State of Oregon
Department of
Environmental
Quality

OREGON DEQ HEATING OIL TANKS PROGRAM – PROCESS OVERVIEW

Guidance for HOT Site Assessment and Cleanup

The following is a brief synopsis of the Heating Oil Tank (HOT) Program's requirements regarding soil and groundwater sampling, sample analysis, and report presentation. Soil gas sampling requirements are presented in Service Provider bulletins and in the Vapor Intrusion Guidance which is expected to be released in the spring of 2010.

The intent of this document is to provide Service Providers with a general overview of the HOT Program's requirements. This is not intended to be a complete presentation of HOT Program requirements. A thorough review of OAR 340-122, 340-150, 340-163, and 340-177 is essential to providing accurate assessments and certifications of HOT decommissionings, assessments, and cleanups.

Investigation of Magnitude and Extent of Contamination *as per 340-122-0240, 340-122-0340, 340-177-0025*

Soil Delineation:

- Initial Assessment samples collected within 6" off of the centerline of the ends of the tank.
    - For sites where the tank has been removed:

      Soil samples must be collected from a depth between six to 12 inches beneath the areas where the bottom ends of the tank were originally located. Initial assessment samples should not be collected deeper than 12 inches beneath the area of the location of the former tank.

    - For sites where the tank is decommissioned in place:

      Soil samples must be collected between twelve to 24 inches beneath the bottom of the ends of tank.

    - Remember to adhere to the requirement of also sampling at visible signs of contamination (as per 340-177-0025(2)(c)(C).

**NOTE: Because new spills or releases from an active tank can occur at any time, DEQ advises that site assessment samples should be relied on for no more than 90 days. After 90 days it is advisable for new assessment data to be collected. DEQ will not accept site assessment data that is more than 90 days old if used to certify a decommissioning or cleanup. **

Vertical and Lateral Delineation in Soil:

- The area of highest TPH-Dx concentrations must be used to determine the vertical extent of contamination. It is possible that the areas of highest TPH-Dx impact are discovered while conducting lateral sampling outside of the tank pit.

- If groundwater is encountered during vertical delineation, the vertical extent of contamination in soil must continue beyond the soil/water interface until TPH-Dx concentrations are non-detect, or below the soil matrix level determined for site-specific conditions.

- Once the vertical extent of contamination is determined in the highest impacted area, lateral samples must be collected at depths equal to the vertical extent of contamination. Lateral samples must be collected from at least three sides of the HOT, four when possible. Driveways, sidewalks, and decks are not obstructions. Lateral samples collected shallower than 75% of the lens thickness of the contaminant plume as determined by the vertical delineation sample will be rejected by the HOT Program.

    - For sites where 75% of the vertical extent of contamination cannot be reached during lateral sampling, lateral samples should be collected closer to the release location (plume) . Collecting samples at these locations will help identify the nature of the plume (vertical versus lateral release).

- When Rate of Reduction calculations are used to determine the extent of contamination due to delineation problems, the HOT Program requires the HOT be removed or at a minimum, the bottom of the tank be removed. Removing the tank or tank bottom will provide for the direct observation of contamination which will provide a more accurate assessment of site conditions.

- If groundwater is encountered at the site, lateral samples must be collected at the soil/water interface (SWI) instead of the vertical extent of contamination as documented at the tank pit. SWI samples must be analyzed for TPH-Dx and BTEX.

Constituent analysis:

- For Risk Based Certifications: PAH and VOC analysis must be conducted on the highest level of remaining TPH-Dx at the site.

- For Generic Remedy Alternative 2, analysis for the presence of benzene, ethylbenzene and naphthalene must be performed on all samples exceeding 2,500 ppm TPH. Measured concentrations for ethylbenzene and naphthalene in soil cannot exceed the generic risked-based concentrations in effect at the time of the cleanup project. Benzene concentrations cannot exceed 0.1 ppm.

Free Product Evaluation:

Soil:

- Page 25 of the Risk Based Decision Making Guidance states:

Even if you do not encounter free product floating on groundwater, high concentrations of TPH in the soil indicate the product is potentially mobile and could eventually reach groundwater or seep out onto surface water bodies. This can happen when concentrations exceed a product's residual saturation in the soil.
Residual saturations vary widely depending on the combination of product and soil type (Brost and De Vaull, 2000). The DEQ recommends that you consider potential product mobility when you are

*proposing to leave soils contaminated with diesel, mineral insulating oil, or other similar non-gasoline petroleum products in concentrations exceeding **10,000 mg/kg** TPH-Dx.*

https://www.oregon.gov/deq/FilterDocs/RBDMGuidance.pdf

Groundwater:

- At sites where groundwater concentrations exceed the solubility of TPH-Dx, the Vapor Intrusion pathway and mobility concerns must be appropriately assessed. The solubility of TPH-Dx is approximately 6 mg/L, or 6,000 ppb.

Groundwater Delineation:

If groundwater has been impacted, the leaching to groundwater pathway is complete as the contamination has leached into the groundwater. Therefore, source removal must be conducted to address continued contribution of contamination to groundwater.

As with determining the extent of soil contamination, the extent of groundwater contamination must also be determined and presented on every site. The extent of groundwater impact must be delineated to ingestion standards for all contaminants of concern.

All groundwater samples must be analyzed for BTEX and PAHs. TPH-Dx can be used as a preliminary screen for PAHs, however if Dx is detected in the groundwater sample, or if the method detection limit is greater than 0.5 ppm, PAH analysis must be conducted. This requirement is presented in OAR 340-122-0340(4)(b)(C), OAR 340-177-0025(2)(e).

A groundwater sample must be collected at the pit as well as down gradient, cross gradient and up gradient of the source area.

Soil water interface samples must be collected from each groundwater sampling location and analyzed for TPH-Dx and BTEX as per OAR 340-122-0340 (4)(b)(C).

Depending on the extent and magnitude of the contamination, permanent monitoring wells may be required (i.e., presence of free product).

The HOT Program requires the completion of a groundwater assessment boring in the presumed down gradient direction of the area just outside of the soil contaminant plume for ALL Risk Based Closure sites. If the completed groundwater assessment boring does not indicate the presence of groundwater beyond 10 feet of the vertical extent of contamination, then it may be concluded that the leaching to groundwater pathway is not complete. Additional vertical assessment of the depth to groundwater may be necessary based on the time of year the assessment is being conducted.

Please contact the HOT Program with any site-specific questions you may have regarding this issue.

Groundwater Use

Special consideration and assessment must be performed for sites where groundwater wells (irrigation, drinking water) are present on or near the site undergoing investigation. Source removal below leaching to groundwater RBCs eliminates the possibility of groundwater wells being impacted by a HOT release.

If it is not possible to remove source material below leaching to groundwater RBCs, the HOT Program will require:

- The onsite well to be properly abandoned as per Oregon Water Resources Standards: http://www.wrd.state.or.us

or

- Quarterly groundwater monitoring for a minimum of one year.

A deed restriction will also be required for properties where groundwater use has been or is present on or near the property undergoing assessment.

Coordination with HOT Program staff is encouraged when working on sites with groundwater wells.

Determining volume of remaining petroleum contaminated soil

An estimate of the remaining volume of petroleum contaminated soil (PCS) must be presented in the closure certification report. Samples delineating the extent of remaining PCS must be used to determine the extent of contamination.

For instance, if lateral samples are collected 10 feet in every direction from the ends and sides of the tank, and are found to be non-detect for TPH-Dx, the extent of contamination would be from the tank center to those sampling points 10 feet away from the tank in every direction. Therefore, the radius of impact at the top of the plume would be eight feet (assuming a 675-gallon tank that is 8 feet long), and the radius of impact on the bottom of the plume would be 14 feet (samples collected 10 feet north and south from the ends of an 8 foot long tank would be 28 feet in diameter).

The vertical extent of contamination has already been determined prior to collecting the lateral samples and can then be used in the remaining PCS calculation. Be sure to use the depth from the tank bottom (not the depth of the initial assessment sample that will be at least 6” below the tank bottom) to the vertical extent of contamination to determine the height of the plume.

Certification Reports

The following items should be included in the closure certification reports:

- Documentation:
  - Make sure the Chain of Custody is complete and legible
  - Include boring logs and field notes
  - Include table showing sample analysis results and depth of sample collection.
  - When heavy oil is detected in sample analysis, add the heavy oil and diesel concentrations together for the total TPH concentration.

- Sampling Maps:
  - Note soil and/or groundwater concentrations on sample location maps
  - Include area of excavation on sampling maps and present note the dimensions of the excavation including width, length, and depth of excavations performed.

- If using the volatilization to indoor air (VolScreen) screening model, please present assumptions associated with the models (i.e. square footage of home, cubic yards of remaining petroleum contaminated soil).

  Note: the VolScreen model may **only** be used for assessing the risk associated with remaining benzene and ethylbenzene concentrations in soil. The HOT Program is not allowing the use of modeling for assessing the vapor intrusion risk with remaining levels of TPH-Dx or naphthalene in soil.

  In addition, if naphthalene and/or TPH-Dx levels in soil require soil gas sampling, benzene and ethylbenzene analysis should also be conducted if concentrations exceed RBCs for the VI pathway.

  The following slope factors must be used if using the VolScreen model:

Contaminant of Concern	Slope Factor*
Benzene	0.027
Ethylbenzene	0.0088

*Slope factors are updated on a periodic basis. Please be sure you are using the correct slope factor by reviewing ToxData tab in the Risk Based Concentrations for Individual Chemicals Spreadsheet:
https://www.oregon.gov/deq/FilterDocs/RBDMGuidance.pdf

HOT Program Cleanup Agreement

The HOT Program has developed a cost recovery agreement for complex sites that require increased coordination between HOT Program project managers and Service Providers.

Examples of these types of sites include but are not limited to the following:

- Long term monitoring due to contamination impacting groundwater or soil vapor.
- Installation of an engineering control.
- Filing of an institutional control to restrict a specific use of the site.

HOT Program staff will coordinate with Service Providers to determine sites requiring enrollment in the Cleanup Agreement.

Enrollment in the HOT Program requires an initial deposit of $500. Once the HOT Program Cleanup Agreement has been signed and the deposit submitted to DEQ, an account will be established for the responsible party. Project management costs will not exceed $1,000.

HOT Service Providers must still certify that the work performed meets the requirements of OAR 340-122-0205 through 340-122-0360 Chapter 340, Division 177. The certification fees of $250 for Soil Matrix, $350 for Generic Remedy, and $450 for Risk-Based projects will also be required.

Depending on site conditions, a conditional no further action letter may be issued for the site. A site that may warrant issuance of a no further action letter in lieu of a closure letter would involve the presence of an engineering control that would require operation and maintenance.