

Environmental Data Collection and Analysis Requirements

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All proposed environmental media sampling and analysis plans must take into consideration how to properly determine the presence or absence of contamination by following commonly referenced EPA, ASTM and ITRC guidance documents. At a minimum, the following guidance and reference documents should be included in the site characterization, sampling, and analysis SOP, where applicable. All sampling work plans must be pre-approved by the Secretary.

All properties enrolled in BRELLA, must follow the ASTM Standard (E1527) Practice for Environmental Site Assessments Phase I. Additional requirements may apply depending on funding sources (EPA, HUD, USDA, etc.).

Site Characterization:

All sites must be characterized in accordance with acceptable industry standard methodologies. Guidance documents are available from EPA, ASTM, and ITRC. Methods and documents used in the site characterization must be referenced in the work plan. SOPs must be available for review if requested by the Secretary. All site characterizations need to determine the source, degree and extent of contamination and identify sensitive receptors.

Environmental Media Sampling Requirements:

1. Field Screening

There are a number of field-portable instruments and detectors (eg. PID, FID, O₂ CO₂, pH meter, conductivity meter, Colormetric Test Kits/Immunoassay Kits, Portable GC, XRF) that are available to screen environmental media. The instrument chosen must be capable of detecting the contaminants of concern at the site. Users must be familiar with and follow the operating instructions recommended by the manufacturer and applicable SOPs.

The most commonly used screening device for VOCs is the PID. A PID may be used for the direct screening of soil contamination with gasoline, diesel, kerosene and #2 fuel oil. A PID is not sufficient for low volatility petroleum contamination such as #4, #6 or used oil or for the identification of compound specific VOCs.

2. Soil Sampling

A soil sampling program should be initiated to assess if any contaminants are present in soils above standards during the initial site screening, SI and post cleanup confirmatory sampling. Soil sampling data must be compared to the appropriate soil standards.



The following references are available for guidance, where applicable:

- [ITRC-Incremental Sampling Methodology, February 2012](#)
- [ASTM-D4547-15 Standard Guide for Sampling Waste and Soils for Volatile Organic Compounds](#)
- [ASTM-D6051-15 Standard Guide for Composite Sampling and Field Subsampling for Environmental Waste Management Activities](#)
- [US EPA Expedited Site Assessment Tools for Underground Storage Tank Sites: A Guide for Regulators \(EPA 510-B-97-001\)](#)

Discrete (or Grab) Samples. Representative of one specific sample site at a specific location. Discrete soil samples are required at Sites to determine the concentrations of the contaminants of concern.

Composite Samples. Non-discrete soil samples composed of more than one specific aliquot collected at various sampling points. May be used for screening for non-volatile contaminants (i.e. TPH, PCBs, metal, SVOCs). Composite samples are not acceptable for VOC sampling or as part of site characterization, but are acceptable for risk assessment and for waste characterization analysis for proper disposal.

Other Acceptable Soil Sampling Methodologies. Incremental Soil Sampling (ISM) is a structured composite sampling and processing protocol that reduces data variability and provides a reasonably unbiased estimate of mean contaminant concentrations in a volume of soil targeted for sampling. ISM provides representative samples of specific soil volumes defined as decision units (DUs) by collecting numerous increments of soil (typically 30–100 increments) that are combined, processed, and subsampled according to specific protocols. Specific protocols can be found in ITRC's [Incremental Sampling Methodology Guidance](#) document.

Soil Excavations. For soils that are removed for stockpiling and/or treatment, samples of the native material remaining in the ground must be collected and submitted for laboratory analysis in order to demonstrate that the full extent of contamination was removed. The number of post-excavation samples for laboratory analysis will be addressed in the work plan, or through communication with the Secretary. Analysis methods will be determined by the contaminant(s) of concern and addressed in the work plan.

3. Groundwater Sampling

Well purging, sampling procedures, and well maintenance. The method of sample collection and materials used will depend on the site conditions and contaminants of concern. The objective is to obtain representative groundwater formation samples (turbidity free) from either temporary well points or monitoring wells for physical and chemical analyses.

The following references are available for guidance, where applicable:

- [ASTM \(D5092M-16\) – Reapproved 2010: Standard Practice for Design and Installation of Groundwater Monitoring Wells](#)
- [ASTM \(D4448-01\) – Reapproved 2013: Standard Guide for Sampling Groundwater Monitoring Wells](#)
- [ASTM \(D6452\) Guide for Purging Methods for Wells Used for Groundwater Quality Investigations](#)
- [ASTM \(D6517\) Guide for Field Preservation of Groundwater Samples](#)
- [EPA Practical Guide for Ground-Water Sampling, EPA/600/2-85/104, US EPA, Dated 1985](#)
- [EPA Low-Flow \(Minimal Drawdown\) Ground-Water Sampling Procedure, April 1996](#)

- [ITRC-Protocol for Use of Five Passive Samplers to Sample for a Variety of Contaminants in Groundwater, February 2007](#)

Metals Analysis. Metals analysis must be for total metals analysis unless otherwise requested by the Secretary and should follow the EPA Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedure-see reference above.

Drinking Water. Potentially impacted or threatened drinking water supplies must be sampled to determine the presence of contamination. The sampler must determine where the sample is to be collected close to the source of the water supply, prior to the pressure tank (if present), or at the kitchen or bathroom tap. Volatile organic contaminant concentrations will be reduced throughout the distribution system if a pressure tank is present. It is sometimes possible to sample directly from the source when the source is a shallow dug well. The next best location is to sample from a faucet or float valve after the pump and prior to the pressure tank. In the case of a gravity feed, the first faucet into the house is the next best to sampling the source itself. Care must be taken to prevent coliform contamination of the water supply from the sampling equipment (example: sampling standing water in a shallow dug well or in a cistern).

The following sampling procedure must be utilized, unless approved by the Secretary:

1. If sampling from a faucet in kitchen or bath, remove any filters or screens present on faucet. If sampling off of a float valve, sample directly into containers. Collect samples directly into appropriate sample bottles. Tap water should be allowed to run fifteen (15) minutes prior to sampling. This purges the plumbing system of stagnant water and ensures that representative drinking water is being sampled.
2. If sampling from shallow dug well, utilize the bailer or peristaltic pump if the sampler cannot reach the water supply. Place sample directly into appropriate sample bottles from sampling device. Ensure no contamination from tubing or bottles. Report any deficiencies in water supply protection that may be present (example: door to spring house off of hinges).

4. Vapor intrusion (sub-slab, indoor air and ambient air)

The potential for VI exists at any site where there has been a release of VOCs near a building, and may present a risk for any future buildings constructed above or near a contaminated area.

The following references are available for guidance, where applicable:

- VT DEC Vapor Intrusion Background Fact Sheet, July 2017
- [ITRC Petroleum Vapor Intrusion, October 2014](#)
- [ITRC Vapor Intrusion Pathway: Investigation Approaches for Typical Scenarios, January 2007](#)
- [OSWER 9200.2-154 Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air](#)
- [EPA 510-R-15-001 Technical Guide for Addressing Petroleum Vapor Intrusion at Leaking Underground Storage Tank Sites](#)

5. Surface Water and Sediments

If a surface water body has been identified as a threatened or impacted sensitive receptor, further characterization maybe appropriate. To evaluate the risk to surface water, sampling data should be compared to the Vermont Water Quality Standards. The following reference is available for guidance, where applicable:

- **VT DEC Recommended Guidelines for Evaluating Contaminants to Adversely Affect Aquatic Biota**

6. Laboratory Analysis Requirements

The contaminants of concern at a site will dictate which analytical method is most appropriate for different media. References to specific laboratory methods are subject to change. EPA Methods referenced below must be used unless an updated or alternative method is approved or requested by the Secretary.

CONTAMINANTS OF CONCERN	ANALYSIS*
VOCs	Initial sampling including petroleum sites: EPA Method 8260 Subsequent petroleum site sampling rounds following Secretary approval: VT Petroleum List** Drinking water supplies: EPA Method 524.2 Soil gas and indoor air: EPA Method TO-15
SVOCs	EPA Method 8270
PAHs	EPA Method 8270 ; SIM
PCBs	EPA Method 8082 for screening purposes; Method 1668a for characterization and confirmation analysis.
DIOXINS/FURANS	EPA Method 8280 or 8290
METALS	EPA SW-846 methods
TPH	Soil analysis ONLY upon approval of the Secretary: 8015 DRO or GRO. For additional information see TPH Policy, 2016.
PAHs, Arsenic, Lead (Development Soils disposal characterization only)	EPA Method 1312 Synthetic Precipitation Leaching Procedure (SPLP)

* For those chemicals not listed, use current EPA approved method

** Vermont Petroleum List: Benzene, toluene, ethylbenzene, xylenes, total trimethylbenzene, naphthalene, MTBE

7. QA/QC requirements

Minimum QA/QC for a sample delivery group: A trip blank or field blank, a duplicate sample, chain of custody documentation, and documentation of the laboratory's QA/QC samples analyzed in addition to site specific media samples. Additional QA/QC requirements may be necessary and must be part of an approved work plan.

8. Toxic Equivalent Quotients (TEQ)

The following contaminants must be reported as Toxic Equivalent Quotients (TEQs):

Polycyclic Aromatic Hydrocarbons (PAHs). All environmental media (soil, groundwater, sediment, surface water) sample results must be compared to applicable PAH standards for each individual PAH. PAHs must

also be reported as a TEQ to benzo(a)pyrene. The toxicity equivalent factors (TEF) for reporting must be the most currently utilized [EPA TEF values](#).

Dioxins. Must be reported as a Toxic Equivalency Quotient (TEQ) to Tetrachlorodibenzo-p-Dioxin(2,3,7,8). The Toxic Equivalency Factors (TEF) to be used by the laboratory during analysis must be the 2005 World Health Organization (WHO) values (or most current values), which may be found in the [US EPA Risk Assessment – Regional Screening Levels Users Guide](#) . Laboratory results must include the 2,3,7,8-TCDD values and concentrations reported for each individual dioxin compound or congener.

Polychlorinated Biphenyls (PCBs). PCBs must be reported as individual congeners or homologs. The sum of all homologs is also referred to as Total PCBs. If PCBs are reported as individual congeners, dioxin-like congeners should be segregated; weighted using the 2005 [WHO TEQs](#); and assessed in conjunction with TCDD-TEQ. The remaining congeners would be summed and assessed as Total PCBs.

9. Reporting

The laboratory method detection limit (MDL) must be below the applicable screening value or best available technology if the screening level cannot be met. If the MDL is above screening values or standards, the Secretary will require that additional samples be analyzed using a method providing an MDL below the applicable screening value or standard. Non-detect (ND) results must be reported as below test method MDL, with the MDL reported.