

SOIL SAMPLING GUIDANCE

The Enforcement Program (ENF) of the Montana Department of Environmental Quality (DEQ) developed this guidance to assist environmental consultants and cleanup contractors to determine the minimum number of samples required to be collected when conducting assessment and remedial actions at release and spill sites conducted under ENF's oversight. ENF classifies release or spill sites as either Small Sites (an excavation floor of 10,000 square feet or less) or Large Sites (an excavation floor of more than 10,000 square feet).

Please note the following are the minimum recommendations and may not be applicable to all release or spill sites managed by ENF. ENF staff may modify the number of samples collected based on site-specific conditions.

Soil samples are collected, analyzed and evaluated to: 1) determine site specific laboratory analytical requirements; 2) verify the effectiveness of the remedial activities; 3) ensure selection of appropriate disposal options; and 4) demonstrate that any remaining contaminants are below DEQ's Tier 1 Risk-Based Corrective Action (RBCA), Risk-Based Screening Levels (RBSLs) or other published cleanup levels when there are no RBCA, RBSLs for the contaminant(s) of concern.

All soil samples collected during assessment and remedial actions are to be analyzed for the parameters listed in [Table A](#) and/or [Table B](#) at a DEQ-approved laboratory. If the material spilled or released is not listed in either Table, the most appropriate Environmental Protection Agency (EPA) analytical method should be selected. It is recommended that the analytical laboratory be contacted in order to determine the appropriate analytical method.

All soil samples are to be collected and preserved in accordance with EPA and standard industry protocols. Failure to properly collect and preserve soil samples will result in the analytical data being declared invalid and resampling the spill site may be required.

Confirmation Soil Samples

Confirmation soil samples are to be collected at the completion of remedial actions at a release or spill site. The confirmation soil samples are collected from the base of the excavation, and along the excavation sidewalls when the depth of the excavation exceeds two feet. Confirmation soil samples should be collected from the worst case areas or where the highest concentrations would be expected based on product pooling, visible contamination, field screening, soil type or other site-specific characteristics.

The minimum number of confirmation samples should be collected and analyzed as discussed below. Sidewall samples are not required for excavations less than or equal to two feet in depth. For irregularly shaped excavations where four sidewalls are not readily discernible, divide the total wall perimeter into four segments of approximately equal size for collection of excavation sidewall samples.

ENFD allows for compositing confirmation soil samples collected and submitted for extractable petroleum hydrocarbon (EPH) analysis, metals and analytes listed in [Table B](#). Typically, analytical laboratories require 16 ounces of sample material in order to perform the required analyses.

Discrete sampling methods are required for all soil samples collected and submitted for volatile petroleum hydrocarbon (VPH) analysis. **Compositing of confirmation soil samples for VPH analysis is not acceptable.**

A. Petroleum Hydrocarbon or Hazardous Chemical-Impacted Soils

1. Small Sites

a. Excavation depth two feet or less:

- One 5-point composite soil sample collected for each 625 sq ft of excavation floor to be submitted for EPH analysis.

- Two discrete (grab) soil samples collected for each 625 sq ft of excavation floor to be submitted for VPH analysis.
- b. Excavation depth greater than two feet:
- Collect composite and discrete soil samples from the excavation floor as discussed in 1.a.
 - One 5-point composite soil sample collected for each 25 linear feet of excavation sidewall to be submitted for EPH analysis.
 - Two discrete (grab) soil samples collected for each 25 linear feet of excavation sidewall to be submitted for VPH analysis.

Where the depth of the excavation is greater than six feet, the sidewall should be equally divided into multiple sections and soil samples should be collected from each height of sidewall section as follows:

- Collect composite and discrete soil samples from the excavation floor as discussed in 1.a.
- One 5-point composite soil sample collected from each height of sidewall section for every 25 linear feet of excavation sidewall to be submitted for EPH analysis.
- Two discrete (grab) soil samples collected from each height of sidewall section for every 25 linear feet of excavation sidewall to be submitted for VPH analysis.

2. Large Sites

The minimum number of confirmation soil samples required to be collected will be determined on a site-by-site basis in consultation with the ENF project manager.

B. Produced Water-Impacted Soil

Any waters generated from oil and gas exploration and production are considered produced water. ENF requires the collection of the following soil samples for all spills or releases of produced water.

I. Background Soil Sample

The background soil sample should be collected in native soils and no more than 25 feet from the produced water-impacted area. The background soil sample is to be collected and submitted for the laboratory analyses required in [Table A](#) and [Table B](#).

II. Pre-excavation Soil Sample

Prior to conducting onsite remedial activities, a “pre-excavation, worst case” soil sample should be collected and submitted for laboratory analyses as shown in [Table A](#) and [Table B](#). A discrete soil sample should be collected from the impacted area that is determined to be the most heavily contaminated based on visual, olfactory or field screening methods. The analytical results from the “pre-excavation” sample will assist in determining appropriate laboratory analytical methods for confirmation soil sample(s).

Pre-excavation sampling is **required** at all produced water spill or release sites. Produced water-impacted soils are a Special Waste (as defined in Section 75-10-802(8) Montana Code Annotated) that require disposal at a licensed Class II disposal facility. Depending on contaminant concentrations, produced water-impacted soils may require disposal at a Class II disposal facility permitted to accept Special Wastes.

1. Small Sites

a. Excavation depth two feet or less:

- One 5-point composite soil sample collected for each 625 sq ft of excavation floor to be submitted for EPH analysis.
- Two discrete (grab) soil samples collected for each 625 sq ft of excavation floor to be submitted for VPH analysis.
- One 5-point composite soil sample collected for each 625 sq ft of excavation floor to be submitted for analytical parameters listed in Table B and RCRA metals analyses.

b. Excavation depth greater than two feet:

- Collect composite and discrete soil samples from the excavation floor as discussed in 1.a.
- One 5-point composite soil sample collected for each 25 linear feet of excavation sidewall to be submitted for EPH analysis.
- Two discrete (grab) soil samples collected for each 25 linear feet of excavation sidewall to be submitted for VPH analysis.
- One 5-point composite soil sample collected for each 25 linear feet of excavation sidewall to be submitted for analytical parameters listed in Table B and RCRA metals analyses.

Where the depth of the excavation is greater than six feet, the sidewall should be equally divided into multiple sections and soil samples should be collected from each sidewall as follows:

- Collect composite and discrete soil samples from the excavation floor as discussed in 1.a.
- One 5-point composite soil sample collected from each height of sidewall section for every 25 linear feet of excavation sidewall to be submitted for EPH analysis.
- Two discrete (grab) soil samples collected from each height of sidewall section for every 25 linear feet of excavation sidewall to be submitted for VPH analysis.
- One 5-point composite soil sample collected from each height of sidewall section for every 25 linear feet of excavation sidewall to be submitted for analytical parameters listed in Table B and RCRA metals analyses.

2. Large Sites

The minimum number of confirmation soil samples required to be collected will be determined on a site-by-site basis in consultation with the ENF project manager.

**TABLE A
Petroleum Containing Products**

Product	VPH	EPH Screen	EPH Fractionation	EPH for PAHs	RCRA Metals	EPA Method 8260B	Oxygenates & Lead Scavengers
Gasoline/Aviation Gasoline	R						SS
Diesel (#1 & #2)	R	R	X				
#1 - #2 Heating Oils	R	R	X				
#3 - #6 Fuel Oils		R	X	SS			
Used/Waste Oil	R	R	X	R ¹	R	R	SS
Kerosene, Jet Fuel (Jet-A, JP-4, JP-5, JP-8, etc.)	R	R	X				
Mineral/Dielectric Oils		R	X				
Heavier Wastes		R	X	R ¹			
Crude Oil	R	R	X	R ¹			
Unknown Oils/Sources	R	R	X	R ¹	R	R	SS
Produced Water	R	R	X	R	R	See Table B for other required analyses	

R - Required analysis

X - Analysis to be run if the EPH screen concentration is >200 ppm TEH

SS – Site Specific

¹ Contact ENF project manager to discuss requirements

**TABLE B
Produced Water**

Analyses	Method
Saturated Paste	
Calcium	E6010.20
Magnesium	E6010.20
Sodium	E6010.20
Sodium Adsorption Ratio (SAR)	Calculation
Saturated Paste Extract	
Conductivity	ASAM10-3
Chloride	E300.0
Sulfate	E300.0
Physical Properties	
Salinity	Calculation
Radionuclides	
Lead 210	E909.0
Lead 210 precision (±)	E909.0
Lead 210 MDC	E909.0
Radium 226	E909.0
Radium 226 precision (±)	E909.0
Radium 226 MDC	E909.0
Radium 228	RA-05
Radium 228 precision (±)	RA-05
Radium 228 MDC	RA-05