of known concentration; used to assess Spike Duplicate laboratory precision and accuracy
<b>TB</b>	Trip Blank	Inert material (deionized water or diatomaceous earth) included in sample cooler; sent by the lab, the sample is used to detect any contamination or cross-contamination during handling and transportation.

In general, selected QC samples will be inserted into the sample train within a group of twenty samples. QC samples will be prepared in the field, apart from trip blanks. Trip blanks will be supplied by the laboratory and will accompany each sample cooler containing samples for analysis of volatile organic compounds.

Typical QC sample collection frequencies are presented in the table below. However, at some sites, especially ones where streams or ponds are sampled, QC samples may need to be taken at a higher frequency. Refer to the project-specific sampling and analysis plan or quality assurance plan for the appropriate QC sample frequency. Each field crew leader will be responsible for all QC samples prepared by that crew.

QC Sample	Purpose	Collection Frequency
<b>Field Duplicate</b>	Measure analytical precision	1 per every 20 samples
<b>Matrix Spike/ Matrix Spike Duplicate</b>	Measure analytical accuracy	1 per every 20 samples
<b>Equipment Rinse Blanks</b>	Evaluate effectiveness of equipment decontamination and sample handling procedures.	1 per sampling event per media type
<b>Field Blank</b>	Assess possible cross-contamination of samples due to ambient conditions during sample collection	1 per sampling event
<b>Trip Blank</b>	Evaluate sample preservation, packing, shipping, and storage	1 per cooler containing samples with volatile constituents

Methods for computing data validation statements can be found in EPA documents or obtained from Geomatrix.