



STATE OF VERMONT  
*Agency of Natural Resources*

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## UNDERGROUND STORAGE TANK CLOSURE AND SITE ASSESSMENT REQUIREMENTS

*June, 2010*

 **VERMONT**  
Environmental Conservation

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This procedure is hereby approved and adopted, in accordance with the Vermont Administrative Procedure Act (3 V.S.A. §835).

Approved by: \_\_\_\_\_

  
Justin Johnson, Commissioner  
Department of Environmental Conservation

Date: \_\_\_\_\_

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**Important note:** The Vermont Department of Environmental Conservation tries very hard to keep all hyperlinks in this document up to date. If a link does not work, or if you have a printed copy of this document, all guidance documents referenced herein can be found at the following web address:  
<http://www.anr.state.vt.us/dec/wastediv/sms/smsgdint.htm>

Copies of this guidance document and other information are available at the Vermont Underground Storage Tank Program web site:

[www.anr.state.vt.us/dec/wastediv/ust/home.htm](http://www.anr.state.vt.us/dec/wastediv/ust/home.htm)

## I. Applicability and Purpose

This guidance document is not an all-inclusive manual on tank closure and site assessment. It is a discussion of the factors to be considered during a site assessment and tank closure. Following this guidance should help tank owners and their contractors comply with the requirements of underground storage tank (UST) closure and site assessment found in Vermont's UST rules. Subchapter 6 of the UST rules address the requirements for out-of-service, continued use, and closure standards for underground storage tank systems and should be reviewed prior to tank closure.

This guidance is applicable to the following systems:

- Category one tanks (tanks required to have a permit);
- Farm and residential motor fuel USTs larger than 1100 gallons capacity (category two tanks);
- Tanks larger than 1100 gallons, used to heat a non-public building<sup>1</sup> (category three tanks);
- Tanks of any size, that are used to heat a public building (category three tanks); and
- Farm and residential heating oil tanks participating in the heating oil tank removal grant program (category three or four tanks, depending on size).

These guidelines are meant to apply only to the closure of underground tanks used for the storage of petroleum products such as gasoline; diesel fuel; #2, #4, and #6 heating oil; motor oil, used motor oil, etc. If the tank stored any other regulated substance (sodium hypochlorite, chlorinated solvents, etc.), contact the Agency prior to planning a closure to discuss the proper methods of closing that tank.

**NOTE: This document only addresses closure of existing tanks. Any new or replacement Category One Underground Storage Tank must be permitted by the DEC before the commencement of construction. For information on applying for a permit and installing a new tank, please see the [Vermont UST Rules](#) or contact the UST Program at 802-828-1138. (If that link does not work, please go to: [http://www.anr.state.vt.us/dec/wastediv/ust/ust\\_regs.htm](http://www.anr.state.vt.us/dec/wastediv/ust/ust_regs.htm))**

## II. Step-by-Step Procedures to Permanently Close Underground Storage Tanks

- A) Notification (8-604(a)).** Notify the Agency by phone (802-828-1138) or writing at least 5 business days before the date scheduled for closure (if the USTs to be closed are subject to this requirement). Obtain the [tank closure forms](#) from the UST Program's web site: (<http://www.anr.state.vt.us/dec/wastediv/ust/pubs/closureform.pdf>). Notify Dig Safe of the time and place of the tank closure so they have an opportunity to mark any buried utilities near the tank(s).
- B) Residual Liquid and Waste Management (8-604(b)).** All residual material must be properly removed and managed in accordance with applicable state and federal requirements, including the Vermont hazardous waste management rules. At a minimum the following steps should be undertaken:
- (i) All liquid must be pumped from the system, before removal from the ground.
  - (ii) If removal is not necessary to adequately assess the site for contamination, piping may be closed-in-place provided that:
    - (a) all fuel is drained back into the tank;
    - (b) the piping is purged with compressed air; and
    - (c) all openings are permanently sealed.

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<sup>1</sup> Public buildings are defined in 20 VSA §2730. In short, any building that is not a single-family residence or a farm building is considered a public building.

- (iii) All sludge must be removed from the tank, and the tank's interior must be cleaned. This may involve entering the tank through a manway built into the tank, or by cutting a hole in the tank. Applicable OSHA confined space entry rules must be followed, and all tank bottom waste and spent cleaning solutions must be handled as hazardous waste.
  - (iv) Prior to transporting, the exterior of the tank must be scraped to remove loose backfill. The tank interior must be rendered inert to ensure that it is not subject to reaching an explosive condition (vapor buildup to the Lower Explosive Limit, or LEL) and it must be properly placarded on the ends and sides. Transportation of the tank must be in accordance with applicable state and federal transportation rules.
- C) Non-explosive (8-604(c)).** Before removal or cutting open, all tanks must be rendered non-explosive in accordance with UST Rules § 8-604(b). This may be accomplished by disconnecting all piping except the vent line, and sealing all openings in the top of the tank. Then, keeping the vent line connected and open, the tank can be rendered non-explosive by either:
- (i) **Inerting:** inserting dry ice (solid carbon dioxide) into the tank in the amount of 1.5 pounds per 100 gallons of tank capacity. Once the dry ice has fully sublimated, the gaseous carbon dioxide should displace the oxygen from the tank's interior. Alternatively, nitrogen or another non-combustible gas may be introduced into the tank, but at low pressures (1.5 psi or less) to avoid buildup of static electricity. The tank is not considered inert until an oxygen meter registers less than 10% oxygen when measurements are taken 1 foot from the bottom of the tank, the middle of the tank's diameter and at the tank opening; or
  - (ii) **Purging:** ventilating the tank with air using an explosion-proof gas exhauster operated with compressed air. An eductor may also be used with compressed air. The tank is not adequately purged until an explosivity meter registers less than 10% of the LEL when measurements are taken 1 foot from the bottom of the tank, the middle of the tank and at the top of the tank.
- D) Tank removal (8-604(d)).** Tanks must be removed from the ground except where removal could compromise the integrity of a nearby structure or an adjacent fiberglass tank. The Agency will only approve in-place closure on a case-by-case basis. In such cases, the "Procedure for In-Place Closure of Underground Storage Tanks" (found in section IV) must be followed.

Any tank that does not meet the construction standards for new tanks contained in the UST rules must be rendered inoperable to prevent unauthorized re-use. A removed UST must meet the requirements of § 8-402(c) of the Vermont UST Rules prior to reuse. Vermont's Fire Prevention Code prohibits re-use of USTs for aboveground use.

- E) Soils management.** Management of petroleum-contaminated soil is a complex issue, and a thorough discussion is beyond the scope of this guidance document. For more information on managing contaminated soils, see the guidance document entitled "[Investigation and Remediation of Contaminated Properites Procedure](#)" If you are reading this document on paper, or if the link does not work, the soils management document is at this address: <http://www.anr.state.vt.us/dec/wastediv/sms/smsgdint.htm>

The following guidelines are only a brief overview of Vermont's soil handling requirements.

Excavation should be conducted to limit the amount of soil removed from the ground. Contaminated soil should be segregated from uncontaminated soil. In addition, contaminated soil should be segregated by degree of contamination. If soils are temporarily stockpiled on site, the stockpile shall be constructed to minimize vapor releases to the air, to minimize the transfer of contaminants to groundwater and to minimize any threat to public health or safety. This is commonly done by stockpiling the soils on a sheet of 8-mil (or thicker) polyethylene, and covering the pile with a layer of the same material.

If contamination is encountered during the tank removal, one option to consider is conducting further characterization and removing the full extent of contamination. This approach could preclude the need for a follow-up investigation. It may be a cost effective option to remove the contamination while the tank grave is open and equipment capable of removing and disposing of soils is already on site.

The PID screening levels which generally trigger the need for further evaluation are 20 ppm for gasoline contaminated soils or 10 ppm for fuel oil or diesel fuel contaminated soils. If you wish to remove all the contamination by excavation, prerequisites for this option are (1) the full extent of contamination can likely be delineated, (2) the majority of the contamination can be readily removed, (3) an acceptable soil disposal plan is in place and (4) approval is granted for the soil removal by the Sites Management Section. At sites where the PID readings are all below these screening levels, soils can be backfilled unless such an action would result in an adverse risk to receptors.

The State may also approve a limited soil removal even if the full extent of contamination is not identified if such a removal is shown to significantly lessen the risks to sensitive receptors. As long as proper procedures are followed, the removal of petroleum contaminated soils is generally an activity whose costs are eligible for reimbursement from the Petroleum Cleanup Fund, though certain limitations apply. For more information refer to the document entitled [Procedures for Reimbursement from the Vermont Petroleum Cleanup Fund](http://www.anr.state.vt.us/dec/wastediv/sms/pubs/PCFReimb.pdf) (<http://www.anr.state.vt.us/dec/wastediv/sms/pubs/PCFReimb.pdf>).

If it is impractical to remove the full extent of contamination due to obstructions in the tank area or the presence of a shallow groundwater table, or the contamination is too extensive to effectively delineate and remove, all soils should be backfilled and a subsurface investigation should be carried out under guidance of the Sites Management Section. A complete discussion of site investigation procedures is also beyond the scope of this guidance document.

or more detailed information on site investigation, see the guidance document entitled [Investigation and Remediation of Contaminated Properties Procedure](http://www.anr.state.vt.us/dec/wastediv/sms/pubs/IROP.pdf) (<http://www.anr.state.vt.us/dec/wastediv/sms/pubs/IROP.pdf>).

**Excavated soils that are contaminated may not be transported off the site without first obtaining written authorization by the Agency.**

In locations where there is insufficient space to stockpile soils, an alternative off-site location for stockpiling soils should be located and approved by the Agency before the tank is removed. Delays can occur if an off site location has to be found and approved by the Agency during the UST removal. Therefore, remember to plan ahead. At a minimum, an off site location must meet the following criteria before receiving Agency approval for off-site soil treatment:

- There are no bedrock drinking water supplies within a 200 foot radius.
- There are no shallow water supplies within a 200 foot radius. This requirement may be extended if shallow water supplies are shown to be hydraulically downgradient.

- There are no sensitive environments such as a stream, river, lake, pond, wildlife refuge, wetland, floodplain, Class I or Class II groundwater zone or other similar areas, within 100 feet of the treatment location.
- There is adequate room to allow for treatment to occur over the necessary time frame.
- The location can be made secure from public access.
- The location is not in a residential area.
- Written approval from the landowner, if different from generator, is obtained before treatment begins.
- The off-site location must be noticed to the local government prior to initiating any soil treatment. Necessary local permits should be obtained. The responsible party must provide evidence to the Agency that this notification has been made.

**Note: An Off-Site Soil Treatment Request Form is available in Appendix B of the publication called "[Investigation and Remediation of Contaminated Properties Procedure](#)."**

**F) Closure reporting and site assessment required (8-604(d)).** The owner of a category one, category two, or category three tank is required to submit a site assessment in accordance with Section III of these guidelines and 8-604(d). It is highly recommended (though not required) that a site assessment be conducted for category four tanks during tank removal.

The site assessment report must be sent to the DEC, so the UST Program can forward the necessary form to the owner in order to update information both in the local land records, and in the State's notification and permit records. If the site assessment report is incomplete or improperly completed, the DEC will require additional work. Any additional work requested by the DEC to fulfill UST Closure Assessment requirements will not be eligible for reimbursement from the Petroleum Cleanup Fund.

It is the responsibility of the tank owner to gather and report all necessary information to adequately describe the site conditions within ten (10) days of closure or upon the request by the Agency within 72 hours of closure. The UST closure report and site assessment shall contain, at a minimum, the following:

- (i) A completed and signed UST tank closure form;
- (ii) A site sketch map that contains the following
  - (a) street names,
  - (b) UST location,
  - (c) property boundaries,
  - (d) adjacent properties, buildings, storm drains, sewers, water lines, monitoring wells, water supply wells within 500 feet of the site location,
  - (e) adjacent surface waters, sensitive environmental areas (wetlands, etc.), recreation areas, etc.
  - (f) The site map must be as accurate and precise as possible. A scale of 1 inch = 50 feet is recommended, but should not be smaller than 1 inch = 100 feet. (Water supply wells within 500 feet of the tank site should be included on the map; an arrow pointing toward a well and its measured distance from the tank area may be used if the well is far enough away that it will not fit on the map area.)

(iii) A written report describing the site conditions that were observed at the time of tank closure. The report should contain the information specified in Section III of this guidance document.

- G) Release reporting.** The DEC must be notified of a release of two gallons or more of petroleum products on its discovery. During normal business hours, notification can be accomplished by contacting the UST Program at (802) 828-1138. Outside normal business hours, notification can be accomplished by contacting the Department of Public Safety's 24-hour hotline at (800) 641-5005. If conditions suggest a release may have occurred (e.g. staining or strong vapors in the soils, free product or sheens on the groundwater, etc.), it must be reported immediately.

### III. Guidelines for Performing a Site Assessment at Petroleum UST Closure Sites

A site assessment must be conducted by a qualified consultant or engineer with experience in environmental sampling for the presence of hazardous materials. A site assessment must evaluate the degree and extent of petroleum contamination, if any exists, and must identify threats to public health and the environment. The following guidelines have been developed to address the issues involving the assessment of petroleum contamination:

**A) Site Characteristics and Contaminant Investigation Results** One of the most important steps in the site assessment process involves searching for contaminants where they are most likely to be encountered. Some of the most common areas to find contamination include, but are not limited to the following: around the fill pipe, along the piping trench, underneath the dispensers, and the tank excavation itself. The site characterization and investigation shall include the following:

- unusual site conditions;
- unusual conditions observed downgradient of the tank site;
- leak detection records;
- inventory records (including water pump outs);
- complaints or reports from neighbors or employees;
- on-site weather conditions;
- a brief analysis of surrounding land uses;
- identification of any particularly vulnerable buildings such as hospitals, nursing homes, schools, day care centers, along with their respective populations;
- A description of the site geology and hydrology must be completed, which will include some, if not all, of the following:
  - Soil technical data using the unified Soil Classification System (SCS) or AASTHO (American Association of State Transportation and Highway Officials) classification (type, thickness, texture);
  - Hydrogeology (permeability, depth to water table, groundwater flow direction, etc.);
  - Strata (different layers of sand, gravel, silts, clays, etc. must be identified);
  - Bedrock (description, location, characteristics, etc.);
- The degree and extent of any petroleum contamination should be identified on site. This generally will include extensive field measurements with a photoionization detector (PID) or equivalent. Field readings are expected throughout the entire excavation, taken at various depths as well as throughout the area laterally. If appropriate, the following information must also be included:
  - Test pit and boring log data (description, methods and results);

- Field observations and studies (soil gas, odor, seeps in banks, sheens on surface water, vapors in basements etc.);
- Sampling of adjacent water wells and analytical results;
- Free product thickness (if any).

**B) Receptor Analysis.** A complete site assessment must include an analysis of all possible receptors of petroleum contamination. A receptor is any location — either natural or made by people — that could be adversely affected by petroleum vapors or liquid product. Examples include lakes, streams, wetlands, basements of buildings, water supply wells, etc. A thorough and complete analysis of all potential receptors is essential since the DEC carefully considers sensitive receptors and contamination levels when determining what level of remedial activity is warranted.

**C) Analytical Methods and Results.** If samples are taken for laboratory analysis, the following documentation must be provided:

- Material sampled and analytical test to be done on that sample.
- Sampling method. The DEC requires discreet samples and will not accept the results of composite samples.
- Results, if available. If results are not included in the report, indicate when they are expected.

Laboratory samples are required for a complete assessment for an UST that contained heavy fuel oil or used oil. For #4 and #6 fuel oils, laboratory analysis for volatile organic compounds (VOCs) by gas chromatograph / photoionization detector methodology (e.g., EPA Method 8021B) and an approved Total Petroleum Hydrocarbon (TPH) method must be used. For used oil, laboratory analysis for RCRA 8 total metals, PCBs, Cyanides, volatile organic compounds (VOCs) and semi volatile organic compounds (SVOCs) by gas chromatograph / mass spectrometry methodology (e.g., EPA Method 8260 and 8270), and an approved TPH method must be used. In most cases, a minimum of two samples per excavation will be required.

**Note: For cases in which soil excavation is conducted as a remedial measure, laboratory samples are required to confirm that all of the contamination has been removed, and that no further investigation (such as groundwater monitoring wells) is needed.**

The UST program understands that analytical results are not often available within 10 days of the tank closure. Unless extreme circumstances warrant expedited analysis and reporting procedures, it is acceptable for laboratory results to be sent in after the initial site assessment form and report are submitted to the UST program.

**D) Conclusions and Recommendations.** The site assessment report must include conclusions and recommendations, including, but not limited to the following:

- Has there been a release of a hazardous material? If so, what was the most likely source of that release?
- What risk does the contamination pose to public health and the environment?
- What further work is needed to better characterize the contamination?
- The most likely cause of the release: spills and overfills, piping leaks, tank failure or any other factor that may have contributed to release. The UST program is tracking the frequency of UST system releases, and which components of the system fail most often. It is helpful to have a consultant's professional opinion on what caused the release.

***The most important conclusion and recommendation is whether the site needs further investigation and/or remedial action. If so, explain which further steps are warranted and why. Any affected or threatened receptors must be clearly identified.***

- E) Quality Assurance/Quality Control.** One of the most important requirements of a site assessment is the quality control/quality assurance program. This ensures that accurate and reliable information is collected so that a proper assessment of the site can be made. All field measurement instruments must be properly calibrated prior to each day's use. A calibration log must be kept to document these measurements. This information must be provided upon DEC request to validate information and conclusions. Any samples collected for laboratory analysis must follow state or federal protocols. The sampling and analysis methods and plans must be provided upon DEC request. All sampling for laboratory analysis must have proper QA/QC samples, including field or trip blanks and duplicate samples.

All monitoring equipment, which is used during the tank closure and site assessment, must be appropriate for that type of use and must be properly maintained and calibrated. For gasoline, kerosene, diesel fuel, and #2 fuel oil, the DEC requires the use of a photoionization detector (PID) for measuring soil contamination levels. Other instruments or measurement methods must have prior approval from the DEC. PID measurements are useful, but by themselves are insufficient, for assessments where USTs contained heavy fuel oils and/or waste oil. For waste oil and heavy fuel oils, laboratory analysis of representative and discreet soil samples is necessary, since PIDs often will not respond predictably to these contaminants.

- F) Minimum Requirements for Conducting Site Assessments.** Federal OSHA requirements in 29 CFR 1910.120 mandate that any employee working in a hazardous environment, including petroleum contamination must have proper training. This training is the employer's responsibility and will be needed to conduct UST closure site assessments.

The DEC also requires proper field instrument training for equipment used in the assessment and proper training of sample collection. In addition, the DEC recommends training in, and practical experience with, at least one of the following areas: engineering, soil science, hydrogeology, geology and/or earth sciences. Site assessments conducted inadequately or by unqualified personnel will be returned, and further information will be required.

#### **IV. Procedure for In-Place Closure of Underground Storage Tanks**

In-place closure of an underground tank must be preapproved by the UST Program.

In cases where a tank is to be closed in-place, excavation to access the top of the tank is still necessary.

Closing a tank in-place is often more expensive than removing a tank from the ground, since extra steps are involved and additional worker safety requirements must be followed.

The DEC will allow fill-in-place closure to be utilized in special conditions. However, a site assessment must still be conducted; this process does not release tank owners from the responsibility for conducting a site assessment and dealing appropriately with any contamination. If contamination is found the state may require the responsible party to retain a qualified consultant to conduct further investigation. These consultants must follow state guidelines in remediating impacted soils, groundwater or surface waters.

The following guidelines have been prepared to assist in meeting these requirements:

- A) The tank owner shall comply with sections II(A) [Notification]; (B) [Residual liquid and waste management]; and (C) [Non-explosive].
- B) After the tank has been properly cleaned, holes can be drilled through the tank side-walls, end-walls, and bottom so that soil samples can be collected without excavating around the tank. This method is usually suitable only in cases where excavation beside the tank is impractical. The consultant conducting the assessment is responsible for complying with all applicable health and safety rules, including confined space entry procedures. Subsurface environmental contamination can also be assessed by using one of the following methods:
- (i). Excavation beside the UST to some depth below its underside, usually with a backhoe<sup>2</sup>; or
  - (ii). Groundwater monitoring well installation beside and downgradient of the UST<sup>3</sup>; or
  - (iii). Soil boring with spoon sampling<sup>4</sup>; or
  - (iv). Any other method as approved by the Agency in advance.
- C) Once the tank's interior is clean and samples have been collected, the tank can be filled to capacity with an inert material (such as sand or concrete slurry) until all voids are filled.
- D) If piping is to be removed it should be disposed of appropriately. If piping will remain in the ground, it must be drained and purged as described in Section II(B)(ii) on page 1; and
- E) The provisions of section II (F) [Closure reporting and site assessment] and (G) [release reporting] apply to tanks closed in-place.

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<sup>2</sup> Excavation beside the UST is one way to confirm whether contamination is present. In areas where underground lines may be present, Dig Safe will need to be called for reference information.

<sup>3</sup> Where backhoe operation is deemed impractical, groundwater monitoring wells may be used. Groundwater monitoring wells are best installed by employing a hollow stem drill rig. A drill auger penetrates the ground and removes soil. When groundwater is located, a monitoring well, usually made of slotted PVC pipe, is put in-place. The auger is then withdrawn, and the slotted PVC pipe is backfilled with a special filter sand. Through the use of a bailer, groundwater sampling can be performed.

<sup>4</sup> Soil boring with split spoon sampling also involves the use of a drill rig. Soil samples are drawn at specified intervals using a split spoon sampler, typically every five feet of drilling. The soils can either be analyzed on site by utilization of a PID, or may be sent to a laboratory for analysis.