

UST CORRECTIVE ACTION MANUAL



**Energy and Environment Cabinet
Division of Waste Management
Underground Storage Tank Branch
300 Sower Boulevard
Frankfort, Kentucky 40601
502-564-5981**

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1.0 INTRODUCTION

This document establishes the procedures regarding corrective action as defined in 401 KAR 42:005, which includes release response and reporting, initial abatement, site check, closure, site investigation, corrective action, corrective action plan, and underground storage tank (UST) facility classification as established in 401 KAR 42:060.

The UST Branch shall have final authority to determine all reimbursable actions, including site characterization and corrective action technologies. The eligible reimbursement of actions directed in accordance with this manual shall be made in accordance with 401 KAR 42:250, Petroleum Storage Tank Environmental Assurance Fund (PSTEAF) reimbursement. All submissions are subject to a technical completeness determination prior to reimbursement or issuance of a no further action (NFA) letter.

The UST Branch reserves the right to require additional information beyond that specified in this manual. If additional information is required, the UST Branch shall contact the owner or operator in writing.

Fieldwork or reporting, in accordance with Sections 2.3 (directed initial abatement measures), 3.0, 4.0 (permanent closure activities under 401 KAR 42:330), 5.0 and 6.0 of this manual, shall not be initiated prior to the issuance of a written directive by the UST Branch. For questions regarding reimbursement, contact the UST Branch Claims and Payment Section at (502) 564-5981.

If free product is encountered within the excavation zone of an active UST system, the owner and operator shall initiate free product recovery as necessary to prevent any further release of regulated substance into the environment.

For definitions of terms used within this manual, refer to 401 KAR 42:005.

The owner/operator/contractor/consultant bears the responsibility of exploring, identifying and addressing all potential safety hazards throughout the course of their fieldwork.

2.0 RELEASE RESPONSE AND INITIAL ABATEMENT

This section is provided to assist owners, operators, and contractor/consultants in complying with UST system release response procedures in 401 KAR 42:060. An owner and operator of an underground storage tank (UST) system(s) regulated by 401 KAR Chapter 42 shall, in response to a confirmed UST system release outside the excavation zone, comply with this section in order to protect human health, safety and the environment, prior to the issuance of a written directive from the cabinet.

In addition, this section provides the minimum UST system release response and initial abatement procedures for responding to the confirmed presence of free product or fumes/vapors outside of the excavation zone, with the exception of free product or fumes/vapors discovered in borings, monitoring or recovery wells or during over-excavation activities. The cabinet reserves the right to require additional information if necessary.

If free product is encountered within the excavation zone of an active UST system, the owner and operator shall initiate free product recovery as necessary to prevent any further release of regulated substance into the environment.

For information regarding reimbursement, refer to 401 KAR 42:250 and the UST PSTEAF Reimbursement Rates.

2.1 Release Response Reporting

In accordance with 401 KAR 42:060, Section 1, an owner and operator shall report, immediately, any suspected UST system release, or unusual operating conditions, unless:

1. The system equipment or component is found not to be releasing regulated substances to the environment;
2. Any defective system equipment or component is immediately repaired or replaced; and
3. For secondarily contained systems, any liquid in the interstitial space not used as part of the interstitial monitoring method is removed immediately.

Confirmed releases, spills, and overfills shall be reported as a suspected release, in accordance with KRS 224.1-400(11), to the cabinet's 24-hour Environmental Response Line at (800) 928-2380, or (502) 564-2380, and appropriate authorities at the local, state, or federal level, for any one (1) of the following:

- A. A confirmed UST system release into the subsurface of any amount;
- B. An aboveground release of petroleum products (excluding diesel) in excess of twenty-five (25) gallons;
- C. An aboveground release of diesel in excess of seventy-five (75) gallons;
- D. An aboveground release of hazardous substance in excess of the reportable quantity under CERCLA (40 C.F.R. Part 302); or
- E. Vapors in surrounding structures resulting from any of the above.

The Incident Number assigned to the release report by the cabinet's Environmental Response Line shall be included in the initial abatement report.

If free product is discovered within the excavation zone during permanent closure, or during optional soil removal outside the excavation zone as described in Section 4.16 of this manual, the reporting procedures of Section 4.7 of this manual shall apply.

An owner and operator shall report an aboveground release, of less than the quantities listed above and not otherwise reportable, that cannot be cleaned up within twenty-four (24) hours, to the cabinet's 24-hour Environmental Response Line at (800) 928-2380 or (502) 564-2380, and appropriate authorities at the local, state, or federal level.

2.2 Initial and Immediate Response

If a UST system release is confirmed, initial and immediate responses shall be performed as required by 401 KAR 42:060 to protect human health, safety and the environment. An attempt shall then be made to locate the source and eliminate any life threatening conditions that may result from a UST system release. Attention shall then be focused on preventing further UST system releases into the environment, determining the media affected by the UST system release, and determining the need for, and type of, any response measures required to abate the UST system release as required by written directive from the cabinet.

A status letter shall be submitted (e.g., email, fax, etc.) to the cabinet within forty-eight (48) hours of the release report, briefly outlining actions taken and proposed future actions. The status letter shall also include a site sketch indicating the location of the UST system release, photo documentation of free product encountered and, if applicable, a map demonstrating the location of the release relative to nearby buildings that may be affected by vapor intrusion.

Refer to Section 3.13 of the UST PSTeAF Reimbursement Rates document, incorporated by reference in 401 KAR 42:250, regarding eligible reimbursement for initial and immediate response actions.

2.2.1 Mitigate Fire and Explosion Hazards

If it is determined that regulated substance(s) have entered the environment and could result in a fire or explosion, the owner and operator shall identify and mitigate any and all fire and explosion hazards within buildings or utility conduits. If there is a danger of fire or explosion from a release of a regulated substance(s), contact the local fire department or disaster and emergency services as appropriate.

Vapor intrusion that does not pose fire or explosion hazards, except those addressed in response to actions directed by the cabinet's Emergency Response Team (ERT) under a declared emergency, shall be addressed as directed in writing by the cabinet, in accordance with Section 5.0 of this manual, in order to be reimbursable in accordance with 401 KAR 42:250.

2.2.2 Prevention of Further UST System Releases

An owner and operator shall take any immediate action necessary to prevent any further UST system release into the environment. If a tank is determined to be leaking, the tank and piping shall be emptied, and product shall not be added, unless under professional guidance for overfill testing. If piping is determined to be leaking, the suspect dispenser shall be taken out of service. An owner and operator shall never wash spilled regulated substance(s) into the sewer, and shall try to keep the spill from spreading, possibly by constructing berms or using absorbent materials.

2.2.3 Cleanup of Spills and Overfills

An owner and operator of UST systems shall immediately contain, and initiate cleanup of, a surface spill or overfill of a regulated substance in excess of the reportable quantity as listed in Section 2.1 of this manual. Construction of berms and/or the use of absorbent materials, pumping, or bailing, may reduce the amount of impact to the environment.

2.3 Directed Initial Abatement Measures

Written directives from the cabinet (in accordance with 401 KAR 42:060 and 40 C.F.R. 280 Subpart F) may require, but are not limited to, the following:

- A. Removal of product from the UST system;
- B. Visual inspection for UST system releases;
- C. Continued monitoring for fire or safety hazards;
- D. Remediation of any hazards from excavated or exposed contamination;
- E. Measuring for the presence of a UST system release;
- F. Investigating for the possible presence of free product;
- G. An Initial Abatement Report;
- H. Free product recovery and disposal, recycling or treatment at a permitted facility;
- I. Migration abatement;
- J. A Free Product Recovery Report; or
- K. A vapor intrusion investigation.

When sampling is performed in response to actions required by this section, refer to Sections 8.0 and 9.0 of this manual for more information regarding analytical procedures, equipment decontamination and investigation derived waste management and disposal.

An owner and operator may proceed with additional initial abatement measures described in this section, prior to UST Branch approval of costs, however costs incurred prior to UST Branch approval shall not be reimbursable.

3.0 SITE CHECK

This section identifies procedures for compliance with a Site Check request by the UST Branch. The goal of a site check is to determine whether a release has occurred outside the excavation zone, in accordance with 401 KAR 42:060. The UST Branch will issue a written directive for all required site check activities. The UST Branch reserves the right to require additional information beyond that specified in this manual. If additional information is required, the owner or operator shall be contacted, in writing, by the UST Branch.

3.1 Applicability

In accordance with 401 KAR 42:060, an owner and operator shall perform a site check as directed by the UST Branch in response to a suspected release. The site check shall measure for the presence of a release where it is most likely to have occurred at a site.

The UST Branch may require a site investigation if contamination levels, outside the excavation zone, exceed the screening levels prescribed in Section 7.0 of this manual for regulated petroleum UST system(s).

3.2 Eligible Reimbursement

For information about reimbursement eligibility, refer to 401 KAR 42:250, the UST PSTEAF Reimbursement Rates document, incorporated by reference in 401 KAR 42:250, or contact the UST Branch's Claims and Payments Section at (502) 564-5981.

3.3 Reporting

A confirmed release shall be reported immediately, in accordance with KRS 224.1-400(11), to ERT at (800) 928-2380 or (502) 564-2380. The Incident Number assigned to the reported release shall be included in the Site Check Report.

A Site Check Report shall be completed in response to a written directive from the UST Branch and shall document the presence or absence of contamination. The Site Check Report and UST Site Check Checklist, DWM 4268, shall be certified by a Professional Engineer (P.E.) licensed with the Kentucky Board of Licensure for Professional Engineers and Land Surveyors, or a Professional Geologist (P.G.) registered with the Kentucky Board of Registration for Professional Geologists. The Site Check Report shall include, at a minimum, the items listed on the UST Site Check Checklist, DWM 4268, and include the information described below.

- A. A UST Classification Guide, DWM 4261, certified by a P.E. or P.G.
- B. Detailed description of the incident that initiated the site check.
- C. Site and area description:
 - 1) Current use of adjacent or nearby properties;
 - 2) Adjacent UST sites, including Agency interest (AI) numbers (e.g., sites that share common property boundary(s), site that are across the street, etc.);
 - 3) Identify and provide a description of local surface and subsurface water use (both public and private); and
 - 4) Identify and provide other pertinent information relevant to the site and local area.
- D. Discussion of past and present UST and piping systems at the site. Information shall include tank size, depth of the excavation zone, past and present contents, installation dates, and construction materials of the tanks and piping.
- E. A detailed site map illustrating the tank and piping locations, all sampling locations, depth of all tank pit excavations, approximate property boundaries and adjacent properties, any other pertinent features at the site, and indicate any areas where future sampling would be prohibited. The map shall also include approximate locations of all underground utility lines (to scale, indicating the type of service of each line). The map shall be to scale and include a north arrow and legend.

- F. Narrative of wellhead protection areas and domestic-use wells, domestic-use springs, and/or domestic-use cisterns.
- G. Procedures for soil and groundwater sampling and handling.
- H. Compliance documentation as follows:
 - 1) Submit a copy of the most recent tank and line tightness test. The cabinet may request an updated tank and line tightness test during site check activities;
 - 2) Submit repair or replacement records for any UST system equipment discovered to be faulty or defective during the investigation and confirmation steps in accordance with 401 KAR 42:060, Section 4, for the confirmed UST system release event; and
 - 3) Submit a copy of the twelve (12) most recent months, from the date of site check request, of monthly release detection records in accordance with 401 KAR 42:020, Section 15.
- I. Provide comprehensive conclusions based on the professional evaluation (i.e., scientific knowledge and conjecture) of the data.
- J. Based upon the nature of the release and supporting analytical data, provide detailed recommendations in accordance with Section 5.9 of this manual.

3.4 Sampling Procedures

Sample collection shall be in accordance with a written directive from the UST Branch. If samples cannot be collected in the location(s) directed by the UST Branch, samples shall be collected in an area based on the best professional judgment of the P.E. or P.G. where contamination is most likely to be present. Professional judgment shall include the nature of the substance, the type of suspected release and backfill, the depth of groundwater, and any other factors appropriate for identifying the presence of a release.

- A. Soil borings shall be advanced to a depth of at least one (1) meter below the excavation zone. Protocols for soil collection, sample handling, instrument calibration, soil boring logs, and borehole abandonment are in Section 5.3.1 of this manual.
- B. Procedures for monitoring well placement and construction, groundwater sample collection, monitoring well gauging and purging are in Sections 5.3.2 and 5.4.2 of this manual. If Groundwater Table 2 or Groundwater Table 3 screening levels are determined, through UST facility classification, to be applicable to the UST facility, the UST Branch may require an assessment at the Point of Compliance as referenced in Section 7.2.4 of this manual.

If free product is discovered in a boring during Site Check activities, include a summary of the type of free product, thicknesses, locations, etc. and recommendation for free product recovery in the Site Check Report.

3.5 Analytical Data

Refer to Section 8.0 of this manual for procedures for laboratory analyses.

3.6 Decontamination and Investigation Derived Waste Management

Provide receipts, manifests, or other documentation verifying proper disposal, treatment, or recycling of materials, at a permitted facility, generated during a site check. Refer to Section 4.17 of this manual for the management of materials.

4.0 PERMANENT CLOSURE AND CHANGE-IN-SERVICE

This section identifies procedures for permanent closure or change-in-service of UST systems, including protocols for sampling soil and/or water to assess UST facilities in accordance with 401 KAR 42:060. This document shall be used in conjunction with UST facility classification in Section 7.0 of this manual, which specifies applicable screening levels in soil and groundwater for permanent closure of regulated petroleum UST systems.

4.1 Applicability

The requirements for notification and for submission of information to the UST Branch are applicable to every permanent closure or change-of-service of a regulated UST system. The cabinet reserves the right to require additional information or sampling in order to clarify permanent closure documentation.

UST facilities with regulated non-petroleum UST systems shall conduct an assessment in accordance with this section. For non-petroleum UST systems, contact the UST Branch for required methods, detection limits, and screening levels for soil and groundwater.

Information for closure for UST systems that are not regulated under 401 KAR Chapter 42 may be obtained by contacting the Superfund Branch or the Hazardous Waste Branch at (502) 564-6716.

An individual compartment of a multi-compartment tank shall not be permanently closed in place with an inert material unless all compartments of the tank are being permanently closed simultaneously.

When piping is replaced within the same trench and the associated UST is not permanently closed, the closure assessment procedures in this section are not required, however a UST Notice of Intent to Install Underground Storage Tank or Piping, DWM 4231, shall be submitted in accordance with 401 KAR 42:020, Section 2. In these cases, confirmed or suspected releases shall be reported in accordance with 401 KAR 42:060, Section 1.

When an owner or operator performs permanent closure (removal or closure in place without replacement within the same trench) for any portion of an individual piping run, the procedures of this section shall apply for that portion.

If the assessment performed as part of a permanent closure or a change-in-service indicates that site investigation activities will be necessary, as determined by the cabinet through an evaluation of submitted information and site-specific conditions, the UST Branch shall issue a written directive to initiate the site investigation process. Eligible reimbursement shall be made in accordance with 401 KAR 42:250.

Open pit excavation management and safety is the responsibility of the tank owner and operator.

The following documents are incorporated by reference in 401 KAR 42:060 and shall be utilized for permanent closures and change-in-service procedures in this section:

- A. American Petroleum Institute Recommended Practice 1604, "Closure of Underground Petroleum Storage Tanks", (Reaffirmed 2001); and
- B. American Petroleum Institute Publication 2015, "Requirements for Safe Entry and Cleaning of Petroleum Storage Tanks", (August 2001).

4.2 Eligible Reimbursement

An owner seeking reimbursement for any permanent closure activities under 401 KAR 42:330 or for disposal or treatment of contaminated soil and/or water under 401 KAR 42:250, shall comply with eligible company or partnership, and laboratory certification requirements in 401 KAR 42:250, Sections 19 and 20.

4.3 Certified Tank/Piping Removal Contractor Requirement

Effective April 1, 1991, in accordance with 815 KAR 30:060, permanent closure of any UST system shall be performed by a certified underground petroleum storage tank removal contractor. The State Fire Marshal's office (SFMO) administers this certification program. Anyone performing removal or closure in place of a UST system shall be certified by the SFMO program and proof of certification shall be supplied, upon request, to cabinet representatives.

For more information or for a list of certified UST removal contractors, contact the SFMO at (502) 573-1702.

4.4 Standards for Closure in Place

For all tanks closed in place, every attempt should be made to follow standards as presented in, American Petroleum Institute (API) Recommended Practice 1604 "Closure of Underground Petroleum Storage Tanks", (Reaffirmed 2001). Once the tank has been evacuated and cleaned, suitable inert solid materials shall be used to backfill the tank. Only non-compressible inert solid materials shall be used as backfill. Acceptable inert materials would include sand, grout or flowable fill. The UST Branch shall preapprove all synthetic materials proposed for use as tank backfill. Whenever possible, the tank(s) shall be backfilled by first cutting a hole of acceptable size into an exposed portion of the top of the tank. Material should be introduced through this opening until it reaches the top of the opening. The volume of inert material placed in the tank shall be verified against the known volume of the tank to insure that the entire tank (minimum 80% full) has been filled with inert material.

Submit the invoice indicating the amount of inert solid materials used to backfill the tank with the submittal of the claim for reimbursement in accordance with 401 KAR 42:330.

4.5 Evacuation of Tank Contents

Tank contents shall be removed until the tank is "empty", as defined in 401 KAR 42:005, prior to permanent closure or change-in-service assessment activities. Spillage from the tank(s) shall be reported in the Closure Assessment Report (CAR). For proper management of tank contents and residual tank materials, refer to Section 4.17 of this manual.

4.6 Regional Office Notification Requirement

In all cases, a completed UST Notice of Intent (NOI) to Permanently Close UST System, DWM 4266, shall be submitted two (2) weeks prior to a permanent closure or change-in-service assessment to the Division of Waste Management regional office serving the county where the UST system will be permanently closed. This provides sufficient time to afford a cabinet representative the opportunity to be present during field activities. The NOI shall only be valid for twelve (12) months from the date received. An owner and operator failing to submit an NOI prior to permanent closure will not be eligible for reimbursement for corrective action under the Financial Responsibility Account (FRA) in accordance with 401 KAR 42:250, Section 4.

A listing of the Division of Waste Management regional offices may be obtained by contacting the Field Operations Branch at (502) 564-6716 or at <http://waste.ky.gov/ust>.

4.7 Reporting

A confirmed or suspected release shall be reported immediately, in accordance with KRS 224.1-400(11), to ERT at (800) 928-2380 or (502) 564-2380. The Incident Number assigned to the reported release shall be included in the CAR.

If free product is encountered outside of the excavation zone, with the exception of free product discovered in borings, monitoring or recovery wells, or during over-excavation activities, refer to Release Response and Initial Abatement, in Section 2.0 of this manual.

The CAR records all activities associated with the permanent closure of regulated UST systems, or a change-in-service of a UST system that previously stored a regulated substance to storage of a substance not regulated under 401 KAR Chapter 42. Required forms, appendices, and addenda submitted shall be complete and accurate, and all information submitted shall include the AI number on all pages of the document submitted. If the AI number is unknown, contact the UST Branch, Administrative Section, at (502) 564-5981.

A completed CAR shall be submitted to the UST Branch within ninety (90) days following the permanent closure or change-in-service assessment of a UST system. The CAR and UST Closure Assessment Report Checklist, DWM 4262, shall be certified by a P.E. or P.G. The CAR shall include, at a minimum, the items listed on the UST Closure Assessment Report Checklist, DWM 4262. The CAR shall also include the following:

- A. A UST Classification Guide, DWM 4261, certified by a P.E. or P.G.
- B. A detailed site history, including the present, and reasonably anticipated, future land use. Include a discussion of past and present UST systems (both tanks and piping) or any other non-regulated systems (e.g., aboveground storage tanks) at the UST site, if applicable;
- C. A scaled site map illustrating tank and piping locations, all sampling locations, depth of all tank pit excavations, optional soil removal (if applicable), property boundaries, adjacent properties, any other pertinent features at the site, and indicate any areas where future sampling would be prohibited. The map shall also include a north arrow and legend, and approximate locations of all overhead and underground utility lines (to scale, indicating the type of service of each line). The map shall depict environmental features within 50-meters of the excavation zone and shall indicate flow direction, if applicable. The map shall also depict domestic-use well, domestic-use springs, and/or domestic-use cisterns within 300-meters of the excavation zone, as identified through UST facility classification in accordance with Section 7.0 of this manual;
- D. A discussion of permanent closure activities (e.g., tank removal, closure in place, change-in-service, etc.). Include visual observations such as petroleum sheen, petroleum odors, ecological impacts, and surface water features within a 50-meter radius;
- E. A description of water encountered during permanent closure activities. The description shall include a physical description (turbidity, odor, sheen, etc.) and an estimate of the volume encountered (in gallons);
- F. Procedures for soil and groundwater sampling and handling;
- G. Photographic documentation of the following, if applicable:
 - 1) Permanent closure activities, including any water encountered within the excavation zone;
 - 2) Evidence that closed in place tanks were filled to capacity (minimum 80% full) with an acceptable inert material (the volume of the fill material shall be recorded in the CAR); and
 - 3) All domestic-use wells, domestic-use springs, and/or domestic-use cisterns located within a 300-meter radius of the excavation zone;
- H. Conclusions drawn from field activities and analytical results; and
- I. Detailed recommendations for further site investigation or no further action.

4.8 Sampling Procedures

Sampling shall be conducted in accordance with "Test Methods for Evaluating Solid Waste: Physical/Chemical Methods" (U.S EPA Publication SW-846) to ensure that a representative sample is collected.

Soil samples shall be collected with a corer, a trowel, or a similar instrument (preferably made of stainless steel). If safety conditions warrant, samples may be obtained from a backhoe bucket. Recognized methods, in accordance with U.S. EPA Standard Operating Procedures, shall be followed for decontamination of all sampling equipment. For information about the Standard Operating Procedures, contact the U.S. EPA, Region IV, Science and Ecosystem Support Division, 980 College Station Road, Athens, Georgia 30605 or call (706) 355-8500.

The following steps shall be followed for collection of soil samples from the excavation zone and piping trench areas.

- A. All preparations for soil sampling shall be made prior to excavation activities.
- B. When removing the tank(s) or piping, backfill material associated with the UST system shall be excavated. Once all backfill material has been removed from the excavation zone, excavation shall cease and initial soil samples shall be collected.
- C. Sampling locations within the excavation zone shall not be exposed for more than four (4) hours prior to sample collection. Soil samples shall be collected in accordance with Sections 4.9.1 and 4.10.1 of this manual.
- D. Soil sample collection, handling, and preservation shall be achieved in a manner that reduces the loss of volatile organic compound (VOC) contamination due to volatilization and biodegradation.
- E. Collection of soil samples and transfer of soil samples from the sampling device to the sample container should minimize disturbance and the amount of time that the sample is exposed to air.
- F. Sample collection and handling shall prevent cross contamination between samples and between sample locations.
- G. Samples shall be placed into containers with minimal headspace, stored on ice at 4°C or less (plus or minus 2°C), etc.
- H. Soil samples shall be analyzed for constituents that include all contents historically stored in the tank(s).
- I. For closed in place sampling, VOC analyses for samples collected from auger cuttings or from auger flights shall not be accepted by the UST Branch.

All water samples shall be collected, handled, and preserved in a manner that reduces the loss of VOC (volatile organic compound) contamination and that follows SW-846 and this section. A trip blank shall accompany all BTEX water samples during storage and transport. Each trip blank analysis shall be included with the laboratory analysis and shall be included as an appendix within the CAR. Trip blanks are not required for water samples collected for PAH and lead analysis when BTEX analysis is not required.

Any water or free product removed shall be properly disposed, recycled, or treated at a permitted facility, if necessary, as required in Section 4.17.5 of this manual.

4.9 Closure by Removal from the Ground

4.9.1 Soil Sampling

Once all backfill material has been removed from the excavation zone, bottom and wall samples shall be obtained from native material unless the tanks are located in fill material in which case samples of that material shall be obtained. Figure 1 illustrates locations for sample collection as discussed in Sections 4.9.1(A) through (C) of this manual. If soil samples cannot be collected as described, refer to Section 4.11 of this manual for deviations from sampling procedures. If water is encountered in the excavation zone during closure activities, refer to Section 4.9.2 of this manual for sampling procedures.

An excavation or piping trench excavated into bedrock (e.g., blasted, hoe-rammed, etc.) shall be reported in the CAR narrative, and any available soils shall be sampled accordingly.

Further assessment shall be directed in writing by the UST Branch in accordance with Section 5.0 of this manual (i.e., Site Investigation), if necessary.

A. Excavation Walls

- 1) Grid each thirty-five (35) foot section of the soil portion of the tank excavation wall, as shown in Figure 1.
- 2) Collect one (1) composite soil sample for laboratory analysis, consisting of a grab sample from each of the four (4) quadrants of the thirty-five (35) foot section.
- 3) Grab samples shall be collected where contamination is most likely to be present.
- 4) A minimum of one (1) sample shall be collected from each tank excavation wall. If a tank excavation wall is greater than thirty-five (35) feet in length, a separate composite soil sample shall be collected from each section (up to thirty-five (35) feet) exceeding the initial thirty-five (35) feet.

B. Excavation Bottom

- 1) Grid each thirty-five (35) foot section of the tank excavation bottom as shown in Figure 1.
- 2) Collect one (1) composite soil sample for laboratory analysis, consisting of grab samples from each of the four (4) quadrants of the thirty-five (35) foot section.
- 3) Grab samples shall be collected where contamination is most likely to be present.
- 4) A minimum of one (1) sample shall be collected from the tank excavation bottom. If a tank excavation bottom is greater than thirty-five (35) feet in length, a separate composite soil sample shall be collected from each section (up to thirty-five (35) feet) exceeding the initial thirty-five (35) feet.
- 5) If bedrock is encountered in the excavation zone and a bottom sample cannot be collected, this shall be noted in the CAR narrative. In lieu of a bottom sample, a composite sample consisting of grab samples obtained from the base of each tank excavation wall at the soil/bedrock interface and combined into a single sample, shall be submitted for analysis. Submit photographs of the bedrock encountered in the tank excavation.
- 6) If water prevents the collection of soil samples from the excavation bottom, refer to Section 4.9.2 of this manual.

Refer to Section 7.1.2(B) of this manual for the collection procedures of soil samples for grain size analysis.

C. Piping Trench

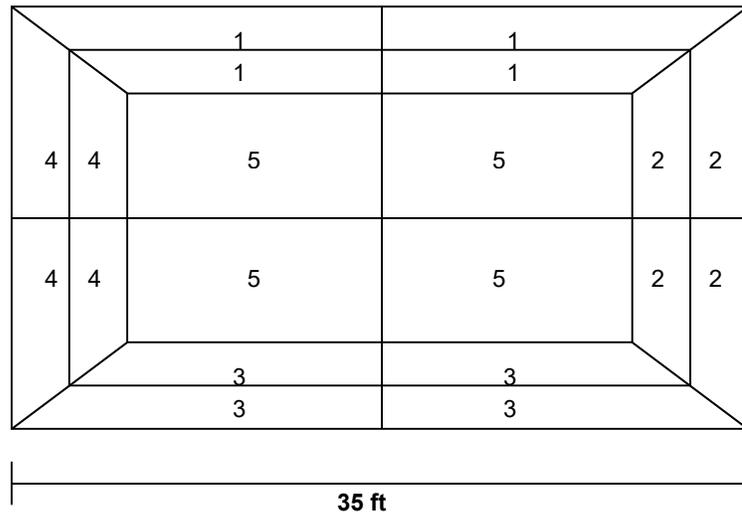
- 1) Grid each thirty-five (35) foot section of the piping trench, as shown in Figure 1. The area under the dispenser island is considered to be part of the piping trench, and soil under the dispenser pad shall be assessed (the dispenser pad may have to be removed for required sampling).
- 2) Grab samples shall be collected where contamination is most likely to be present.
- 3) A minimum of one (1) composite sample consisting of four (4) grab samples, shall be collected from the thirty-five (35) foot section of the piping trench. If the piping trench is greater than thirty-five (35) feet in length, a separate composite soil sample shall be collected from each section (up to thirty-five (35) feet) exceeding the initial thirty-five (35) feet. If applicable, the absence of a piping trench shall be explained in the narrative submitted with the report.

D. Excavated (Backfill) Material

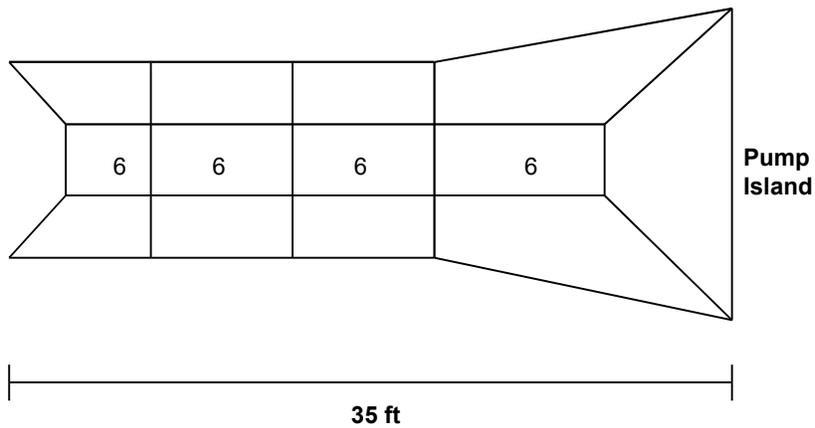
Once the tank and all backfill material has been removed from the excavation zone:

- 1) Obtain a photograph of the excavation zone, verifying all backfill material has been removed;
- 2) Backfill material generated during the removal of the tank(s) or piping shall be placed on, and covered with, plastic; and
- 3) Collect at least one (1) composite sample from the backfill material. Backfill shall be sampled as described below.
 - a) Divide the backfill material into at least four (4) equal sections.
 - b) Collect one (1) composite soil sample consisting of grab samples taken at least one (1) foot into the interior of each of the four (4) sections of each pile. Within each section, the sample shall be collected from areas where contamination is most likely to be present.
 - c) Backfill material contaminated above screening levels shall be properly disposed or treated at a permitted facility in accordance with Section 4.17.6 of this manual.

Figure 1 – Closure Soil Sampling: Tank and Piping Removed from Ground



Tank Excavation Example



Piping Trench Example

1-6 = Grab sample location

Measures shall be taken to prevent any surface runoff from entering or washing away the backfill material (e.g., berms, straw bales, etc.).

If the backfill material is to be used for unrestricted off-site use, the material shall be sampled and analytical results shall be below the screening levels for all constituents listed in Table 5 (Soil Table C), Section 7.0 of this manual.

If the backfill material is to be treated, a petroleum contaminated soil treatment facility permit is required. For additional information, contact the Solid Waste Branch, Division of Waste Management, 300 Sower Boulevard, Frankfort, KY 40601, or call (502) 564-6716.

Owners and operators of those UST facilities seeking reimbursement from the PSTEAF for the disposal or treatment at a permitted facility of contaminated backfill material shall confirm, through laboratory analysis, that contamination above screening levels is present.

Owners and operators of those UST facilities not seeking reimbursement from the PSTEAF for disposal or treatment at a permitted facility shall not be required to perform additional sampling and analysis of backfill material, beyond that required by the permitted disposal or treatment facility.

Eligible reimbursement, in accordance with 401 KAR 42:250, shall only include those costs related to the transportation, disposal or treatment at a permitted facility, and replacement (with clean material) of backfill material contaminated above screening levels, as verified through laboratory analysis, for facilities that do not otherwise qualify for reimbursement under 401 KAR 42:330 (Small Owners Tank Removal Account (SOTRA)).

The entry level, in accordance with 401 KAR 42:250, Section 5, shall not be deducted from the eligible reimbursement if the petroleum storage tank owner or operator performs optional soil removal outside the excavation zone during permanent closure, in accordance with Section 4.16 of this manual, for the transportation and disposal of:

- a) Backfill material contaminated above applicable screening levels within the excavation zone; or
- b) Pit water contaminated above applicable screening levels within the excavation zone.

Additional sampling as prescribed by the cabinet shall be performed if the backfill material is improperly stored, if any degradation of plastic or runoff barriers occurs prior to disposal or treatment at a permitted facility, or if any evidence of contamination is observed (e.g., fumes, odors, free product, etc.) peripheral to the backfill material.

4.9.2 Water Sampling

If water is encountered during permanent closure activities, a description of the water shall be included in the CAR narrative and shall include, at a minimum:

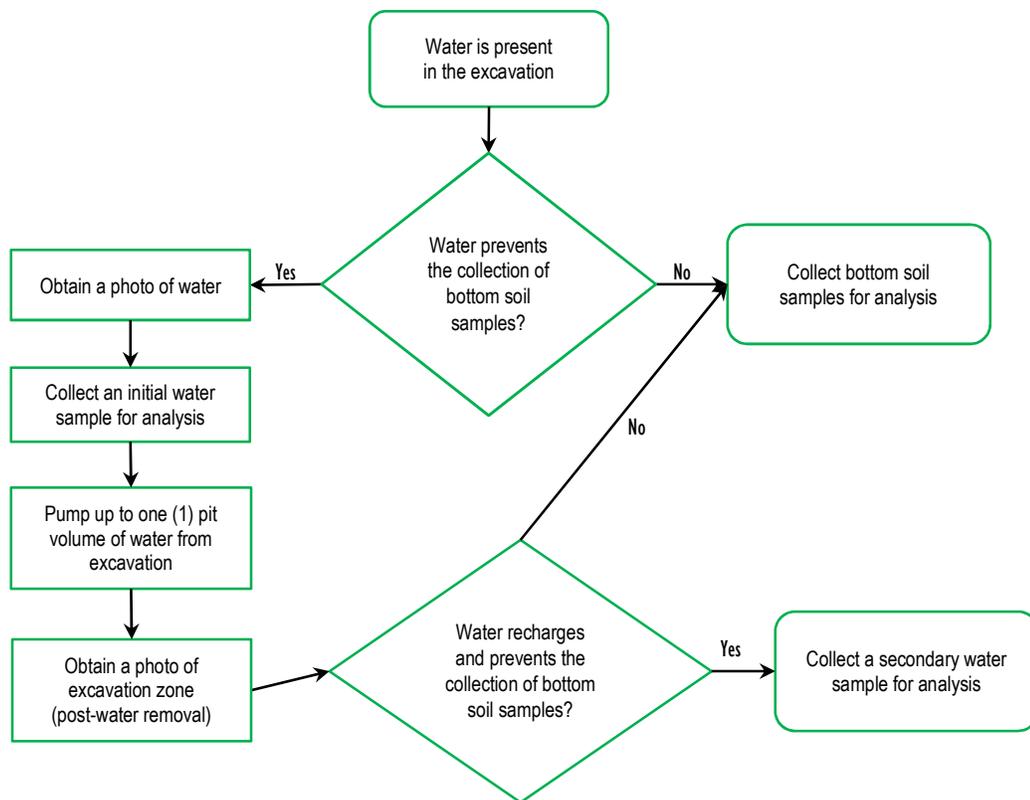
- 1) A physical description (turbidity, odor, sheen, etc.);
- 2) An estimate of the volume encountered (in gallons); and
- 3) If the water was determined to meet the definition of groundwater as defined in 401 KAR 42:005, a discussion based on this determination (e.g., water was pumped from the tank excavation or piping trench and recharge was observed).

Once all backfill material from the excavation zone has been removed and wall samples have been collected in accordance with Section 4.9.1(A) of this manual, water sampling shall be performed as described in Sections 4.9.2(A) through (E), and Figure 2 in this manual.

If water prevents the collection of soil samples from the excavation bottom, the following steps shall be followed.

- A. Obtain a photograph of the water in the excavation zone to be submitted in the CAR.
- B. Collect an initial water sample and analyze for the appropriate constituents.
- C. Remove water as a single event (up to one (1) pit volume) to observe whether groundwater recharge occurs during the permanent closure process.
- D. Obtain a photograph of the excavation zone post-water removal to be submitted in the CAR.
- E. Collect samples, based on whether recharge occurs, as follows:
 - 1) Recharge does not occur – Collect bottom excavation soil samples in accordance with the procedures in Section 4.9.1(B) of this manual; or
 - 2) Recharge occurs preventing collection of soil samples in accordance with Section 4.9.1(B) – Collect a secondary water sample to be analyzed in lieu of collecting soil samples from the bottom excavation.

Figure 2 – Excavation Water Sampling Flowchart



If water is not assessed in accordance with this section, Section 4.13 of this manual shall be met.

Any water or free product removed shall be properly disposed, recycled, or treated at a permitted facility, if necessary, as required in Section 4.17.5 of this manual. Measures shall be taken to prevent rainwater or surface water from entering the excavation zone.

If reimbursement for proper disposal or treatment of water at a permitted facility is sought, water shall be sampled and analyzed to verify that contamination exceeds applicable screening levels. During permanent closure, removal and management of water below screening levels shall not be reimbursable, unless the closure is approved in accordance with 401 KAR 42:330 (SOTRA).

4.10 Closure in Place (includes Change-in-Service)

4.10.1 Soil Sampling

The following describes procedures for the collection of representative samples from the tank excavation and piping trench areas of UST systems to be closed in place, or for the resampling of tank excavation and piping trench areas of previously closed UST systems that cannot be re-excavated. Figures 3 and 4 illustrate locations for sample collection. If soil samples cannot be collected as described, refer to Section 4.11 of this manual for deviations from sampling procedures.

Soil boring logs shall be submitted for each boring advanced for closed in place sampling. All soil boring logs shall include a description of the field screening results, soil lithology, presence/absence of water, and hydrocarbon odor.

If water is encountered in any boring, include a note in the narrative and refer to Section 4.9.2 of this manual for additional assessment procedures.

An excavation or piping trench excavated into bedrock (e.g., blasted, hoe-rammed, etc.) shall be reported in the CAR narrative, and any available soils shall be sampled accordingly.

Further assessment shall be directed in writing by the UST Branch in accordance with Section 5.0 of this manual (i.e., Site Investigation), if necessary.

A. Excavation Area

Figure 3 illustrates boring locations if one (1) UST system is to be closed in place. Figure 4 illustrates boring locations if more than one (1) tank is to be closed in place (i.e., one (1) boring at either end of each tank and two (2) additional borings along each of the remaining two (2) sides of the excavation).

- 1) Perform soil borings outside of, and as close as possible to, the original limits of the tank excavation at the ends and sides of each tank as shown in Figures 3 and 4.
- 2) Advance borings to a depth of at least one (1) meter below the bottom of the excavation zone. Continuous soil collection and soil screening (at two (2) foot intervals) is required at each soil boring location using methods designed to minimize volatilization from soil samples. A quantity of soil for screening purposes shall be collected from within every two (2) foot interval and field screened with a properly calibrated field screening instrument, (e.g., PID (photoionization detector) or FID (flame ionization detector)). A soil sample collected from approximately the same location shall be obtained and immediately preserved for possible analysis. The preserved soil sample from each boring associated with the highest field screening reading shall be submitted for laboratory analysis. If field screening does not indicate the presence of contamination within a boring, a soil sample from the termination depth of the boring shall be submitted for laboratory analysis.
- 3) Proper calibration of the field screening instrument shall be documented in the CAR narrative in accordance with Section 5.4.1 of this manual.
- 4) Drilling shall cease if bedrock is encountered prior to reaching the required depth, and the sampling required above shall be performed.

Refer to Section 7.1.2(B) of this manual for the collection procedures of soil samples for grain size analysis.

B. Piping Trench Area

- 1) Divide the piping trench length into thirty-five (35) foot sections. The area under the dispenser island is considered part of the piping trench, and soil under the dispenser pad shall be assessed.
- 2) Collect one (1) composite soil sample, consisting of grab samples from the boring locations for each thirty-five (35) foot section. A composite sample consisting of four (4) grab samples shall be collected for each thirty-five (35) foot section that does not terminate at the pump island. For each thirty-five (35) foot section that includes the pump island, five (5) grab samples shall be collected as illustrated in Figure 3. Grab samples shall be collected as close as possible to the piping and

borings shall extend at least one (1) meter below the bottom of the piping trench. Continuous soil collection and soil screening for each boring is required as described in Section 4.10.1(A)(2) of this manual. If field screening does not indicate the presence of contamination within a boring, a soil sample from the termination depth shall be selected as a grab sample to be composited.

- 3) Drilling shall cease if bedrock is encountered prior to reaching the required depth.
- 4) In each grab sample collection location, sample(s) shall be collected from areas where contamination is most likely to be present.
- 5) A minimum of one (1) composite soil sample shall be collected from the piping trench. If the piping trench is greater than thirty-five (35) feet in length, a separate composite soil sample shall be collected from each section (up to thirty-five (35) feet) exceeding the initial thirty-five (35) feet. If applicable, the absence of a piping trench shall be explained in the narrative submitted with the report.

Figure 3 – Closure Soil Sampling: Single Tank or Piping Closed in Place

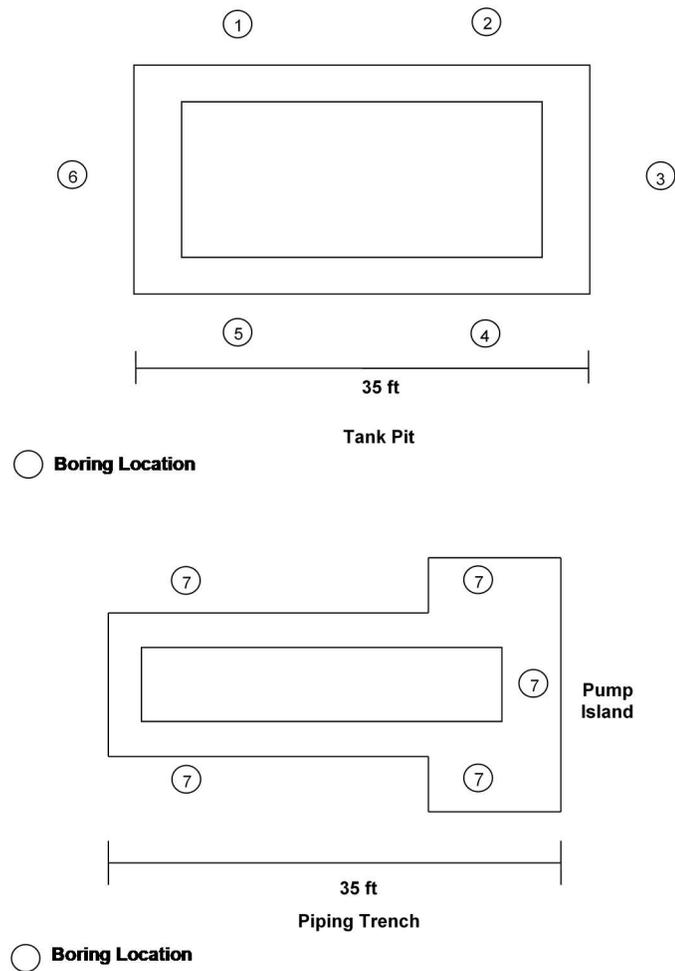
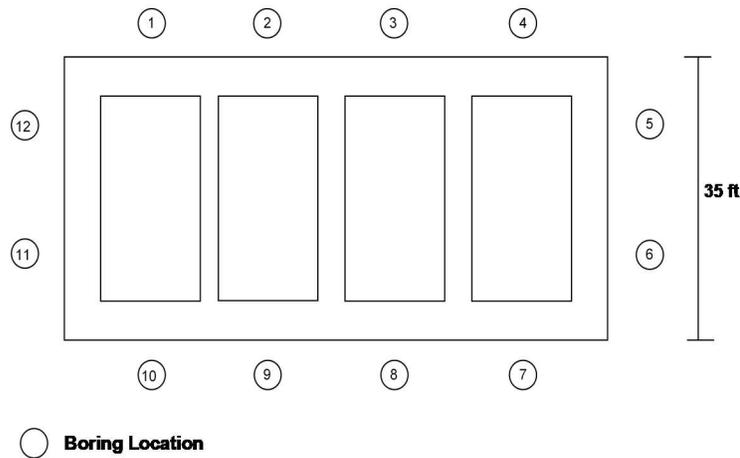


Figure 4 – Closure Soil Sampling: Multiple Tanks Closed in Place



4.10.2 Water Sampling

If, during the performance of closure in place sampling, water is encountered in one (1) or more closed in place borings, water sampling shall be performed in the following manner:

- A. Collect an initial water sample from the water bearing boring, determined by the P.E. or P.G. to most likely be contaminated, and analyze for the appropriate constituents;
- B. Remove water from the water bearing boring as a single event (up to one (1) bore volume) to observe whether groundwater recharge occurs during the permanent closure process; and
- C. If recharge occurs and accumulates within the boring, collect a secondary water sample to be analyzed.

If water is not assessed in accordance with this section, Section 4.13 of this manual shall be met.

Any water or free product removed shall be properly disposed, recycled, or treated at a permitted facility, if necessary, as required in Section 4.17.5 of this manual. Measures shall be taken to prevent rainwater or surface water from entering the closed in place borings.

If reimbursement for proper disposal or treatment of water at a permitted facility is sought, water shall be sampled and analyzed to verify that contamination exceeds applicable screening levels. During permanent closure, removal and management of water below screening levels shall not be reimbursable, unless the closure is approved in accordance with 401 KAR 42:330 (SOTRA).

4.11 Deviations from Sampling Procedures (Alternative Sampling Plan)

If samples cannot be collected in locations as described in Sections 4.9 and 4.10 of this manual, an alternative sampling plan proposal shall be submitted to the UST Branch. The alternative sampling plan shall include, at a minimum, the following information:

- A. An explanation as to why the standard sampling procedures cannot be followed;
- B. A scaled schematic or drawing of proposed sampling points; and
- C. Any other information supporting the proposed alternative sampling plan.

Prior written approval from the UST Branch shall be obtained before the proposed alternative sampling plan is implemented.

4.12 Domestic-Use Source Sampling

Water samples from all domestic-use wells, domestic-use springs, and/or domestic-use cisterns identified within a 100-meter radius of the UST system shall be sampled and analyzed for all appropriate constituents (including methyl tertiary-butyl ether [MTBE]) listed in Table 8, Section 8.0 of this manual. If water samples are collected from a domestic-use well, domestic-use spring, and/or domestic-use cistern, include a description of the point at which the sample was obtained (i.e., from a spigot/tap or wellhead). Prior to sampling a domestic-use well, a reasonable effort shall be made to collect a representative groundwater sample.

Note, a cistern does not meet the definition of a "domestic-use cistern" unless the cistern is constructed in a manner that allows infiltration of groundwater. A cistern that is filled by rainwater or by a water hauler would not meet the definition of a "domestic-use cistern".

4.13 Failure to Meet the Water Sampling Procedures

If water was encountered within the excavation zone, or borings installed for closure in place, and the procedures of Sections 4.9.2 or 4.10.2 of this manual were not met, the following procedures shall followed.

- A. Collect a water sample from within the excavation zone, or an additional closed in place boring, and analyze for the appropriate constituents.
- B. Provide a P.E. or P.G. discussion why Sections 4.9.2 or 4.10.2 of this manual were not met.
- C. Provide the process by which a water sample was collected from within the excavation zone or the additional closed in place boring.

The costs incurred to meet the procedures described in Section 4.13 of this manual are not reimbursable in accordance with 401 KAR 42:250 and 42:330.

4.14 Point of Compliance Groundwater Assessment

If groundwater, as determined in accordance with Sections 4.9.2 or 4.10.2 of this manual, is contaminated above the screening levels specified in Groundwater Table 1, the UST Branch shall, if necessary, direct in writing, in accordance with Section 5.4.2(F) of this manual, that a groundwater assessment at the Point of Compliance be performed. Eligible reimbursement shall be made in accordance with 401 KAR 42:250.

4.15 Analytical Data

Refer to Section 8.0 of this manual for procedures for laboratory analyses. If more than one (1) product was stored in a tank during its lifetime, samples shall be analyzed for all substances historically stored prior to permanent closure as identified in Tables 7 and 8 in Section 8.0 of this manual.

Refer to Section 4.1 of this manual for procedures associated with non-petroleum regulated UST system(s).

4.16 Optional Soil Removal Outside the Excavation Zone

In order to expedite the closure process, an owner and operator may, without written direction from the UST Branch, remove contaminated soil outside of the excavation zone up to 300-cubic yards (450 tons), in accordance with the following procedures for each excavation zone and associated piping trench. The optional soil removal outside of the excavation zone shall be completed within ninety (90) days from the date of permanent closure.

4.16.1 Criteria for Optional Soil Removal

If analytical results indicate soil contamination above the site-specific Class A adjusted screening levels or Class B screening levels (refer to Section 7.0 of this manual), upon completion of the initial sampling performed in accordance with Sections 4.9 and 4.10 of this manual, excavation of 300-cubic yards (450 tons) may proceed followed by sampling of the newly excavated wall, bottom, or piping trench. Confirmatory samples shall be collected in accordance with Section 4.9 of this manual.

4.16.2 Pit Water Encountered Preventing Soil Removal

Water encountered during the optional soil removal activities outside of the excavation zone, which would require removal to allow for further over-excavation, shall be removed as a single event (up to one (1) pit volume). Optional soil removal at the time of permanent closure shall cease upon encountering water that would require pumping more than one (1) pit volume during a single event to allow for further over-excavation. If reimbursement for proper disposal or treatment of water at a permitted facility is sought, water shall be sampled and analyzed to verify that contamination exceeds applicable screening levels and shall be limited to a single event up to one (1) pit volume.

4.16.3 Eligible Reimbursement

Eligible reimbursement shall be made upon confirmation of the accurate classification of the UST facility in accordance with Section 7.0 of this manual, submittal of analytical results verifying the need for additional soil removal, and that confirmation of optional soil removal at the time of closure was performed within ninety (90) days from the date of permanent closure. Optional soil removal reimbursement shall be limited to a total of 300-cubic yards (450 tons) per UST excavation zone. Refer to 401 KAR 42:250, Section 9, and the UST PSTEAF Reimbursement Rates document, incorporated by reference in 401 KAR 42:250, for specific information regarding eligible reimbursement for optional soil removal outside of the excavation zone.

The entry level, established in accordance with 401 KAR 42:250, Section 5, shall not be deducted from the eligible reimbursement if the petroleum storage tank owner or operator performs optional soil removal outside the excavation zone during permanent closure.

4.16.4 Documentation

Information related to optional soil removal at the time of permanent closure shall be documented on the UST Closure Assessment Report Checklist, DWM 4262. Additional documentation, submitted as an appendix to the CAR, shall include the following:

- A. A narrative description of soil removal activities;
- B. An indication of the presence or absence of water;
- C. Analytical results;
- D. Chain of custody;
- E. A summary of weigh tickets for soil disposal or treatment at a permitted facility that identifies the total tonnage disposed or treated (individual weigh tickets are not required with the technical report, but are required with the submittal of the claim for reimbursement);
- F. Photographs of field activities; and
- G. A scaled map of the UST facility depicting the former UST system location and the optional soil removal area superimposed with confirmatory soil sample locations labeled.

4.16.5 Disposal of Excavation Material

Any excavated material generated during optional soil removal activities shall be disposed of in accordance with Section 4.17.6 of this manual. Excavated material generated during optional soil removal activities that cannot be transported immediately to a permitted facility, shall be placed on, and covered with, plastic. Measures shall be taken to prevent any surface runoff from entering or washing away the excavated backfill material (e.g., berms, straw bales, etc.). Excavated material generated during optional soil removal activities does not have to be sampled or analyzed in order to be eligible for reimbursement for disposal or treatment at a permitted facility.

4.17 Management of Materials

The management of various products and wastes that result from permanent closure activities shall be handled and disposed, treated, or recycled properly in accordance with 401 KAR Chapters 30 through 49, as applicable. If wastes are hazardous, additional requirements pertaining to disposal, manifesting, registration, etc. shall be addressed in accordance with 401 KAR Chapters 30 through 44, as applicable. For more information, contact the Hazardous Waste Branch, Division of Waste Management, 300 Sower Boulevard, Second Floor, Frankfort, KY 40601, or call (502) 564-6716.

4.17.1 Tank Contents

All tank contents are considered a waste unless they are transported directly to a permitted recycling facility, or unless the contents removed are product which can be used without any processing or treatment. If the recycling facility can only accept a portion of the tank contents (e.g., product/water mixture) removed from the tank, all unaccepted tank contents (e.g., accumulated water, product/water mixture, and bottom sediments) not accepted by a permitted recycling facility shall be considered a waste and subject to hazardous waste determination. A listing of permitted recycling facilities may be obtained by contacting the Hazardous Waste Branch, Division of Waste Management at 300 Sower Boulevard, Second Floor, Frankfort, KY 40601 or by calling (502) 564-6716. Recycling does not include processing the tank contents through an oil/water separator.

Documentation of the proper handling of the tank contents shall include a receipt from the recycling facility that contains the following information:

- A. The AI number(s) designating the location of the UST system from which tank contents were removed;
- B. A complete description of the tank contents submitted for recycling;
- C. The amount of tank contents (gallons or pounds) submitted (per tank) for recycling; and
- D. The complete name and location of the receiving facility and all permit numbers of the receiving facility in effect the date tank contents were received.

4.17.2 Residual Tank Materials

An owner and operator shall empty and properly clean a UST removed from the ground by removing all liquids and accumulated sludge, and shall complete the UST Certification of Properly Cleaned USTs, DWM 4260. The UST Certification of Properly Cleaned USTs form shall be submitted with the CAR.

All residual tank materials are considered a waste and are subject to hazardous waste determination. The hazardous waste determination shall be conducted in accordance with 401 KAR 32:080, Section 1.

Hazardous wastes that are generated during permanent closure activities and removed from the site shall be managed at a permitted hazardous waste treatment, storage, or disposal (TSD) facility and, quantity dependent, shall be hauled by a registered hazardous waste transporter. Any site that generates hazardous waste during permanent closure activities shall register with the Hazardous Waste Branch of the Division of Waste Management and shall comply with the requirements of 401 KAR Chapter 39. For information about hazardous waste pretreatment requirements and accumulation time, certified hazardous waste transporters, permitted hazardous waste disposal facilities, and procedures for one (1) time generators contact the Hazardous Waste Branch, Division of Waste Management at 300 Sower Boulevard, Second Floor, Frankfort, Kentucky 40601 or (502) 564-6716.

Documentation of proper transport and management of both hazardous and non-hazardous waste shall include, at a minimum the following information:

- A. Documentation of the hazardous waste determination conducted in accordance with 401 KAR 32:080;
- B. A complete waste manifest (hazardous or non-hazardous as appropriate) including all required signatures and both the TSD facility's and generator's EPA identification numbers; and
- C. A receipt from the TSD facility, which shall include all of the following information:
 - 1) The AI number designating the location of the UST system from which residual tank materials were removed;
 - 2) A complete description of the waste and the waste identification codes;
 - 3) The volume of the waste generated (volume determines generator status); and
 - 4) The complete name and location of the receiving facility and all permit numbers of the receiving facility in effect the date the residual tank materials were received.

4.17.3 Cleaning Liquids and Cleaning Materials

Any liquid or solid material used to clean a UST system, whether relating to removal or closure in place, is considered a waste and subject to a hazardous waste determination. Refer to Section 4.17.2 of this manual for general information on waste determination, transportation, and management.

4.17.4 Tank or Piping Disposal

Disposal documentation of a removed tank(s) or piping shall be included in the CAR and shall document, at minimum, the information described below.

- A. If the tank(s) or piping is disposed of at a scrap metal company or a landfill, a receipt from the receiving facility shall be submitted. This receipt shall be signed by the receiving facility and shall include the receiving facility's name, address, and phone number, as well as the name of the site, the AI number, the location address, the number of tank(s) or piping, and the size of the tank(s) (if applicable).
- B. If the tank(s) or piping is not disposed of at a scrap metal company or a permitted landfill, a bill of sale from the individual or facility receiving the tank or piping shall be submitted. This bill of sale shall indicate that the individual or facility accepts responsibility for the tank or piping and acknowledges that its use will be in compliance with regulatory requirements. This document shall be signed by the individual or facility receiving the tank or piping and shall indicate the receiving individual or facility name, address, and telephone number, as well as the AI number of the site where the tank or piping was removed and a listing of all content(s) stored at any time in the tank(s). A recommended example of a bill of sale is included in Appendix A.
- C. If the tank(s) is to be reused as an aboveground tank for storage of a flammable substance, a permit of approval from the State Fire Marshal's office (SFMO) is required. Applications for this permit will be considered by the SFMO if the tank manufacturer provides information confirming the structural integrity of the tank(s) for use as an aboveground storage tank. Contact the SFMO at (502) 573-1702 regarding the application for reuse of a UST as an aboveground storage tank (AST).
- D. If the tank(s) is to be reused for any other purpose, contact the SFMO at (502) 573-1702.
- E. For tanks closed in place, indicate the type of inert solid (e.g., sand, concrete) used to fill the tank after any emptying or cleaning.
- F. For piping closed in place, indicate that the piping has both ends capped after any emptying or cleaning.

In accordance with the API Recommended Practice 1604, removed tanks shall not be used for drainage culverts or the subsequent storage of food or liquids intended for animal or human consumption.

4.17.5 Contaminated Water Disposal

Water removed from the excavation zone or borings during permanent closure, which is contaminated above screening levels, shall be properly disposed or treated in one (1) of the following manners.

- A. On-Site Treatment – If the treated water is to be discharged (e.g., storm sewer, drainage ditch, etc.) rather than taken to a registered facility, submit a copy of the one-time Kentucky Pollutant Discharge Elimination System (KPDES) water discharge permit obtained from the Kentucky Division of Water (DOW). For more information, call DOW at (502) 564-3410.
- B. Disposal or Treatment at a Permitted Facility – Submit a receipt from the receiving facility.
- C. Discharge into a Sanitary Sewer System – Submit a copy of the letter of approval or permit issued by the sewer district.

Any permit, receipt, or letter documenting the disposal or treatment of contaminated water shall include the amount of water disposed of or treated, AI number of the site from which the water originated, and any analytical results required.

Eligible reimbursement, in accordance with 401 KAR 42:250, shall only include those costs related to the transportation and disposal, treatment, or recycling of free product or water at a permitted facility, encountered during the permanent closure process, contaminated above screening levels, as verified through laboratory analysis, for facilities that do not otherwise qualify for reimbursement under 401 KAR 42:330 (Small Owners Tank Removal Account (SOTRA)).

4.17.6 Management of Contaminated Excavation Material

Excavated material contaminated above screening levels generated during permanent closure activities shall be received by a permitted disposal facility or permitted treatment facility as soon as practicable.

A petroleum contaminated soil treatment facility permit is required for a treatment facility to receive excavated material for the purpose of treatment. For additional information concerning petroleum contaminated soil treatment facility permits or to obtain a list of permitted disposal or treatment facilities in Kentucky, contact the Solid Waste Branch, Division of Waste Management at 300 Sower Boulevard, Frankfort, Kentucky 40601, or (502) 564-6716.

Excavated material treated at a permitted treatment facility shall not exceed the applicable screening levels established in accordance with Section 7.0 of this manual prior to reuse as backfill material.

If the excavated material is to be used for any un-restricted off-site purpose, it shall be sampled, analyzed, and compared to the levels specified in Table 5 (Soil Table C) in Section 7.0 of this manual. Each soil sample shall be analyzed for BTEX, PAH, and Total Lead. If analysis indicates levels above those specified in Table 5 (Soil Table C), the material shall be disposed of or treated properly.

Submit documentation indicating the amount of excavated material accepted by a permitted disposal or treatment facility. A summary of weigh tickets for soil disposal or treatment shall be submitted to the UST Branch that identifies the total tonnage disposed or treated. Individual weigh tickets are not required with the technical report, but are required with the submittal of the claim for reimbursement in accordance with 401 KAR 42:250, Section 8.

Excavated material generated during the permanent closure of regulated UST systems containing substances other than petroleum products is subject to a hazardous waste determination.

Refer to 401 KAR 42:250, Section 13, and the UST PSTEAF Reimbursement Rates document, incorporated by reference in 401 KAR 42:250, for specific information regarding eligible reimbursement.

5.0 SITE INVESTIGATION

This section identifies procedures for site investigation activities for releases from UST systems, including procedures for sampling soil, groundwater and vapor to determine the horizontal and vertical extent of contamination in accordance with 401 KAR 42:060. The UST Branch reserves the right to require additional information beyond that specified in this manual. If additional information is required, the owner or operator shall be contacted, in writing, by the UST Branch.

Site investigations shall be directed in writing by the UST Branch in order to acquire data about physical site conditions and the nature and extent of contamination. Site investigation activities have the goal of helping to develop a conceptual understanding of the release, and for the evaluation and integration of all relevant data and information to provide a foundation for the evaluation of strategies to mitigate the site-specific contaminants of concern and achieve no further action. Information collected over time may reveal data gaps that require site investigation activities other than advancement of soil borings and installation of monitoring wells (e.g., collection of deeper bedrock data via coring/monitoring wells, surface and borehole geophysical data, dye tracer data, etc.). All data collected via site investigation activities are to be used to refine the conceptual understanding of a UST site.

A Site Investigation Report shall be submitted in response to a written directive from the UST Branch. When a Site Investigation Report is not required, the UST Branch may request a Groundwater Monitoring Report (GMR) for groundwater sampling/monitoring and miscellaneous site-related activities. The GMR shall be submitted in accordance with a written directive by the UST Branch.

Submit a completed UST Site Investigation Checklist, DWM 4269, or UST Groundwater Monitoring Checklist, DWM 4264, and all other required documents as directed by the UST Branch. The UST Site Investigation Checklist, DWM 4269, or UST Groundwater Monitoring Checklist, DWM 4264 shall be certified by a P.E. or P.G. The AI number shall be clearly marked on the first page of each document.

The Site Investigation Report shall include, at a minimum, the items listed on the UST Site Investigation Checklist, DWM 4269.

5.1 Site Information and History

Provide a narrative describing the events that led to the release, remedial measures taken, and a description of the property.

5.1.1 Chronology of Events

- A. Release Scenario – Identify cause of release, source of the release, the date, duration, contaminants of concern, location(s) affected by the release, existing delineation, migration routes, and migration mechanisms.
- B. History of prior releases (including free product and vapor issues).
- C. Prior corrective action measures, removals, or engineering controls.
- D. Historic property changes or physical land modifications relevant to the release.

5.1.2 Site and Area Description

- A. Current property use.
- B. Current and historic use of adjacent or nearby properties.
- C. Adjacent UST sites, including AI numbers (e.g., sites that share common property boundary(s), sites that are across the street, etc.).

- D. Provide a discussion of all known (past and present) USTs or any other non-regulated systems (e.g., aboveground storage tanks) ever located on the subject property (e.g., tank size, all contents ever stored, installation dates, and closure dates – if applicable).
- E. Provide status of USTs on adjacent properties.
- F. Description of known or potential receptors.
- G. Provide a discussion of man-made and natural preferential flow-paths (e.g., below grade utility trenches, sewer lines, foundations, karst terrain, springs, etc.).
- H. Identify and provide a description of local surface and subsurface water use (both public and private).
- I. Identify and provide a description of other potential man-made or natural sources of like contaminants of concern.
- J. Identify and provide other pertinent information relevant to the site and local area.
- K. Provide photographs of the UST facility and contiguous properties; new photos shall be required if site features change.

5.1.3 Site Geology, Hydrogeology, and Stratigraphy

The P.E. or a P.G. shall provide a detailed summary of historic and current information necessary to address the following items in relation to the UST facility.

- A. Geology, Hydrogeology, and Surface Water Hydrology – Provide a detailed narrative of the geology, hydrogeology, and surface water hydrology at the UST site. Include lithological descriptions of the underlying geology.

Site conditions may be assessed by examining local rock exposures and road cuts; on-site and off-site reconnaissance; information obtained during previous soil boring and monitoring well drilling activities; scientific publications, and professional judgment of the P.E. or P.G. All soil and unconsolidated lithological logging shall be completed according to ASTM Designation: D-2487 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System [USCS]). The USCS is a soil classification system, used in engineering and geology professions, to give field guidance to consistently and objectively determine and describe the texture, grain size, and other pertinent properties of a soil or unconsolidated sediment.

- B. Trends in Groundwater Flow – Provide a narrative describing the general groundwater flow trend for all water-bearing units based on an evaluation of the historic potentiometric surface maps.
- C. Geologic Cross Sections – Using the available soil boring data, provide at least two (2) geologic cross sections. All geologic cross sections shall include the information and formatting as described below.
 - 1) The map location of the boreholes along the cross sections from which the geologic data were obtained.
 - 2) Provide copies of all boring logs for borings used in cross sections.
 - 3) Soil lithology and stratigraphy.
 - 4) Free product (vertical thickness and horizontal extent).
 - 5) Adsorbed soil mass identifying contaminant concentrations.
 - 6) Recent depth to groundwater elevations.
 - 7) Dissolved phase plume identifying contaminant concentrations in groundwater.
 - 8) Map legend, horizontal map scale, and vertical exaggeration scale.
 - 9) All elevations (e.g., land, monitoring wells, groundwater, natural and man-made surface, subsurface features, etc.).
 - 10) Natural and man-made surface/subsurface features along the cross section transect (e.g., tank excavations, streets, underground utilities, monitoring wells, soil borings, surface water, etc.).

- D. Karst Evaluation – If the site is located in a carbonate bedrock setting (refer to Section 7.0 of this manual), the following shall be performed.
- 1) Provide a discussion of surficial karst features, subsurface karst features, and flow regimes observed during previous site investigation activities.
 - 2) Review published research and discuss all relevant karst features such as sinkholes, sinking streams, caves, and springs in the locale surrounding the site. If available, include a summary of karst basins and dye traces, available through the Kentucky Geological Survey Publications & Maps Catalog.
 - 3) If necessary, provide recommendations for additional site characterization including a karst inventory, surface geophysical investigation, borehole geophysical investigation, and/or a dye tracer study.
- E. Wellhead Protection Areas and Domestic-Use Sources
- 1) Based on current wellhead protection area records, indicate whether the site is located within a wellhead protection area (as required under 401 KAR 5:037 Groundwater Protection Plans). Include a narrative describing the location of the site relative to the nearest extraction point(s) of the wellhead protection area.
 - 2) Provide a discussion of the inter-relationship between water-bearing zones associated with any domestic-use wells, domestic-use springs, and/or domestic-use cisterns identified during facility classification and water-bearing zones encountered at the UST facility. A similar discussion shall be provided for sites not required to submit a UST facility classification in accordance with 401 KAR 42:060, Section 7 (e.g., Pre-April 18, 1994 qualified sites).

5.1.4 UST Facility Classification Re-Evaluation

The P.E. or P.G. shall provide discussion on the current UST facility classification and whether the following criteria has changed in accordance with Section 7.0 of this manual.

- A. Soil type
- B. Depth to groundwater
- C. Distance to domestic-use wells, domestic-use springs, or domestic-use cisterns

If UST facility classification criteria has changed, the P.E. or P.G. shall make a recommendation for an amended UST Classification Guide, DWM 4261.

5.2 Maps

5.2.1 Site Survey Map

A site survey map shall be submitted as part of the Site Investigation Report. An Initial Site Survey or Supplemental Site Survey shall be completed, when requested in writing by the UST Branch, and shall be drawn to scale and include a North arrow, bar scale and legend.

- A. Initial Site Survey – A base map extending approximately 30-meters (100 feet) from the UST system excavation zone in all directions (i.e., 100-foot radius).
- B. Additional Site Survey – An addition to a site survey map, extending approximately 30-meters (100 feet) beyond the perimeter of the most recent site survey area, in the direction of confirmed contamination as directed by the UST Branch. Additional Site Surveys shall be integrated into the Initial Site Survey to produce a single map.

All site survey maps shall be legible for a technical completeness determination and shall identify, at a minimum, the following:

- 1) The approximate property boundaries of the subject site and adjacent properties;
- 2) The survey reference point (i.e., a datum or United States Geological Survey [USGS] benchmark). The reference point used for surveying the top of casing elevations for existing monitoring wells shall be identified on the site survey map, and the same reference point shall be used for future top of casing elevation measurements;
- 3) Excavation zones including depth of each excavation, material used for backfill, existing ground cover and sampling locations within each excavation area (as applicable), sampling locations within the excavation zone, confirmatory sampling locations from over-excavation;
- 4) Past and present UST systems (e.g., piping, dispenser-islands, tanks, canopies etc.);
- 5) Name and contact information for each off-site property owner;
- 6) Soil borings and soil sampling locations;
- 7) Monitoring wells, temporary monitoring wells and piezometers (a different symbol should be used to identify historic wells that have been destroyed or abandoned);
- 8) Soil vapor sample locations, including sub-slab sampling locations;
- 9) Buildings, canopies, roadways, railroad tracks, bridges, and fences;
- 10) Domestic-use wells, domestic-use springs, domestic-use cisterns, and surface water intake points;
- 11) Wetlands, surface water features (e.g., streams, ponds, lakes, springs, etc.);
- 12) Storm sewer catch basins, drainage ditches;
- 13) Utilities (e.g., overhead utilities, buried utilities, septic systems, etc.);
- 14) Paved, gravel, and grassy areas;
- 15) Trees and inaccessible steep slopes;
- 16) Any feature that would obstruct future sample collection shall be identified (e.g., when a conventional drill rig is used for sample collection, identification of areas with limited space, overhead utilities, etc., is necessary); and
- 17) All known historic and existing potential sources of contamination (e.g., USTs, tank excavations including above ground tanks and heating oil tanks, piping, and other potential sources of contamination).

As additional work is completed (e.g., additional soil borings, monitoring wells, etc.), that work shall be surveyed and added to the site survey map.

To avoid overcrowding, the UST Branch map require a site survey map for each type of media sampling or supplemented by providing enlarged portions of the map to aid the reader.

If permanent changes (e.g., construction, demolition, utility installations, etc.) could affect an ongoing investigation, these changes shall be reported to the UST Branch. A site survey map shall be amended, as directed in writing by the UST Branch, to reflect those changes.

5.2.2 Vicinity Map

Provide a map of the site and adjacent off-site properties. The vicinity map does not have to be surveyed (but should be roughly to scale). It shall depict adjacent properties within 100-meters (328-feet) of the site (businesses, residences, other UST sites and their corresponding AI numbers, etc.), and domestic-use wells/springs/cisterns located within 300-meters.

5.2.3 Aerial (Photograph) Map

Provide an aerial photograph showing the location of the site at the same or approximate scale as the site survey map.

5.2.4 Topographic Map

Provide the portion of the 7.5-minute USGS topographic map that depicts the location of the site. The portion of the topographic map submitted shall indicate the name of the map, latitude and longitude of the UST facility, and a map scale.

5.2.5 Geologic Quadrangle Map

Provide the portion of the 7.5-minute USGS geologic quadrangle map identifying the appropriate geologic unit corresponding to the site location.

5.2.6 Groundwater Potentiometric Surface Map

Provide a map for the most recent groundwater sampling and gauging event where three (3) or more sampling points are gauged. The groundwater flow direction shall be shown on the map with an arrow. Equipotential lines shall be properly labeled and shall agree with the most recent gauging data. The map shall be supported by the data and shall not include equipotential representations outside the area covered by the data. Gauging data from different sampling events shall not be combined on the same map or represented as being equivalent or simultaneous. The most recent site survey map shall be used as a base map for groundwater potentiometric surface maps.

5.2.7 Contaminant Isocontour Map

Provide a contaminant isocontour map to illustrate the horizontal extent and contaminant concentration for each applicable environmental media (e.g., soil, groundwater, soil-vapor, etc.). Individual isocontour maps shall be provided for BTEX, PAHs, and Lead according to each media impacted, as applicable depending upon the site-specific contaminants of concern.

5.2.8 Bedrock Contour Map

Provide a site-specific Bedrock Contour map using all available soil boring and monitoring well data when directed by the UST Branch.

5.3 Drilling Procedures

The UST Branch shall issue a written directive for the advancement of soil borings or installation of monitoring wells in order to collect environmental media samples (e.g., soil, groundwater, soil-vapor, surface water, etc.).

In order to advance soil borings, install monitoring wells, etc. the appropriate equipment and technology (e.g., drill rigs, direct-push technology, hand auger, etc.) shall be chosen in consideration of site conditions and direction from the UST Branch. The owner/operator/contractor/consultant bears the responsibility of exploring, identifying, and addressing all potential safety hazards throughout the course of all fieldwork.

All drilling equipment shall be decontaminated between the advancement of each soil boring, in accordance with Section 9.1 of this manual.

5.3.1 Soil Boring Advancement

A. Soil Boring Placement

If a boring cannot be advanced at the location designated by the UST Branch, the boring shall be advanced in an area based on the best professional judgment of the P.E. or P.G. A narrative description shall be provided to explain the selection of any alternate sampling location(s).

B. Soil Boring Logs

Soil boring logs shall be submitted for soil borings from the current investigation. Field screening results, from a properly calibrated instrument as described in Section 5.4.1(C) of this manual, corresponding to each two (2) foot interval shall be recorded on each soil boring log. All soil and unconsolidated lithological logging shall be completed continuously at two (2) foot intervals and completed in accordance with the Unified Soil Classification System (USCS). The USCS is a soil classification system, used in engineering and geology professions, to give field guidance to consistently and objectively determine and describe the texture, grain size and other pertinent properties of a soil or unconsolidated sediment.

All soil boring logs shall include, but are not limited to, a description of the following:

- 1) Field screening results;
- 2) Soil lithology;
- 3) Lenses or thin lithological layers encountered;
- 4) Presence/absence of water;
- 5) Presence/absence of free product; and
- 6) Hydrocarbon odor.

5.3.2 Monitoring Well Installation

Monitoring well installation shall be performed in accordance with 401 KAR 6:350. Monitoring wells shall be properly maintained and repaired throughout site investigation and corrective action activities, as required by 401 KAR 6:350. An owner and operator shall ensure that all monitoring wells are properly maintained, marked, and accessible (e.g., monitoring wells shall not be paved over).

An owner and operator seeking reimbursement from the UST Branch for monitoring well maintenance, modification, or repair, shall support a request for a directive by providing documentation such as photographs, statements, and diagrams. A written directive from the UST Branch shall be issued prior to incurring such costs in accordance with Section 3.7 of the UST PSTEAF Reimbursement Rates document, incorporated by reference in 401 KAR 42:250.

Reporting protocol for monitoring well installation, modification, and repair activities shall include the following:

- 1) Provide copies of monitoring well construction records and construction diagrams (refer to Section 5.3.2(E) of this manual;
- 2) Names of persons who performed the work;
- 3) Equipment used;
- 4) Photographs documenting the installation, modification, or repair of each monitoring well, include surrounding landmarks and features (electronic date and time stamped);
- 5) Photographs of the equipment while being used on site;
- 6) Photographs of risers and well screens prior to installation; and
- 7) A written description of the procedures followed to ensure the integrity of the monitoring wells (e.g., locking caps, watertight seals, concrete pads).

A. Monitoring Well Placement

If a monitoring well or a temporary monitoring well cannot be constructed in the location directed, the monitoring well or a temporary monitoring well shall be installed in an area determined by the best professional judgment of the P.E. or P.G. Photographic documentation shall be included in the report submitted to support the need for alternate well placement. A narrative description shall be included with the report submitted to explain the selection of the alternative location determined for the monitoring well or temporary monitoring well.

B. Monitoring Well Construction

Monitoring well construction shall be performed in accordance with 401 KAR 6:350, except that all monitoring wells shall be constructed with a minimum inside diameter of two (2) inches, regardless of installation method (i.e., direct-push and temporary wells).

- 1) Monitoring well screens and filter packs shall be installed in a manner that enables collection of groundwater samples at appropriate depths (i.e., for an unconfined aquifer, the screened interval shall be constructed so that it intersects the surface of the water table and accounts for seasonal fluctuations in the static water level – refer to Figures 5, 6 and 7).
- 2) Monitoring wells shall be properly developed, as described in 401 KAR 6:350, prior to the collection of groundwater samples.

C. Bedrock Monitoring Wells

Bedrock monitoring well construction shall be performed in accordance with 401 KAR 6:350 when directed in writing by the UST Branch. When the UST Branch issues a written directive for bedrock monitoring wells, procedures described in Section 5.3.2(B) of this manual shall be followed, as well as any special installation techniques that prevent cross contamination of aquifers.

If assessment of groundwater in bedrock is recommended, a written recommendation shall be provided in the submitted report. The recommendation shall include the following information:

- 1) Justification for investigating groundwater in bedrock. If bedrock characterization is justified, provide a detailed narrative describing the data goals and scope (e.g., surface geophysics, borehole geophysics, borehole packer tests, etc.) of the bedrock groundwater investigation;
- 2) Methods for determining bedrock well location and depth (e.g., plume geometry, surface geophysics, borehole geophysics, etc.);
- 3) Proposed well construction design and proposed well construction materials;
 - a) For single-cased bedrock wells refer to Figure 6; and
 - b) For double-cased bedrock wells refer to Figure 7;
- 4) Proposed drilling methods; and
- 5) Any additional recommendations.

Installation of a double-cased monitoring well will be directed in writing by the UST Branch if necessary based on site-specific conditions. Install the bedrock well as specified in the directive received from the UST Branch. The permanent outer casing shall be installed in accordance with 401 KAR 6:350 Section 2(3) and one (1) foot below the soil/bedrock interface. Temporary outer casing is NOT permitted.

D. Modifications and Repairs

Monitoring well modifications and repairs shall be performed and reported in accordance with 401 KAR 6:350. All monitoring well modifications and repairs shall be directed in writing by the UST Branch. If a monitoring well cannot be repaired, then it shall be abandoned as required by 401 KAR 6:350, Section 11.

E. Well Records and Construction Diagrams

In addition to the DOW reporting requirements specified by 401 KAR 6:350, monitoring well construction records and diagrams shall also be submitted as part of the report for each monitoring well installed during the current investigation.

Construction diagrams shall, at a minimum, accurately depict the depth of the screen interval, riser casing interval, filter pack, bentonite seal thickness, and grout seal thickness. A written description of the procedures followed to ensure the integrity of the monitoring wells (e.g., locking caps, watertight seals, concrete pads) shall be included in the report narrative.

F. Lost or Destroyed Monitoring Wells

If a previously installed monitoring well cannot be located or has been destroyed, a narrative detailing the steps taken to locate each lost (missing) monitoring well and photographs for destroyed monitoring wells shall be included in the submitted report.

5.3.3 Monitoring Well Abandonment

Monitoring wells shall be abandoned in accordance with 401 KAR 6:350, Section 11. All monitoring well abandonments shall be directed in writing by the UST Branch. The UST Branch will determine what abandonment method is appropriate based upon well characteristics and site-specific conditions. Reporting protocol for monitoring well abandonment activities shall include the following:

- 1) Provide copies of monitoring well records;
- 2) Names of persons who performed the work;
- 3) Equipment used;
- 4) A narrative description of the abandonment method;
- 5) A copy of the variance request submitted to DOW and variance approval or denial (if monitoring well abandonment by variance is directed);
- 6) A map depicting monitoring well location(s);
- 7) Before and after photographs of each monitoring well including surrounding landmarks and features (electronic date and time stamped);
- 8) Photographs of the equipment while being used on site;
- 9) Photographs of risers and well screens (if removed); and
- 10) Any other documentation that demonstrates the abandonment method employed matches the monitoring well record.

Temporary monitoring wells shall be installed and abandoned in accordance with 401 KAR 6:350.

5.4 Sampling Procedures

The UST Branch shall issue a written directive requiring environmental media samples (e.g., soil, groundwater, soil-vapor, surface water, etc.). Each phase of an investigation shall include a discussion of the type of environmental media sampled, as well as discussion of how the sample was collected, handled, and preserved.

All reports submitted shall include the current and historic analytical data for all environmental media samples collected in separate data tables. Data tables shall include the sample identification number, depth sampled (as applicable), date sampled, and analytical results (indicating appropriate units). Sampling data from site check, tank/piping closure activities, and/or indoor air and soil vapor investigations shall be included in the comprehensive historic data tables. Data tables shall include the appropriate screening levels for the constituents of concern. Refer to Appendix B for examples of comprehensive historic data tables.

- A. Soil data shall be reported chronologically.
- B. Groundwater data shall be grouped by sample location and sorted chronologically.
- C. Soil vapor data shall be grouped by sample location and sorted chronologically.

5.4.1 Soil Sampling

Soil sample collection, handling, and preservation procedures shall be documented and reported for all fieldwork. Each Site Investigation Report shall include a discussion of soil sample collection, handling, and preservation procedures. Soil samples shall be analyzed for the appropriate constituents (refer to Section 8.0 in this manual for procedures for laboratory analysis).

If free product is discovered in a boring during field activities, include a summary of the type of product, thickness, location, etc., and recommendations for free product recovery in the report.

A. Collection

Soil samples may be collected by split spoons, direct-push soil samplers, or hand augers. Written approval from the UST Branch shall be necessary for other soil collection methodologies.

Unless otherwise directed, field screening and lithologic characterization is required at continuous two (2) foot intervals to termination depth for each soil boring location. Field screening soil samples shall be collected for each soil boring location, as described below.

- 1) From each two (2) foot interval (or specifically directed interval), one (1) sample shall be collected for field screening using a properly calibrated instrument as described in Section 5.4.1(C) of this manual.
- 2) From the same aliquot of soil collected for field screening, a laboratory sample shall be collected, "set aside" and preserved on ice pending review of the field screening data for the soil boring (refer to Table 10 for soil preservation methods/temperatures).
- 3) Once field screening is complete for the soil boring, the laboratory "set aside" sample corresponding to the interval exhibiting the highest field screening value, in addition to any specifically directed interval(s), shall be properly preserved, packaged, and shipped for laboratory analysis.

NOTE: All soil collected for field screening and potential laboratory analysis, shall be collected from the portion of the two (2) foot interval that appears to have the greatest contaminant impact.

Unless otherwise directed, two (2) soil samples shall be submitted from each soil boring for laboratory analysis, as described below.

- 4) One (1) soil sample from the interval with the highest instrument reading (e.g., PID/FID) in accordance with item number 3 above. If field screening does not indicate the presence of contamination within a soil boring, one (1) soil sample from the middle portion of the soil boring shall be submitted for laboratory analysis. For example, if a soil boring is installed to twenty (20) feet and field screening does not indicate contamination, then one (1) soil sample will be submitted from a depth of approximately 10 (ten) feet.
- 5) One (1) soil sample from the interval representing the termination depth of the soil boring. If bedrock is encountered prior to the specified termination depth, a soil/bedrock interface sample shall be collected.
- 6) Soil sample(s) from additional intervals specifically directed in writing by the UST Branch.

NOTE: If the interval representing the soil boring termination depth contains the highest field screening value, then submit one (1) soil sample from the termination depth and one (1) soil sample from the interval with the second-highest field screening value.

B. Handling

Collection of soil samples and transfer of soil samples from the sampling device to the sample container should minimize sample disturbance and the amount of time that the sample is exposed to air. Soil sample collection, handling, and preservation techniques shall reduce the loss of volatile organic compounds (VOCs) due to volatilization and degradation. Sample collection and handling shall prevent cross contamination between samples and between sample locations. Samples shall be placed into containers with minimal headspace, stored on ice at 4°C or less (plus or minus 2°C), etc. Soil samples collected for VOC analysis from auger cuttings or from auger flights shall not be accepted by the UST Branch.

C. Instrument Calibration

Proper calibration of the field screening instrument (e.g., PID or FID) shall be documented in the Site Investigation Report narrative by recording the serial number of the instrument, the initial and final span settings, the date and time of calibration, the concentration of the calibration gas used, the manufacturer of the calibration gas (with lot number and expiration date), and the contact name and information for the person who calibrated the instrument.

D. Soil Bore Abandonment

All soil borings shall be properly abandoned immediately after obtaining a sample. Proper abandonment is achieved by sealing the boring with cement/bentonite or bentonite from bottom to top in a manner that prevents communication of surface water and groundwater through the boring and to prevent communication between two or more water-bearing zones through the boring.

If a soil boring is to be converted to a monitoring well, then the soil boring does not need to be abandoned prior to monitoring well installation.

5.4.2 Groundwater Sampling

Groundwater sample collection, handling, and preservation procedures shall be documented and reported for all fieldwork. Each Site Investigation Report shall include a discussion of groundwater sample collection, handling, and preservation procedures. Groundwater samples shall be analyzed for the appropriate constituents (refer to Section 8.0 of this manual for procedures for laboratory analysis). Any instrument utilized for field measurements shall be operated and calibrated in accordance with the manufacturer's instructions.

A. Collection

Collection and transfer of a groundwater sample from the sampling device to the sample container should minimize disturbance and limit the amount of time the sample is exposed to air. Groundwater sample collection, handling, and preservation shall be achieved in a manner that reduces the loss of VOC contamination due to volatilization and biodegradation. Sample collection shall minimize sample agitation. Sample collection and handling shall prevent cross contamination between samples and between sample locations. Samples shall be placed into containers with zero headspace, with the appropriate preservative, stored on ice at 4°C or less (plus or minus 2°C), etc. Groundwater samples shall be analyzed for the appropriate constituents (refer to Section 8.0 of this manual for procedures for laboratory analyses).

If collection of soil samples during monitoring well installation is directed, refer to Section 5.4.1 of this manual for soil sampling protocols.

Unless otherwise directed, groundwater samples shall not be collected for laboratory analysis from monitoring wells with measureable free product. If free product is discovered in a monitoring well during field activities, include a summary of the type of free product, thicknesses determined by an interface probe, locations, etc.

B. Gauging

Each monitoring well shall be gauged every time groundwater samples are collected or when directed in writing by the UST Branch. Each time a monitoring well is sampled, the following items shall be recorded and reported on a gauging data table as reference in Section 5.4.2(D) of this manual (refer to Appendix B for an example of a historic gauging data table).

- 1) Monitoring well name and AKGWA Number
- 2) Date measured
- 3) Well diameter (in inches)
- 4) Top-of-casing elevation (in feet)
- 5) Depth to hydrocarbon (in feet)
- 6) Depth to water (in feet)
- 7) Depth of bore (in feet)
- 8) Purged volume (in gallons)
- 9) Depth of screened interval (in feet)
- 10) Hydrocarbon surface elevation (in feet)
- 11) Water surface elevation (in feet)
- 12) Hydrocarbon thickness (in feet)
- 13) Potentiometric surface elevation (in feet)
- 14) Sample description (e.g., turbidity, odor, sheen, etc.)

C. Purging

Monitoring wells and temporary monitoring wells shall be purged up to three (3) well volumes prior to obtaining groundwater samples that are representative of the groundwater at the UST site.

D. Gauging Data Table

Provide a historic gauging data table that summarizes construction details of monitoring wells. Refer to Appendix B for an example gauging table. This table shall note the monitoring status of each well and note if a well is active, abandoned, lost, or destroyed and shall, further, include the information specified in Section 5.4.2(B) of this manual.

E. Domestic-Use Wells, Domestic-Use Springs and/or Domestic-Use Cisterns

Domestic-use wells, domestic-use springs, and domestic-use cisterns identified within a 300-meter (984 feet) radius from the UST system shall be sampled and analyzed for the appropriate constituents and MTBE, listed in Table 8 of Section 8.0 of this manual, as directed in writing by the UST Branch. Prior to collecting water samples, a reasonable effort shall be made to purge wells up to three (3) well volumes.

When directed in writing by the UST Branch, a domestic-use well, domestic-use spring, or domestic-use cistern may be abandoned in order to be disregarded in the determination of UST facility classification. Wells shall be abandoned in accordance with 401 KAR 6:350, Section 11. Cistern abandonment consists of rendering the cistern inoperable by removing all accessible pumps and filling with inert material (e.g., grout, sand, gravel, etc.).

F. Groundwater Within the Point of Compliance

If groundwater, within the Point of Compliance, is contaminated above the screening levels specified in Groundwater Table 1 (refer to Section 7.2.4 of this manual), the UST Branch shall determine if a groundwater assessment at the Point of Compliance is necessary. If necessary, the UST Branch will direct a groundwater assessment in writing.

G. Concentration and Groundwater Elevation Graphs

Provide a graphical representation of contaminant concentration and groundwater elevation versus time for each monitoring well and groundwater monitoring point with historical or current contamination concentrations above applicable screening levels. Concentration, elevation, and time shall be shown on the same plot for each sampling location.

5.4.3 Vapor Sampling

If collection of vapor sampling (near and sub-slab soil vapor, crawlspace and indoor air) is required for any phase of site investigation, the UST Branch shall send a written directive specifying the collection of vapor samples. Vapor sample collection, handling, and preservation procedures shall be documented and reported for all fieldwork. Each Site Investigation Report shall include a discussion of vapor sample collection, handling, and preservation procedures. Vapor samples shall be analyzed for the appropriate constituents (refer to Section 8.0 of this manual for procedures for laboratory analysis).

Summa canisters used for indoor air sampling shall be individually certified by the laboratory and shall be equipped with pressure gauges and the appropriate flow controller. Individually certified summa canisters may be required for soil vapor sampling when directed in writing by the cabinet.

A. Soil Vapor Sampling Plans

All soil vapor sampling (including near and sub-slab sampling) plans shall be approved in advance by the cabinet and shall be completed and certified by a P.E. or P.G. Sampling plans shall include the submittal of a UST Vapor Intrusion Building Assessment Checklist, DWM 4271, including external photographs of the building and any other notable features (i.e., cracks in the foundation or building slab, utility penetrations, etc.), when a sampling plan includes sub-slab or near-slab sampling.

All proposed soil vapor sampling plans and cost estimates shall be requested in writing from the UST Branch and shall include, at a minimum, the following:

- 1) Provide a detailed description of sampling protocols (e.g., active or passive sampling) and equipment to be utilized. Additionally, if passive sampling is recommended, the type of adsorbent to be used shall be discussed;
- 2) A discussion of the limitations of the methods;
- 3) A schematic of soil vapor probe;
- 4) A site map indicating proposed soil vapor sampling locations;
- 5) Name and contact information for the laboratory that will analyze the samples;
- 6) The analytical method to be utilized based on the constituents of concern (refer to Table 9 in Section 8.0 of this manual);
- 7) Monitoring well construction diagrams, if samples are to be collected from monitoring well headspace; and
- 8) An updated data table documenting historic gauging data.

B. Soil Vapor Documentation

Summaries of site investigation activities in which soil vapor sampling (including near and sub-slab sampling) has been directed by the cabinet, shall be completed and certified by a P.E. or P.G. At a minimum, documentation of soil vapor sampling shall include the following:

- 1) A detailed narrative regarding field activities and investigation results;
- 2) A detailed description of sampling protocols and equipment utilized;
- 3) A discussion of the limitations of the methods;
- 4) A schematic of soil vapor probe;
- 5) A presentation/discussion of the raw data and data interpretation;
- 6) A discussion of the conclusions and recommendations (e.g., potential additional investigations, potential remedial strategy, potential risk management strategy, etc.);
- 7) A laboratory analytical report with completed chain of custody record. NOTE: sample results shall be reported in $\mu\text{g}/\text{m}^3$ and all VOCs or semi-volatile organic compounds (SVOCs) applicable to the selected analytical method shall be reported); and
- 8) Copies of the UST Vapor Intrusion Assessment Checklist, DWM 4270, certified by the P.E. or P.G. for each day of sampling where vapor sampling takes place.

C. Indoor Air Sampling

All indoor air and crawlspace sampling plans shall include at least one (1) background or ambient air sample per sampling event. Sampling plans shall be approved in advance by the UST Branch and shall be completed and certified by a P.E. or P.G. Sampling plans shall include, at a minimum, the following:

- 1) A UST Vapor Intrusion Building Assessment Checklist, DWM 4271, including external photographs of the building and any other notable features (i.e., cracking foundation, utility penetrations, etc.), when a sampling plan includes indoor air or crawlspace;
- 2) Name and contact information for the laboratory that will analyze the samples. NOTE: Sample results shall be reported in $\mu\text{g}/\text{m}^3$ (micrograms per cubic meter);
- 3) A detailed list of equipment to be used for the sampling event;
- 4) A detailed description of the sampling protocols;
- 5) Location of ambient (background) air samples; and
- 6) Sampling duration for the air sampling (refer to Table 1).

Table 1 – Indoor Air Sampling Duration Criteria

Sampling Duration	Conditions
8-hour	Occupational settings where employees work an 8-hour shift.
12-hour	Occupational settings where employees work a 12-hour shift OR Residential settings where all occupants routinely work outside the home, attend school or daycare, or other activities.
24-hour	Residential or occupational settings where occupants are typically in the building all day long. This may include disabled persons, children cared for within the home, adults that work within the home or are retired or residential care facilities (i.e., inpatient medical facilities, nursing homes).
Other	As approved by the cabinet.

D. Notification of Indoor Air Sampling

Building owners and occupants shall be provided written notification of indoor air or crawlspace sampling seven (7) days in advance of the sampling event. A written notification shall be delivered by certified mail, as directed by the cabinet. Refer to Appendix C for an example of a written notification. A waiver to this procedure may be requested in writing in the case of emergencies. As part of the notification, building occupants shall be asked to:

- 1) Operate furnaces and whole house air conditioners as appropriate for the current weather conditions;
- 2) Refrain from use of wood stoves, fireplaces or auxiliary heating equipment;
- 3) Refrain from keeping windows or doors open for extended periods of time;
- 4) Avoid using window air conditioners, fans or vents;
- 5) Refrain from smoking tobacco products inside of the building;
- 6) Refrain from using air fresheners or odor eliminators;
- 7) Refrain from using paints or varnishes (up to a week in advance, if possible);
- 8) Refrain from using cleaning products (e.g., bathroom cleaners, furniture polish, appliance cleaners, all-purpose cleaners, floor cleaners, etc.);
- 9) Refrain from using cosmetics including hair spray, nail polish remover, or perfume;
- 10) Refrain from participating in hobbies that use solvents within the building;
- 11) Refrain from storing containers of gasoline, oil or petroleum based or other solvents within the building or attached garages (except for fuel oil tanks);
- 12) Refrain from operating or storing automobiles in an attached garage; and
- 13) Refrain from operating gasoline powered equipment within the building, attached garage or around the immediate perimeter of the building.

E. Indoor Air Sampling Summary

Summaries of site investigation activities in which indoor air and crawlspace sampling has been directed by the cabinet, shall be completed and certified by a P.E. or P.G. Documentation of indoor air and crawlspace shall include, at a minimum, the following information:

- 1) Detailed narrative regarding field activities and investigation results;
- 2) Detailed description of sampling protocols and equipment utilized;
- 3) Discussion of the limitations of the methods;
- 4) Presentation/discussion of the raw data;
- 5) Discussion of the conclusions and recommendations (e.g., potential additional investigations, potential remedial strategy, potential risk management strategy etc.);
- 6) Laboratory analytical report with completed chain of custody record NOTE: sample results shall be reported in $\mu\text{g}/\text{m}^3$ and all VOCs or SVOCs applicable to the selected analytical method shall be reported;
- 7) Photographs documenting all sampling locations; and
- 8) Provide a comprehensive data table of all vapor analytical data. Data shall be arranged by sample location. A copy of the UST Vapor Intrusion Assessment Checklist, DWM 4270, completed and certified by the P.E. or P.G. for each day of sampling where vapor sampling takes place.

5.5 Analytical Data

Refer to Section 8.0 of this manual for procedures for laboratory analyses.

5.6 Decontamination and Investigation Derived Waste Management

Refer to Section 9.0 of this manual for procedures for decontamination of drilling and sampling equipment and management and disposal of investigation derived waste (IDW).

5.7 Off-Site Access and Encroachment Permits

If soil and/or groundwater contamination likely extends off-site or within an access right-of-way (ROW), the information described below shall be provided for each property owner or public entity in each Site Investigation Report.

- A. Provide the off-site property owner's name or public entity's name, mailing address, and an attempt shall be made to obtain a telephone number.
- B. Provide a copy of the property value administrator (PVA) documentation of ownership for all potentially affected property owners or public entities.
- C. Provide copies of all existing written access agreements.

Requests for off-site access agreements and encroachment permits shall be directed in writing by the UST Branch, as necessary. In response to a written directive from the UST Branch for off-site access or an encroachment permit, an attempt shall be made to directly contact the off-site property owner or public entity. The following procedures shall be followed to document an off-site access request or encroachment permit.

- D. If an agreement is obtained – Provide a copy of the signed access agreement or encroachment permit.
- E. If an off-site property owner or public entity denies property access – Provide a copy of a written denial.
- F. If a written denial, signed access agreement, or permit is not obtained – Send a certified letter requesting off-site access to the off-site property owner or public entity with a fourteen (14) day response deadline.
- G. If there is no response to the certified letter – Provide to the UST Branch a copy of the off-site access request letter with the signed certification of delivery card, and a detailed description of attempts to directly contact the property owner or public entity.

5.8 Conclusions

Provide conclusions based on the professional evaluation (i.e., scientific knowledge and conjecture) of the data and information included with the Site Investigation Report. Conclusions shall be comprehensive, and shall, at a minimum, include the following:

- A. Provide a narrative description of the progress towards defining the horizontal and vertical extent of soil and groundwater contamination, including site-specific conditions that affect the completion of that determination;
- B. A detailed discussion as to whether the groundwater encountered constitutes a current or potential source for domestic use;
- C. A detailed discussion of potential contaminant migration between the uppermost contaminated groundwater zone and deeper water bearing units (vertical migration);
- D. A detailed discussion of contaminant mobility, migration pathways, and potential receptors;
- E. A detailed discussion of the dissolved phase groundwater plume (i.e., expanding, decreasing, stable);
- F. Discuss potential impacts to buried utility conduits;
- G. Discuss abatement measures implemented at the site for vapors, fumes, and free product, if applicable; and
- H. Interpret and discuss data trends of all gauging and contaminant concentration data.

5.9 Recommendations

Based upon the available data, evaluate possible strategies for the site. Available options may include, but are not limited to, the following:

5.9.1 Continued Site Investigation

If the nature and extent of contamination has not been defined adequately to make a remedial decision, provide recommendations for additional site investigation actions, including, but not limited to, the following:

- A. A map depicting proposed sampling locations for future soil borings or monitoring wells;
- B. A discussion of soil boring depths and monitoring well construction needed to further determine the nature and extent of contamination;
- C. If a monitoring well is in a state of disrepair (e.g., cracked concrete pad, damaged protective casing, etc.), provide photographs and descriptions of necessary monitoring well repairs;
- D. Necessary off-site access agreements (refer to Section 5.7 of this manual); and
- E. Necessary additional site surveys (refer to Section 5.2.1 of this manual).

5.9.2 No Further Action (NFA) Recommendation

A. Facility Restoration

If a NFA recommendation is included in a report, the following information shall be included to expedite UST facility restoration if a NFA determination is made by the cabinet. Refer to 401 KAR 42:250, Section 13, for areas eligible for surface material replacement.

- 1) For surface material replacement:
 - a) Type of material (asphalt, concrete, or grass);
 - b) Area (*ft*²);
 - c) Thickness (*inches*) of material;
 - d) Photographs of all areas needing surface replacement; and
 - e) Any other pertinent surface material details.
- 2) For monitoring well abandonment:
 - a) Monitoring well ID number;
 - b) Type of well (overburden, bedrock, double-cased, etc.);
 - c) Type of abandonment requested (abandonment by variance or in accordance with 401 KAR 6:350, Section 11); and
 - d) Well depth (*ft*).
- 3) Provide a site map depicting the area requiring surface replacement and locations of monitoring wells requiring abandonment.

B. NFA Considerations

If site investigation data provides sufficient evidence to determine residual contaminant concentrations (which may vary from the applicable screening levels) are protective of human health and the environment, the cabinet may consider NFA for the UST release or closure. The following list provides examples of evidence that may be considered for an NFA recommendation.

- 1) Source area treatment or removal
- 2) Plume size and stability (stable decreasing plume size and concentrations)
- 3) Presence and potential migration of free product
- 4) Presence of vapors
- 5) Groundwater usage
- 6) Distance to public water source
- 7) Current and assumed future land use
- 8) All reasonable exposure scenarios (e.g., ingestion, inhalation, and dermal contact with soil, groundwater or vapor contamination)

Soil and groundwater screening levels prescribed in accordance with Section 7.0 of this manual, or the screening levels in effect prior to April 18, 1994, may constitute final standards for NFA consideration.

5.9.3 Interim Corrective Action

In the interest of promoting timely and efficient remediation, interim corrective action(s) may be suggested by the owner and operator, or directed by the UST Branch, while the extent of contamination continues to be determined. Such actions shall be compatible with, and ultimately integrated into, subsequent remedial strategies.

- A. Contamination Removal by Over-Excavation – Over-excavation is often an effective method to remove contaminant mass. An owner and operator may propose over-excavation of contaminated soils. An owner and operator seeking reimbursement from the UST Branch for over-excavation activities shall provide a written justification for the proposed scope of work of the over-excavation and a management plan for managing water that may be encountered.

An owner and operator will receive written approval for the scope and associated costs in accordance with the UST PSTEAF Reimbursement Rates document, incorporated by reference in 401 KAR 42:250, from the UST Branch to implement over-excavation activities prior to performing the work. An owner and operator seeking reimbursement from the UST Branch for over-excavation activities shall follow 401 KAR 42:250. For questions regarding reimbursement, contact the UST Branch's Claims and Payments Section at (502) 564-5981.

In response to a written directive from the UST Branch, over-excavation activities shall be conducted as follows (unless otherwise directed by the UST Branch):

- 1) Confirmatory soil samples, if required, shall be collected from each segment of excavated area within four (4) hours of the termination of over-excavation activities. Unless directed otherwise, soil sampling shall be as described in Section 4.9 of this manual (i.e., Closure by Removal from the Ground). Soil samples shall be properly collected, handled, preserved, and analyzed according to SW-846.
- 2) Excavated material generated during over-excavation having contamination above screening levels shall be properly handled in accordance with Section 4.17.6 of this manual.
- 3) If water is encountered that must be removed to allow for over-excavation, the water shall be temporarily managed on-site in a holding tank.
- 4) Eligible reimbursement for the removal, transportation, and disposal or treatment of water, at a permitted facility, during over-excavation shall be made in accordance with 401 KAR 42:250, limited to one (1) pit volume, and water encountered during over-excavation shall be sampled and analyzed to verify that contamination exceeds applicable screening levels.
- 5) If the regulated constituents in the water are below applicable screening levels, the water is not eligible for reimbursement for off-site disposal at a permitted treatment facility.
- 6) Prior to discharging water below applicable screening levels into a stream, sanitary sewer system, etc., appropriate local/municipal/state permitting shall be acquired (e.g., KPDES, etc.). In response to a written directive from the UST Branch, costs for on-site management, treatment and permitted discharge of petroleum contact water are eligible for reimbursement.

An Over-Excavation Report shall be submitted in response to a written directive from the UST Branch. Submit a completed UST Over-Excavation Checklist, DWM 4267, and all other required documents with the Over-Excavation Report. The UST Over-Excavation Checklist, DWM 4267, shall be certified by a P.E. or P.G. The AI number shall be clearly marked on the first page of each document.

The Over-Excavation Report shall include, at a minimum, the items listed on the UST Over-Excavation Checklist, DWM 4267, as well as the following:

- 7) A narrative describing over-excavation activities, photographs of field work, an indication of the presence or absence of water in the over-excavation, and the volume of water removed, if encountered;
 - 8) Documentation indicating the amount of excavated material accepted by the permitted disposal or treatment facility. A summary of weigh tickets for soil disposal or treatment that identifies the total tonnage disposed or treated (individual weigh tickets are not required with the technical report, but are required with the submittal of the claim for reimbursement);
 - 9) A map showing the initial excavation zone, previous soil and groundwater sampling locations, and the over-excavation area superimposed with confirmatory soil sample locations labeled; and
 - 10) Conclusion with respect to the success of the over-excavation activity and recommendations for any follow up actions.
- B. Contaminant Removal, Stabilization, and Mitigation by Other Means – If interim corrective action other than over-excavation is recommended to mitigate impacts from site contaminants, then the owner and operator shall recommend feasible interim corrective action technologies, as follows:
- 1) If data indicates the presence of free product, then removal of free product shall be recommended and may include skimming, dual-phase extraction, hand-bailing, and other effective mass removal technologies. Free product removal recommendations shall include a discussion of the following to facilitate the development of a written directive by the UST Branch.
 - a) Frequency of removal events (or site visits)
 - b) Number and location of wells used as extraction points
 - c) Equipment and materials necessary
 - 2) If over-excavation is not feasible, then interim technologies designed to stabilize, destroy, or degrade the contaminants (*In-Situ* or *Ex-Situ*) shall be recommended.
 - 3) If vapor mitigation is necessary, a recommendation based on Section 5.4.3 of this manual shall be submitted.
 - 4) The purpose of any such interim remedy should be to slow or prevent the migration of contamination off-site or to sensitive receptors.

An owner and operator will receive written approval for the scope and associated costs in accordance with the UST PSTEAF Reimbursement Rates document, incorporated by reference in 401 KAR 42:250, from the UST Branch to implement interim corrective actions prior to performing the work. An owner and operator seeking reimbursement from the UST Branch for interim corrective actions shall follow 401 KAR 42:250. For questions regarding reimbursement, contact the UST Branch's Claims and Payments Section at (502) 564-5981.

An Interim Corrective Action Report shall be submitted in response to a written directive from the cabinet. Submit a completed UST Interim Corrective Action Checklist, DWM 4265, and all other required documents with the Interim Corrective Action Report. The UST Interim Corrective Action Checklist, DWM 4265, shall be certified by a P.E. or P.G. The AI number shall be clearly marked on the first page of each document.

In response to a written directive from the UST Branch, interim corrective action activities shall be accompanied by a completed UST Interim Corrective Action Checklist, DWM 4265, and shall, at a minimum, include:

- 1) Historical data tables for soil and groundwater meeting the procedures established in Section 5.4 of this manual;
- 2) A map(s) showing the area remediated, previous soil and groundwater sampling locations, extent of soil and groundwater contamination, and the area treated, superimposed with confirmatory soil sample locations (if applicable);
- 3) Photographs of the interim corrective action implementation;
- 4) A narrative describing interim corrective action activities, photographs of the fieldwork, quantities of products injected (if applicable), and any problems encountered during implementation; and
- 5) Conclusion with respect to the success of the corrective action activity and recommendations for any follow up actions.

5.9.4 Corrective Action

If the UST Branch determines that the nature and extent of contamination has been defined, and corrective action is necessary in accordance with 401 KAR 42:060, then the UST Branch shall issue a written directive to initiate actions in accordance with Section 6.0 of this manual (i.e., Corrective Action).

The UST Branch shall have final authority to determine all reimbursable actions, including site characterization and corrective action technologies.

Figure 5 – Overburden Monitoring Well Schematic

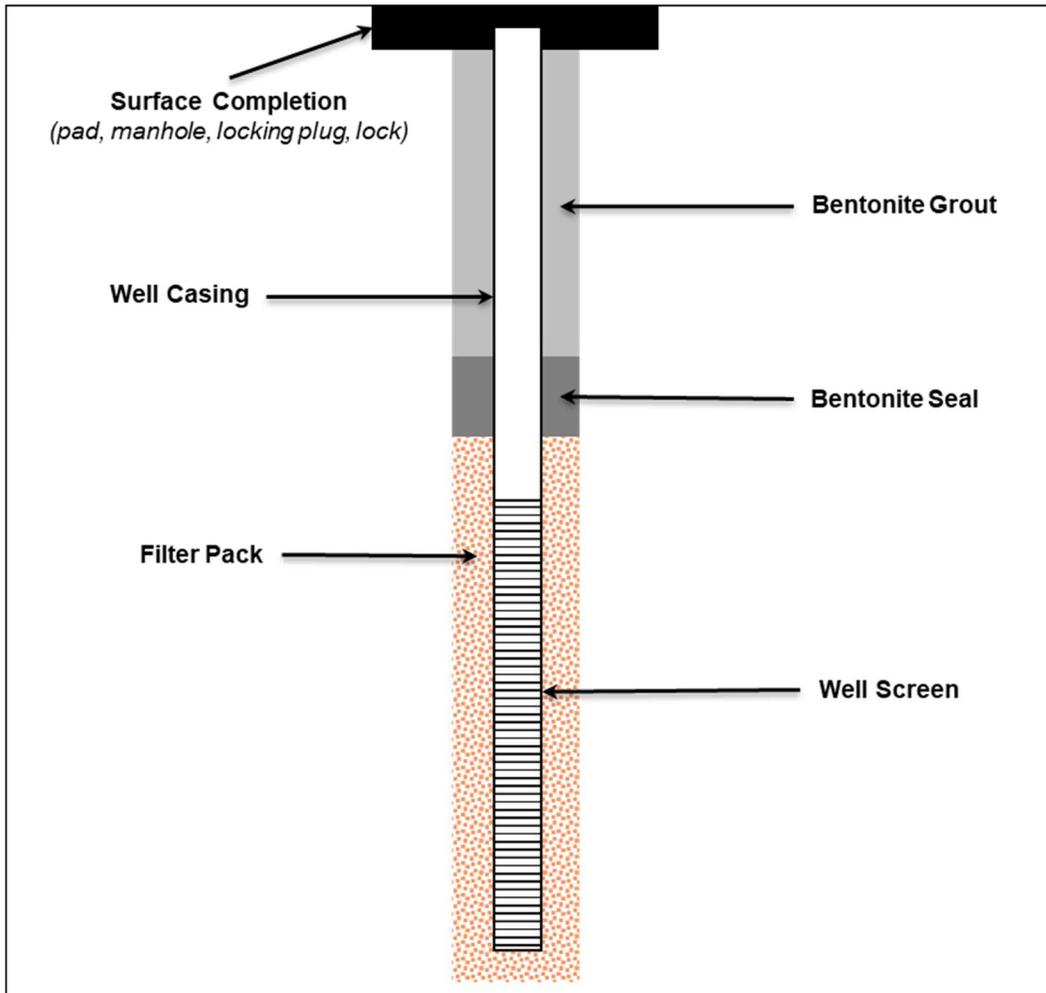


Figure 6 – Bedrock (Single-Cased) Monitoring Well Schematic

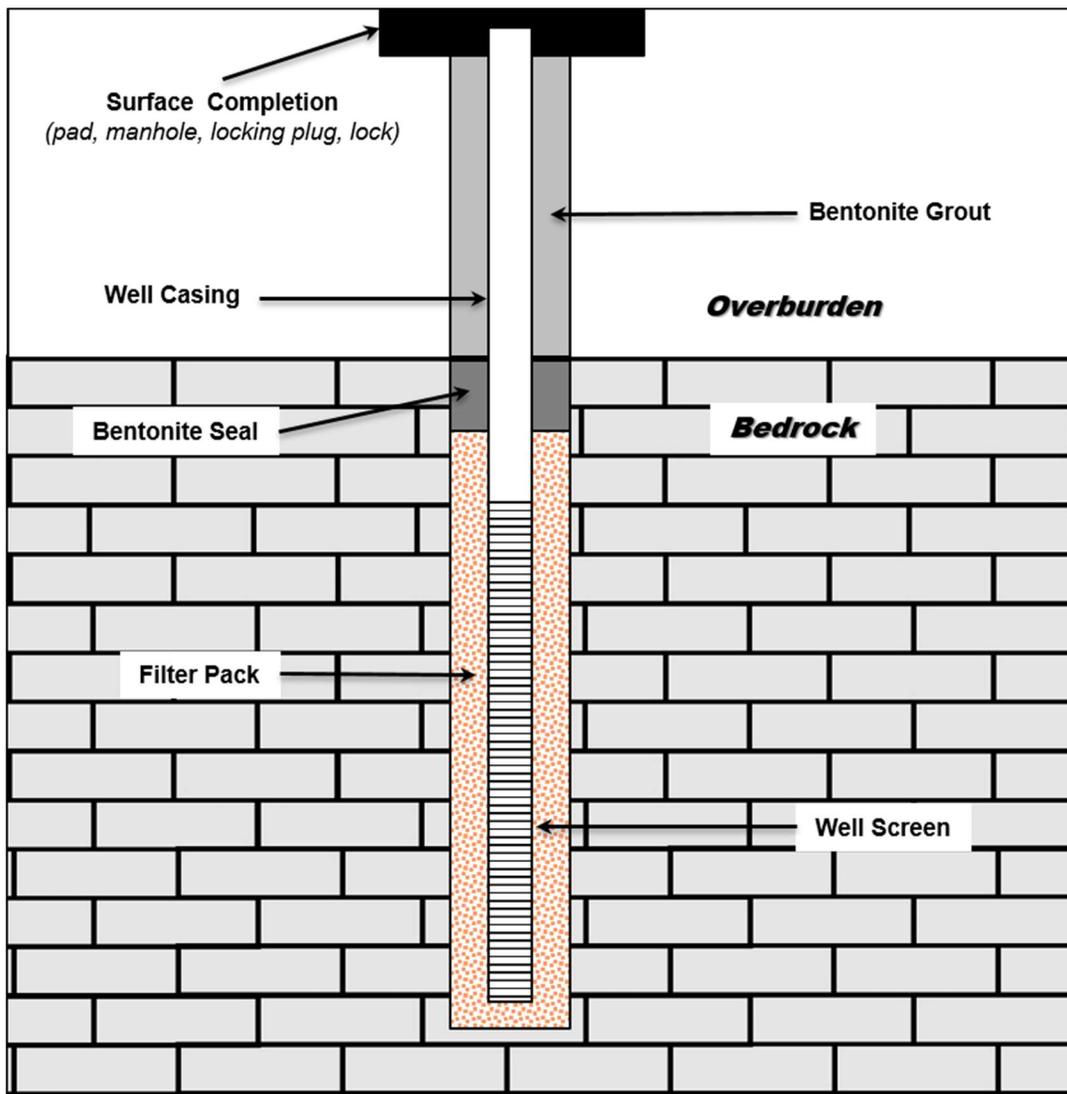
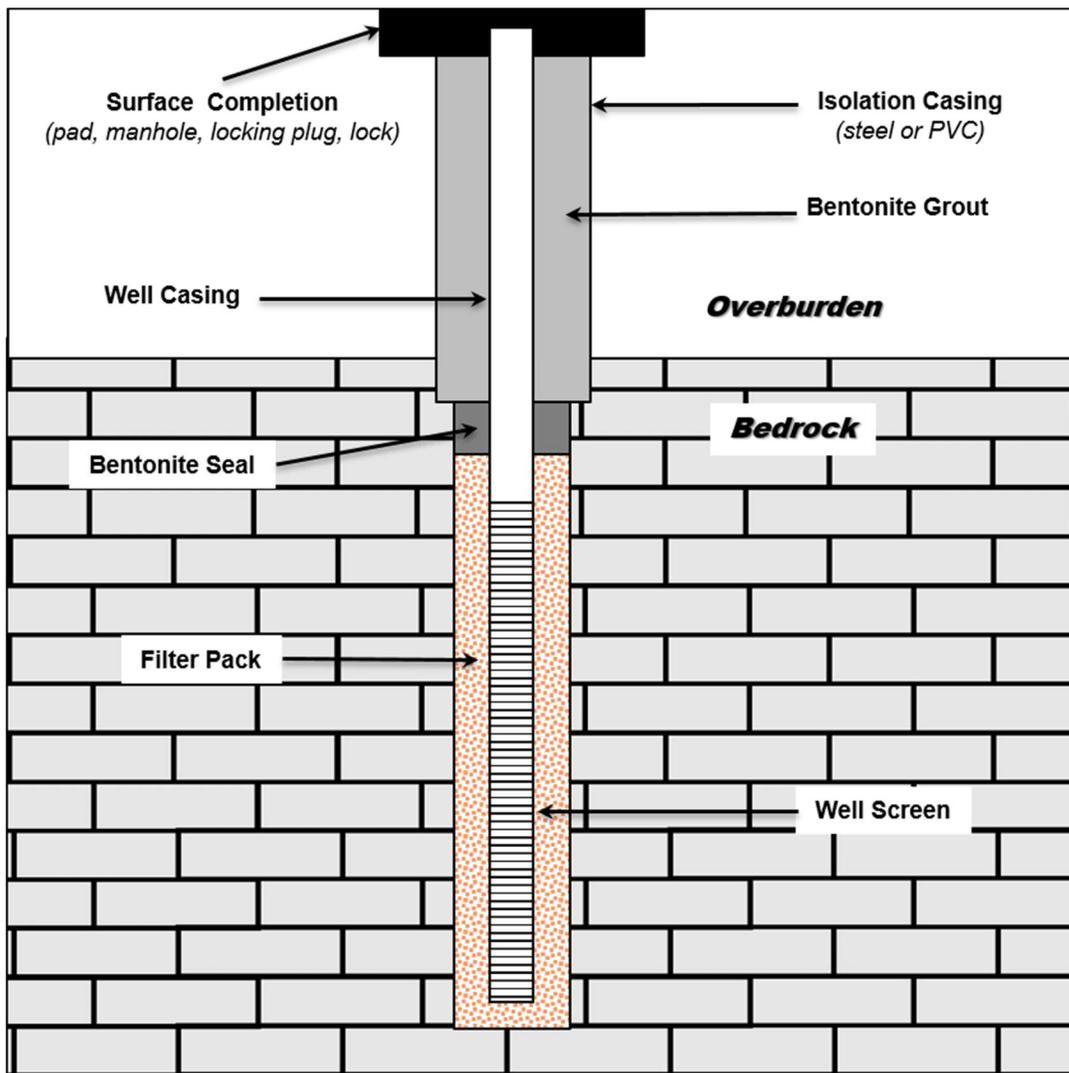


Figure 7 – Bedrock (Double-Cased) Monitoring Well Schematic



6.0 CORRECTIVE ACTION

This section identifies corrective action activities for releases from UST systems, including protocols for the following in accordance with 401 KAR 42:060.

- A. Feasibility Study (Section 6.1)
- B. Pilot Study (Section 6.2)
- C. Corrective Action Plan (Section 6.3)
- D. Public Notice (Section 6.4)
- E. Report Certification (Section 6.5)
- F. Other Considerations (Section 6.6)

Soil and groundwater screening levels prescribed in accordance with Section 7.0 of this manual or the screening levels in effect prior to April 18, 1994, may constitute final standards for no further action (NFA). However, if the conceptual understanding of the release, based on site-specific information, provides sufficient evidence to determine residual contaminant concentrations (which may vary from the applicable screening levels) are protective of human health and the environment, the cabinet may consider NFA for the UST release or closure.

A UST Groundwater Monitoring Checklist, DWM 4264, shall be utilized to report analytical data as directed in writing by the UST Branch. Any report prepared in response to actions directed in accordance with this section shall be completed and certified by a P.E. or P.G.

All reports in this section shall include a UST Corrective Action Certification, DWM 4263. The UST Corrective Action Certification, DWM 4263, shall be certified by a P.E. or P.G.

The UST Branch shall have final authority to determine all reimbursable actions including site characterization and corrective action technologies.

6.1 Feasibility Study

The UST Branch may send a written request for a feasibility study prior to requiring the submittal of a Corrective Action Plan (CAP). The parameters included in the request for a feasibility study shall be based on site-specific information, the technologies under consideration, and the media impacted above screening levels. The Feasibility Study Report shall include a comparative discussion of technologies, the recommended technology or technologies, and the basis for the recommendation. In general, the report should compare and contrast the various technologies based upon the criteria listed below:

- A. Short and long-term effectiveness and expected reductions in toxicity, mobility or volume
 - 1) Short-term effectiveness refers to the period of time when a technology is being constructed and implemented, and considers such things as safety to workers and the public, environmental impacts that may occur as a result of implementing a technology, and the time necessary to reach final cleanup goals.
 - 2) Long-term effectiveness refers to the period following remedy implementation and takes into consideration the amount of residual contamination that may remain following implementation of a technology.
- B. Technical and administrative implementability
 - 1) Technical implementability refers to how easy it will be to construct, operate, and monitor a given technology as well as to the reliability of a given technology. Physical site restrictions are a good example of something that would need to be taken into consideration when evaluating technical implementability.
 - 2) Administrative implementability refers to how difficult it would be to obtain any necessary approvals for construction and operation of a technology, as well as the difficulty in obtaining

the necessary materials and services. Owner or operator business concerns and local restrictions are two examples of things that would need to be taken into consideration when evaluating administrative implementability.

C. Disproportionate cost relative to effectiveness

Cost comparisons should be made by evaluating whether a more costly technology is significantly more effective relative to its additional cost than another less costly competing technology, thereby justifying the additional expense.

The Feasibility Study shall provide a comprehensive discussion of the viability of various technologies that may be used as an individual remedial approach, or as part of an overall remedial strategy, based on site-specific geologic and hydrogeologic factors. If the conclusions section of the Feasibility Study Report includes a recommendation for a pilot study, a proposal shall be included.

6.2 Pilot Study

The UST Branch may, based on the P.E. or P.G. recommendations or as otherwise deemed necessary, direct in writing that a pilot study be performed. A pilot study is a smaller scale study of the expected corrective action technology or strategy to confirm effectiveness before implementing full scale. A pilot study is not a test of multiple technologies in order to determine which may or may not be effective.

For an owner and operator seeking reimbursement from the UST Branch for a pilot study, written approval from the UST Branch shall be obtained prior to beginning a pilot study.

A Pilot Study Report shall be submitted upon completion of the pilot study. The Pilot Study Report shall include a summary of the pilot study, all field and laboratory data collected during the pilot study, as well as conclusions based on the data, and recommendations for corrective action.

6.3 Corrective Action Plan (CAP)

The approval of a CAP shall be based upon the UST Branch's evaluation of site-specific conditions and consideration of the P.E. or P.G. recommendations.

The format below details the protocol of preparing a CAP report with corresponding sectional breakdowns. A response to each section below shall be provided and will determine technical completeness of the CAP report for the purpose of eligible reimbursement.

A. Section 1 – Executive Summary

Provide an interpretation of the site investigation data. Describe the types and quantity of data that were gathered during the site investigation phase of the project, where the data was obtained, and how this information was synthesized into a comprehensive interpretation of the site. This interpretation should include a discussion of contaminant type (e.g., BTEX, etc.) and form (e.g., free-phase, sorbed-phase and dissolved-phase), presumed release mechanisms, identified migration pathways, and known or potential exposure routes.

B. Section 2 – Remedial Goals

- 1) Provide the site-specific screening levels for soil and/or groundwater as prescribed in accordance with Section 7.0 of this manual that were utilized for the purpose of site investigation. Site-specific screening levels shall be verified and included in the CAP.
- 2) Discuss and provide justification as to these levels becoming final cleanup goals or justification for site-specific alternative clean up goals based upon the conclusions of the Site Investigation, Section 5.8 of this manual. Include an estimated timetable for the implementation of the CAP, and for achieving intermediate and final corrective action objectives.

C. Section 3 – Detailed Design Plans

- 1) Provide a schematic summary of the design and operation of the selected technology (or technologies), including a description of equipment, operating and monitoring procedures, ground layout (proposed location of monitoring wells, extraction wells, injection wells, etc.), and methods used to control discharges of air and/or water. This shall be a working conceptual plan and not a final "as built" design.
- 2) Provide a list of all permits required for the project, and the contacts necessary to obtain these permits.
- 3) Provide a discussion of all hazardous and solid waste disposal issues produced by the corrective action technology.

D. Section 4 – Technology Monitoring

Summarize and discuss the measurements and metrics associated specifically with the treatment system (e.g., influent/effluent measurements, stack testing, pass-through flow velocity, etc.) that will be utilized to monitor the effectiveness of the selected technology (or technologies).

E. Section 5 – Specific Data Elements used to Monitor Remedial Effectiveness

Provide a description of the parameters in soil and/or groundwater to be sampled (e.g., contaminant concentrations, soil gas, soil pore water, and groundwater chemistries such as pH, O₂, and COD), or other methods for determining corrective action effectiveness at the site.

F. Section 6 – Monitoring Remedial Effectiveness

Provide a schedule for sampling selected parameters for affected media, including target contaminant concentrations, on a frequency sufficient to determine changes in contaminant levels and potential or real plume migration, including post-corrective action monitoring.

G. Section 7 – Public Notice

Provide the method of distribution for the public notice. The public notice will be provided by and directed in writing by the UST Branch. Refer to Section 6.4 of this manual for public notice procedures.

H. Section 8 – Figures

- 1) Figure 1 – Provide a map that illustrates the footprint of the contaminated area in conjunction with the footprint of the proposed remedial approach. It may be necessary to include additional maps to provide a detailed illustration of each component of the entire remedial approach.
- 2) Figure 2 and Figure 3 – Provide geologic cross sections along the long axis and short axis of the contaminant plume indicating the following, as applicable:
 - a. Free-phase hydrocarbons;
 - b. Absorbed soil mass identifying contaminant concentrations;
 - c. Dissolved-phase plume identifying contaminant concentrations;
 - d. Soil and lithological stratigraphy;
 - e. Recent depth to groundwater elevations;
 - f. Other pertinent subsurface features (tank excavations, underground utilities, monitoring wells, soil borings, etc.); and
 - g. Proposed injection depths, extraction depths, estimated zone of influence, etc.
- 3) Other Figures – Provide other corrective action strategy or technology figures and schematics as needed to give sufficient explanatory detail based on the professional judgment of the P.E. or P.G. or as requested by the cabinet.

6.4 Public Notice

When directed in writing by the UST Branch, a public notice shall be provided, as follows:

- A. After a CAP has been approved in writing by the UST Branch and prior to the implementation of a CAP, notice of the proposed corrective action shall be provided to the public by means designed to reach those members of the public directly affected by the release and the planned corrective action. The notice may include the following: public notice in local newspapers, public service announcements, publication in a state register, letters to individual households, etc.
- B. Public notice shall be provided if the corrective action technology and strategy of an approved CAP is amended with respect to scope or performance.
- C. Public notice may be requested if implementation of an approved CAP does not achieve the remedial goals established in the plan and if termination of the plan is under consideration by the UST Branch.

Documentation of executing the public notice shall be provided. If publication in a local newspaper is the chosen method, submit a copy of the invoice and an affidavit of publication from the newspaper to the UST Branch within seven (7) days after publication.

6.5 Other Considerations

The UST Branch shall consider a recommendation from the P.E. or P.G. to initiate an assessment of risk associated with residual levels of contamination above the screening levels prescribed in accordance with Section 7.0 of this manual. If the corrective action approach for a site consists only of a Risk Assessment, contact the UST Branch.

Refer to Section 5.0 of this manual for more information regarding monitoring well protocols, data tables, proper sample collection and management, and trip blank procedures.

Refer to Sections 5.7 and 5.9.2 of this manual, regarding off-site access agreements and considerations for no further action (NFA).

Refer to Section 7.0 of this manual for additional information regarding screening levels.

Refer to Section 9.0 of this manual for more information regarding equipment decontamination and investigation derived waste management and disposal.

7.0 UST FACILITY CLASSIFICATION

This section shall be used to classify UST facilities with UST systems containing petroleum, based upon their potential impact to human health, safety, and the environment. UST facilities shall be classified by assessing site-specific conditions as documented and certified by a P.E. or P.G. in order to establish screening levels for petroleum constituents in soil and groundwater.

An owner and operator shall classify the UST facility as a whole, representing all UST systems collectively, unless the individual UST systems are separated by 100-meters (328 feet) or more. An additional UST facility classification is required for each UST system, at a UST facility, separated by 100-meters (328 feet) or more.

The prescribed screening levels for soil and groundwater shall be utilized for the initial assessment during permanent closure, site check, and site investigation to determine the extent of contamination. If petroleum contaminant concentrations exceed those screening levels specified within the applicable classification, a site investigation may be directed in writing by the UST Branch, in accordance with Section 5.0 of this manual.

If an owner or operator of a UST facility is directed to undertake actions required by this manual, the prescribed screening levels may or may not constitute final cleanup target concentrations upon further evaluation of site-specific physical conditions and exposure pathway determinations. UST facility classification shall be amended, if warranted, due to changes in on-site or off-site conditions, additional information, or if a release from the UST system is documented to have no potential impact on domestic-use wells, domestic-use springs, or domestic-use cisterns. A completed UST Classification Guide, DWM 4261, shall be submitted by the owner or operator when requested by the UST Branch to replace the original UST Classification Guide submitted.

A UST Classification Guide, DWM 4261, shall be completed for UST facilities with UST systems containing petroleum at the time of permanent closure, site check, or when directed by the UST Branch in order to appropriately establish soil and groundwater screening levels. Knowledge of site history and other site-specific information, and further research on the part of the owner or operator, may be necessary to complete the UST Classification Guide. The UST Classification Guide shall be submitted with the UST Closure Assessment Report Checklist, DWM 4262 (refer to Section 4.0 of this manual for Permanent Closure and Change-In-Service), UST Site Check Checklist, DWM 4268 (refer to Section 3.0 of this manual for Site Check), or when specified by the UST Branch. The UST Classification Guide, DWM 4261, shall be completed and certified by a P.E. or P.G.

Photographic documentation and a physical address with owner contact information shall be provided for all identified domestic-use wells, domestic-use springs, or domestic-use cisterns located within 300-meters from the excavation zone. Kentucky Geological Survey (KGS) hydrologic searches may not identify all domestic-use wells or domestic-use springs in the search area.

If site-specific information demonstrates no risk (e.g., a domestic-use well hydrogeologically upgradient from the excavation zone) to domestic-use wells, domestic-use springs, or domestic-use cisterns from a release within the excavation zone, those features shall be disregarded in the determination of a UST facility classification.

Sample collection and management shall be performed in accordance with Section 5.4 of this manual. The cabinet may evaluate instrument/method detection limits, the method's quantitation limits, relative standard deviation and sample matrices in the assessment, and validation of laboratory results. The cabinet may consider the variability in analytical results within the laboratory methods specified in USEPA SW-846.

7.1 Soil Classification

The screening levels in soil shall be established through an assessment of site-specific conditions as determined by a P.E. or P.G. Soil screening levels shall be classified as either Class A or Class B through an assessment of the criteria described below.

7.1.1 Class A

The following criteria shall be established and verified by a P.E. or a P.G. in order for a UST facility to be classified under Class A:

- No domestic-use wells, domestic-use springs, or domestic-use cisterns are located within a 100-meter (328 feet) radius from the excavation zone.

If site-specific information demonstrates no risk (e.g., a domestic-use well hydrogeologically upgradient from the excavation zone) to domestic-use wells, domestic-use springs, or domestic-use cisterns from a release within the excavation zone, those features shall be disregarded in the determination of a UST facility classification.

Class A Classification – Example

To determine the applicable site-specific soil screening levels within and beyond the point of compliance, complete the Class A Soil Screening Levels Table in the UST Classification Guide, DWM 4261. Two (2) examples are shown below.

- Row 1 Identifies the baseline soil screening levels in Class A.
 Row 2 Identify the applicable Matrix Table levels applicable to soil beyond the Point of Compliance.
 Row 3 Identify the adjusted soil screening levels required within the Point of Compliance for a UST facility in Class A. Choose the less stringent constituent levels from Rows 1 and 2 for each constituent, and complete Row 3 to identify the final soil screening levels within the Point of Compliance.

Example 1 – Gasoline USTs

Class A Soil Screening Levels Table (ppm)											
Row		B	T	E	X	Ch	B(a)A	cPAH	nPAH	NAP	Lead
1	Class A Baseline Soil Screening Levels within the Point of Compliance	2	18	30	50	15	0.15	0.3	10	5	400
2	Matrix Table Soil Screening Levels beyond the Point of Compliance	Class B Soil Matrix Table: I Soil Type: <u>Sand</u> Depth to Groundwater: <u>4.5m</u>									
		0.1	35	30	210	NA	NA	NA	NA	NA	NA
3	Class A Adjusted Soil Screening Levels within the Point of Compliance	2	35	30	210	NA	NA	NA	NA	NA	NA

Example 2 – Gasoline and Waste Oil USTs

Class A Soil Screening Levels Table (ppm)											
Row		B	T	E	X	Ch	B(a)A	cPAH	nPAH	NAP	Lead
1	Class A Baseline Soil Screening Levels within the Point of Compliance	2	18	30	50	15	0.15	0.3	10	5	400
2	Matrix Table Soil Screening Levels beyond the Point of Compliance	Class B Soil Matrix Table: II Soil Type: <u>Silt</u> Depth to Groundwater: <u>7.5m</u>									
		0.2	40	30	330	15	0.15	0.3	10	5	400
3	Class A Adjusted Soil Screening Levels within the Point of Compliance	2	40	30	330	15	0.15	0.3	10	5	400

7.1.2 Class B

The following procedures shall be required to establish the screening levels for petroleum constituents in soil, and shall be documented by a P.E. or P.G. This class includes all UST facilities that do not meet the Class A soil classification.

UST facilities in Class B shall be placed into one of three (3) Class B Soil Matrix Tables listed in Table 2, which indicate the soil screening levels, based upon the geologic setting in which the UST facility is located. The geologic setting of the site shall be determined by locating the site on a 7.5-Minute USGS Geological Quadrangle Map and confirmation by field observations, if possible. A description of the geology is in the legend where a geologic column for the quadrangle and a detailed description of the formations is presented.

Table 2 – Class B Soil Matrix Table Descriptions

Class B Soil Matrix Table	Geologic Setting	Description
Matrix Table I	Carbonate Bedrock	These areas are underlain by carbonate rocks including limestone, dolostone, interbedded limestone and shale, or interbedded dolostone and shale.
Matrix Table II	Alluvium	These areas are underlain by deposits of Quaternary Alluvium found predominantly in the valleys along major streams (third order or greater). This setting includes sediments of lacustrine deposition or sediments derived from other glacial deposits.
	Fractured Shale	These areas are underlain by thick sections of fractured shale and include the Devonian and Lower Mississippian shales as well as other areas of the state where shale is the predominant bedrock material.
	Fractured Sandstone and Shale (<i>Eastern Coal Field</i>)	These areas are underlain by alternating units of sandstone, siltstone, shale, limestone, coal, and clay. These deposits are mapped on the Geologic Quadrangle maps as predominantly Pennsylvanian in age and occur in the Eastern Coal Field Physiographic Region of the state.
Matrix Table III	Gulf Coast Plain Sediments	These areas are underlain by sediments of Cretaceous and Tertiary Age and are commonly overlain by Pleistocene loess. This geologic setting is found mainly in the Jackson Purchase Physiographic Region of Western Kentucky.
	Fractured Sandstone and Shale (<i>Western Coal Field</i>)	These areas are underlain by alternating units of sandstone, siltstone, shale, limestone, coal, and clay. These deposits are mapped on the Geologic Quadrangle maps as predominantly Pennsylvanian in age and occur in the Western Coal Field Physiographic Region of the state.

Establishing the Applicable Class B Soil Matrix Table Screening Levels

Once the UST facility has been placed into the appropriate Class B Soil Matrix Table listed in Table 2, the applicable soil screening levels shall be based on all of the following criteria:

- Depth to groundwater; and
 - Soil type present at the site (sand, silt, or clay).
- A. Depth to Groundwater – Depth to groundwater shall be determined by one of the following:
- 1) Assessment of existing monitoring wells;
 - 2) Performance of a site-specific investigation (e.g. drilling to groundwater, etc.) to determine depth to groundwater; or
 - 3) A visual examination of the excavation zone and piping trench at the time of permanent closure.

- 4) If groundwater is encountered within the excavation zone, piping trench, or borings, the 4.5-meter depth to groundwater screening levels shall be used within the appropriate Class B Soil Matrix Table.
- 5) If groundwater is not present within the excavation zone, piping trench, or borings the actual depth of the excavation zone or borings shall be noted, and the depth listed in the appropriate Class B Soil Matrix Table which is equal to or immediately greater than the actual depth of the excavation zone shall be used for initial classification.

If an actual determination of depth to groundwater, below the bottom of the excavation, is made which falls between the depths listed within the Class B Soil Matrix Tables, the upper depth listed shall be used to determine soil screening levels. For example, if the depth to groundwater is established at 12-meters through a site-specific determination, the 10.5-meter depth to groundwater screening levels shall be used as opposed to the 13.5-meter depth to groundwater levels.

- B. Soil Type – Soil type may be determined through a field determination by a P.E. or P.G. or a grain size analysis shall be conducted as follows:
- 1) Collect one (1) soil sample for grain size analysis, consisting of a three (3) point composite sample along a diagonal line across the bottom of the excavation zone; taking one (1) sample at each end and one (1) in the middle of the line. NOTE: For closure in place sampling, collect a sample from the bottom of three (3) of the borings required.
 - 2) A single composite of these three (3) samples shall be submitted for grain size analysis.
 - 3) Composite samples shall be classified according to ASTM Designation: D6913 / D6913M-17 Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis. The soil type shall be defined by the 50 percent value (D50) as plotted on a grain size distribution curve (a semi-logarithmic plot) with weight percent finer plotted on the arithmetic scale and the grain sizes plotted on the semi-logarithmic scale.

If an owner and operator of a UST system are required to perform site investigation activities, and the site-specific geology and predominant soil type identified in boring logs is different than that identified at the time of the initial closure classification, the UST Branch may request a reevaluation of grain size.

Class B Classification – Example

To determine the applicable site-specific soil screening levels within and beyond the point of compliance, complete Class B Soil Screening Levels Table in the UST Classification Guide, DWM 4261. Two (2) examples are shown below.

Example 1 – Gasoline USTs

Only complete the Class B Soil Screening Levels Table below for UST facilities classified as Class B in Section 7.1.2 of the UST Corrective Action Manual.											
Class B Soil Screening Levels Table (ppm)											
Soil Screening Levels within and beyond the Point of Compliance	Class B Soil Matrix Table: <u>I</u>				Soil Type: <u>Sand</u>			Depth to Groundwater: <u>4.5m</u>			
	B	T	E	X	Ch	B(a)A	cPAH	nPAH	NAP	Lead	
	0.1	35	30	210	NA	NA	NA	NA	NA	NA	

Example 2 – Gasoline and Waste Oil USTs

Only complete the Class B Soil Screening Levels Table below for UST facilities classified as Class B in Section 7.1.2 of the UST Corrective Action Manual.

Class B Soil Screening Levels Table (ppm)

Soil Screening Levels <u>within</u> and <u>beyond</u> the Point of Compliance	Class B Soil Matrix Table: <u>II</u> Soil Type: <u>Silt</u> Depth to Groundwater: <u>7.5m</u>									
	B	T	E	X	Ch	B(a)A	cPAH	nPAH	NAP	Lead
	0.2	40	30	330	15	0.15	0.3	10	5	400

Table 3 – Class B Soil Matrix Tables (Gasoline, Kerosene, Jet Fuel)

SOIL TYPE	MATRIX TABLE I					MATRIX TABLE II					MATRIX TABLE III				
	Depth to Groundwater (meters)	Soil Screening Levels (ppm)				Depth to Groundwater (meters)	Soil Screening Levels (ppm)				Depth to Groundwater (meters)	Soil Screening Levels (ppm)			
		B	T	E	X		B	T	E	X		B	T	E	X
Sand	4.5	0.1	35	30	210	4.5	0.01	0.5	0.4	3	4.5	0.01	0.5	0.4	3
	5.5	0.5	110	100	500	5.5	0.01	2	2	18	5.5	0.01	2	1	13
	7.5	0.8	180	160	500	7.5	0.02	7	4	40	7.5	0.01	4	2	20
	10.5	1	180	230	500	10.5	0.05	20	10	90	10.5	0.02	6	3	30
						13.5	0.1	40	20	190	13.5	0.02	8	4	40
						16.5	0.2	70	40	320	16.5	0.03	9	5	50
						23.5	1	180	210	500	23.5	0.05	15	8	80
Silt	4.5	0.1	35	30	230	4.5	0.01	0.5	0.4	3	4.5	0.01	0.5	0.4	3
	5.5	0.4	80	80	500	5.5	0.03	2	4	40	5.5	0.01	1	1	10
	7.5	0.6	180	140	500	7.5	0.2	40	30	330	7.5	0.01	3	2	20
	10.5	1	180	240	500	10.5	0.8	180	180	500	10.5	0.02	5	3	30
						13.5	6	180	300	500	13.5	0.03	8	5	45
						16.5	20	180	300	500	16.5	0.04	12	9	70
						23.5	20	180	300	500	23.5	0.09	30	18	150
Clay	4.5	0.1	35	30	240	4.5	0.01	0.5	0.4	3	4.5	0.01	0.5	0.4	3
	5.5	0.3	80	60	470	5.5	0.1	50	40	250	5.5	0.01	0.7	0.8	7
	7.5	0.5	150	100	500	7.5	19	180	300	500	7.5	0.01	2	1	13
	10.5	2	180	300	500	10.5	20	180	300	500	10.5	0.03	7	7	40
						13.5	20	180	300	500	13.5	0.09	20	15	120
						16.5	20	180	300	500	16.5	0.4	50	35	290
						23.5	20	180	300	500	23.5	0.5	50	70	330
	Lead - 400 ppm					Lead - 400 ppm					Lead - 400 ppm				

B: Benzene
T: Toluene
E: Ethylbenzene
X: Xylene (Total)
ppm: mg/kg - parts per million

NOTE: The UST Branch may consider the variability in analytical results within the laboratory methods specified in USEPA SW-846.

Table 4 – Class B Soil Matrix Tables (Diesel, Waste Oil, New Oil)

SOIL TYPE	MATRIX TABLE I						MATRIX TABLE II						MATRIX TABLE III							
	Depth to Groundwater (meters)	Soil Screening Levels (ppm)					Depth to Groundwater (meters)	Soil Screening Levels (ppm)					Depth to Groundwater (meters)	Soil Screening Levels (ppm)						
		Ch	B(a)A	cPAH	nPAH	NAP		Ch	B(a)A	cPAH	nPAH	NAP		Ch	B(a)A	cPAH	nPAH	NAP		
Sand	4.5	15	0.15	0.3	10	5	4.5	15	0.15	0.3	3	1	4.5	15	0.15	0.3	3	1		
	5.5	15	0.15	0.3	10	5	5.5	15	0.15	0.3	9	2	5.5	15	0.15	0.3	8	2		
	7.5	15	0.15	0.3	10	5	7.5	15	0.15	0.3	10	4	7.5	15	0.15	0.3	10	2		
	10.5	15	0.15	0.3	10	5	10.5	15	0.15	0.3	10	5	10.5	15	0.15	0.3	10	4		
							13.5	15	0.15	0.3	10	5	13.5	15	0.15	0.3	10	5		
							16.5	15	0.15	0.3	10	5	16.5	15	0.15	0.3	10	5		
							23.5	15	0.15	0.3	10	5	23.5	15	0.15	0.3	10	5		
Silt	4.5	15	0.15	0.3	10	5	4.5	15	0.15	0.3	3	1	4.5	15	0.15	0.3	3	1		
	5.5	15	0.15	0.3	10	5	5.5	15	0.15	0.3	10	5	5.5	15	0.15	0.3	6	1		
	7.5	15	0.15	0.3	10	5	7.5	15	0.15	0.3	10	5	7.5	15	0.15	0.3	10	3		
	10.5	15	0.15	0.3	10	5	10.5	15	0.15	0.3	10	5	10.5	15	0.15	0.3	10	5		
							13.5	15	0.15	0.3	10	5	13.5	15	0.15	0.3	10	5		
							16.5	15	0.15	0.3	10	5	16.5	15	0.15	0.3	10	5		
							23.5	15	0.15	0.3	10	5	23.5	15	0.15	0.3	10	5		
Clay	4.5	15	0.15	0.3	10	5	4.5	15	0.15	0.3	3	1	4.5	15	0.15	0.3	3	1		
	5.5	15	0.15	0.3	10	5	5.5	15	0.15	0.3	10	5	5.5	15	0.15	0.3	8	2		
	7.5	15	0.15	0.3	10	5	7.5	15	0.15	0.3	10	5	7.5	15	0.15	0.3	10	5		
	10.5	15	0.15	0.3	10	5	10.5	15	0.15	0.3	10	5	10.5	15	0.15	0.3	10	5		
							13.5	15	0.15	0.3	10	5	13.5	15	0.15	0.3	10	5		
							16.5	15	0.15	0.3	10	5	16.5	15	0.15	0.3	10	5		
							23.5	15	0.15	0.3	10	5	23.5	15	0.15	0.3	10	5		
		Lead - 400 ppm							Lead - 400 ppm							Lead - 400 ppm				

PAH: Polynuclear Aromatic Hydrocarbons
 Ch: Soil screening level individually for Chrysene
 B(a)A: Soil screening level individually for Benzo(a)anthracene
 cPAH: Soil screening level individually for Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, and Indeno(1,2,3-cd)pyrene
 nPAH: Soil screening level individually for Acenaphthene, Acenaphthylene, Anthracene, Benzo(ghi)perylene, Fluoranthene, Fluorene, Phenanthrene, and Pyrene
 NAP: Soil screening level individually for Naphthalene
 ppm: mg/kg - parts per million

NOTE: The UST Branch may consider the variability in analytical results within the laboratory methods specified in USEPA SW-846.

Table 5 – Soil Table C (Un-Restricted Off-Site)

Allowable Soil Levels in Excavated Materials to be used for Un-Restricted Off-Site Purposes
(Must analyze for BTEX, PAH, and Total Lead when this table is used)

BTEX (ppm)	
BENZENE	0.01
TOLUENE	0.7
ETHYLBENZENE	0.9
XYLENE (Total)	5
PAH (ppm)	
Ch	15
B(a)A	0.15
cPAH	0.3
nPAH	10
NAP	5
Total Lead (ppm)	
400	

- BTEX: Benzene, Toluene, Ethylbenzene, and Xylene (Total)
 PAH: Polynuclear Aromatic Hydrocarbons
 Ch: Soil screening level individually for Chrysene
 B(a)A: Soil screening level individually for Benzo(a)anthracene
 cPAH: Soil screening level individually for Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, and Indeno(1,2,3- cd)pyrene
 nPAH: Soil screening level individually for Acenaphthene, Acenaphthylene, Anthracene, Benzo(ghi)perylene, Fluoranthene, Fluorene, Phenanthrene, and Pyrene
 NAP: Soil screening level individually for Naphthalene
 ppm: mg/kg - parts per million

NOTE: The UST Branch may consider the variability in analytical results within the laboratory methods specified in USEPA SW-846.

7.2 Groundwater Classification

The screening levels in groundwater shall be established through an assessment of site-specific conditions as determined by a P.E. or P.G. Groundwater Table 1, Groundwater Table 2, and Groundwater Table 3 specify the groundwater screening levels through an assessment of the criteria described below.

7.2.1 Groundwater Table 1

The screening levels in Groundwater Table 1 shall be used if either of the following conditions exists:

- The UST facility is not serviced by a public water supply; or
- Domestic-use wells, domestic-use springs, or domestic-use cisterns are located within a 100-meter (328 feet) radius from the excavation zone.

If site-specific information demonstrates no risk (e.g., a domestic-use well hydrogeologically upgradient from the excavation zone) to domestic-use wells, domestic-use springs, or domestic-use cisterns from a release within the excavation zone, those features shall be disregarded in the determination of groundwater screening levels.

7.2.2 Groundwater Table 2

The screening levels in Groundwater Table 2 shall be used if:

- The UST facility is serviced by a public water supply;
- Domestic-use wells, domestic-use springs, or domestic-use cisterns are not located within a 100-meter (328 feet) radius from the excavation zone; and
- Domestic-use wells, domestic-use springs, or domestic-use cisterns are located within a 100-meter (328 feet) to 300-meter (984 feet) radius from the excavation zone.

If site-specific information demonstrates no potential impact (e.g., a domestic-use well hydrogeologically upgradient from the excavation zone) to domestic-use wells, domestic-use springs, or domestic-use cisterns from a release within the excavation zone, those features shall be disregarded in the determination of groundwater screening levels.

7.2.3 Groundwater Table 3

The screening levels in Groundwater Table 3 shall be used if:

- The UST facility is serviced by a public water supply; and
- Domestic-use wells, domestic-use springs, or domestic-use cisterns are not located within a 300-meter (984 feet) radius from the excavation zone.

7.2.4 Groundwater at or Beyond the Point of Compliance

In every case, Groundwater Table 1 screening levels shall be applied to groundwater at or beyond the Point of Compliance for the purpose of site investigation.

If groundwater, within the Point of Compliance, is contaminated above the screening levels specified in Groundwater Table 1, the UST Branch shall, if necessary, direct in writing that a groundwater assessment at the Point of Compliance be performed.

Groundwater Screening Levels – Example

To determine the applicable groundwater screening levels within the point of compliance, complete the Groundwater Screening Levels Table in the UST Classification Guide, DWM 4261. In every case, Groundwater Table 1 screening levels shall be applied to groundwater at or beyond the Point of Compliance.

- Row 1 Identify the applicable Groundwater Table and corresponding BTEX screening levels within the Point of Compliance (refer to Table 6).
- Row 2 Identifies Groundwater Table 1 and corresponding screening levels beyond the Point of Compliance.

Groundwater Screening Levels (ppm)									
Row		B	T	E	X	cPAH	nPAH	NAP	Dissolved Lead*
1	Groundwater Screening Levels within the Point of Compliance	Groundwater Table: 3							
		0.31	101	148	719	0.005	3	0.3	0.015
2	Groundwater Screening Levels beyond the Point of Compliance	0.007	0.94	0.47	5.89	0.005	3	0.3	0.015

Table 6 – Groundwater Screening Levels

BTEX (ppm)			
TABLE	1	2	3
Distance Parameters <i>per Section 7.2</i>	0-100 <i>(meters)</i>	100-300 <i>(meters)</i>	Over 300 <i>(meters)</i>
BENZENE	0.007	0.039	0.31
TOLUENE	0.94	7.81	101
ETHYLBENZENE	0.47	5.59	148
XYLENE (<i>Total</i>)	5.89	51	719

PAH (ppm)	
cPAH	0.005
nPAH	3
NAP	0.3
Dissolved Lead (ppm)	
0.015*	

- BTEX: Benzene, Toluene, Ethylbenzene, and Xylene (*Total*)
 PAH: Polynuclear Aromatic Hydrocarbons
 cPAH: Screening level individually for Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Chrysene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene
 nPAH: Soil screening level individually for Acenaphthene, Acenaphthylene, Anthracene, Benzo(ghi)perylene, Fluoranthene, Fluorene, Phenanthrene, and Pyrene
 ppm: mg/L - parts per million
 * Samples shall be filtered prior to acid preservation.

NOTE: The UST Branch may consider the variability in analytical results within the laboratory methods specified in USEPA SW-846.

7.3 Vapor Intrusion

An owner and operator of UST systems suspected of being the source of vapor intrusion may be directed in writing to perform a vapor intrusion assessment in accordance with Section 5.4.3 of this manual.

Vapor screening levels are specific to the appropriate sample type and setting. The U.S. EPA Vapor Intrusion Screening Levels (VISLs) may be utilized for comparison of vapor analytical data.

Based upon the vapor intrusion assessment, the UST Branch will make a determination whether vapor intrusion has occurred. This determination will be utilized to determine a UST facility ranking in accordance with 401 KAR 42:250, Section 21.

When a UST system is classified to use Groundwater Table 2 or Groundwater Table 3 screening levels, and vapor persists within residential or commercial structures after achieving cleanup to Groundwater Table 2 or Groundwater Table 3 screening levels, additional corrective action may be directed in writing by the UST Branch, as necessary.

8.0 ANALYTICAL DATA

In all reports submitted to the UST Branch requiring analytical data, provide documentation indicating that recognized methods, in accordance with US EPA SW-846, were followed for sample collection, sample preservation, sampling equipment, decontamination procedures, sample containers, sample size, and maximum sample holding times. Samples shall be delivered to an appropriate materials testing laboratory for the analysis required. Refer to Tables 7 through 10 for specific analytical requirements.

8.1 Laboratory Data

Laboratory data sheets shall be submitted with any report requiring data collection and analysis. All laboratory analysis will be directed in writing by the UST Branch.

A trip blank shall accompany all BTEX water samples during storage and transport. Each trip blank analysis shall be included with the laboratory analysis within all reports submitted to the UST Branch. Trip blanks are not required for water samples collected for PAH and lead analysis when BTEX analysis is not required.

A field blank shall be collected, when directed in writing by the UST Branch, during sampling activities to assess contamination from field conditions.

All laboratory data sheets shall, at a minimum, indicate the following:

- A. Date of sample collection;
- B. Date received by the laboratory;
- C. Date analyzed;
- D. Sample extraction date (if required);
- E. Surrogate recovery percentages;
- F. US EPA SW-846 method number(s) used; and
- G. Appropriate reporting limits.

8.2 Chains of Custody

Provide chain of custody documentation that identifies who has had possession of the sample, the time of possession, and where the sample has been from the time of collection until the laboratory accepts it. The chain of custody shall indicate the method of preservation and the temperature at which the samples were received by the laboratory. Chain of custody procedures shall be followed to ensure the validity of all samples. If the chain of custody is not maintained (e.g., if someone leaves a sample unattended), then the integrity of the sample is compromised and may be rejected by the UST Branch. The chain of custody shall be maintained as indicated by US EPA SW-846 requirements and shall be attached to all analytical results submitted, and shall include the trip blank, field blank (if directed), or other additional quality assurance/quality control samples as directed in writing by the cabinet.

8.3 Flagged Data

Reports submitted to the UST Branch shall discuss the validity of any flagged data (e.g., surrogate recovery data out of range, samples received at high temperature, etc.).

Table 7 – Analytical Requirements for Soil Samples

Product stored in UST System	Required Parameters	Acceptable Method	Maximum Acceptable Reporting Limit (ppm)
Gasoline, Kerosene, or Jet Fuel	BTEX	Method SW-846 8260	B: <0.01 T: <0.7 E: <0.9 X: <5
Diesel or regulated Heating Oil	PAH	Method SW-846 8270	Ch: <15 B(a)A: <0.15 cPAH: <0.3 nPAH: <3 NAP: <1
Waste Oil	PAH	Method SW-846 8270	Ch: <15 B(a)A: <0.15 cPAH: <0.3 nPAH: <3 NAP: <1
	Total Lead	Method SW-846 6010 or 6020	Total Lead: <400
New Oil	PAH	Method SW-846 8270	Ch: <15 B(a)A: <0.15 cPAH: <0.3 nPAH: <3 NAP: <1
Other Petroleum (<i>biodiesel, mineral spirits, etc.</i>) or Non-Petroleum	Contact the UST Branch		

- BTEX: Benzene, Toluene, Ethylbenzene, and Xylene (*Total*)
- PAH: Polynuclear Aromatic Hydrocarbons
- Ch: Screening level individually for Chrysene
- B(a)A: Screening level individually for Benzo(a)anthracene
- cPAH: Maximum acceptable reporting limit individually for Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene
- nPAH: Maximum acceptable reporting limit individually for Acenaphthene, Acenaphthylene, Anthracene, Benzo(ghi)perylene, Fluoranthene, Fluorene, Phenanthrene, and Pyrene
- NAP: Naphthalene
- ppm: mg/kg - parts per million

Table 8 – Analytical Requirements for Pit Water and Groundwater Samples

Product stored in UST System	Required Parameters	Acceptable Method	Maximum Acceptable Reporting Limit (ppm)
Gasoline, Kerosene, or Jet Fuel	BTEX**	Method SW-846 8260	B: <0.005 T: <0.94 E: <0.47 X: <5.89
Diesel or regulated Heating Oil	cPAH nPAH NAP	Method SW-846 8270	cPAH: <0.005 nPAH: <3 NAP: <0.3
Waste Oil	cPAH nPAH NAP	Method SW-846 8270	cPAH: <0.005 nPAH: <3 NAP: <0.3
	Dissolved Lead*	Method SW-846 6010 or 6020	Dissolved Lead: <0.015
New Oil	cPAH nPAH NAP	Method SW-846 8270	cPAH: <0.005 nPAH: <3 NAP: <0.3
MTBE sampling as required by the cabinet for domestic use water sources only	MTBE	Method SW-846 8260	MTBE: <0.05 ppm
Other Petroleum (biodiesel, mineral spirits, etc.) or Non-Petroleum	Contact the UST Branch		

BTEX: Benzene, Toluene, Ethylbenzene, and Xylene (*Total*)
 PAH: Polynuclear Aromatic Hydrocarbons
 cPAH: Maximum acceptable reporting limit individually for Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Chrysene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene
 nPAH: Maximum acceptable reporting limit individually for Acenaphthene, Acenaphthylene, Anthracene, Benzo(ghi)perylene, Fluoranthene, Fluorene, Phenanthrene, and Pyrene
 NAP: Naphthalene
 MTBE: Methyl Tertiary-Butyl Ether
 ppm: mg/L - parts per million

* Samples shall be filtered prior to acid preservation (refer to Table 10).

** Shall include a trip blank analysis

Table 9 – Analytical Requirements for Soil Vapor and Indoor Air Samples

Product stored in UST System	Required Parameters	Acceptable Method	Maximum Acceptable Reporting Limit ($\mu\text{g}/\text{m}^3$)
Gasoline, Kerosene, or Jet Fuel	BTEX VOCs	Method SW-846 8260, TO-15, TO-17	B: <0.36 T: <520 E: <1.1 X: <100
Diesel or regulated Heating Oil	NAP VOCs	Method SW-846 8260, TO-15, TO-17	NAP: <2.8
Waste Oil	NAP VOCs	Method SW-846 8260, TO-15, TO-17	NAP: <2.8
New Oil	NAP VOCs	Method SW-846 8260, TO-15, TO-17	NAP: <2.8
Other Petroleum (<i>biodiesel, mineral spirits, etc.</i>) or Non-Petroleum	Contact the UST Branch		

BTEX: Benzene, Toluene, Ethylbenzene, and Xylene (*Total*)
 NAP: Naphthalene
 VOCs: Volatile Organic Compounds
 $\mu\text{g}/\text{m}^3$: Micrograms per cubic meter

Table 10 – Sample Preparation Protocol

Parameter	Container Type	Sample Size	Preservation Method	Holding Times (Maximum)
Volatile Organics for Soil (<i>BTEX</i>)	Wide-mouth glass w/ Teflon-lined cap	120 ml or 4 oz.	Cool to 4°C (+/- 2°C)	14 days
Volatile Organics for Water (<i>BTEX; MTBE</i>)	Two (2) clear glass w/ Teflon-lined cap (<i>VOA</i>)	40 ml or 1 oz.	Add four drops of HCl to each Cool to 4°C (+/- 2°C)	14 days
Polynuclear Aromatic Hydrocarbons for Soil (<i>PAH</i>)	Wide-mouth glass w/ Teflon-lined cap	250 ml or 8 oz.	Cool to 4°C (+/- 2°C)	14 days <i>until</i> lab extraction 40 days <i>after</i> lab extraction
Volatile Organics for Soil Vapor – Active Sampling Methods	Tedlar Bag	1 or 6 liter	NA	2 days
	Summa canister			14 days
Volatile Organics for Indoor/CrawlSpace/Ambient Air	Summa canisters	1 or 6 liter	NA	14 days
Polynuclear Aromatic Hydrocarbons for Water (<i>PAH</i>)	Amber glass w/ Teflon-lined cap	1 liter	Cool to 4°C (+/- 2°C)	7 days <i>until</i> lab extraction 40 days <i>after</i> lab extraction
Total Lead for Soil	Wide-mouth glass w/ Teflon-lined cap	500 ml or 16 oz.	N/A	180 days
Dissolved Lead for Water (shall be filtered prior to acid preservation)	Plastic or glass	500 ml or 16 oz.	Cool to 4°C (+/- 2°C) Add HNO ₃ after filtering until pH is less than 2	180 days
Volatile Organics for Sludge (<i>TCLP</i>)	Wide-mouth glass w/ Teflon-lined cap	120 ml or 4 oz.	Cool to 4°C (+/- 2°C)	14 days <i>until</i> lab extraction 14 days <i>after</i> lab extraction
Acid/Base/Neutral for Sludge (<i>TCLP</i>)				14 days (hold) 7 days <i>until</i> lab extraction 40 days <i>after</i> lab extraction
Metals for Sludge (<i>TCLP</i>)	Wide-mouth glass w/ Teflon-lined cap	500 ml or 16 oz.	Cool to 4°C (+/- 2°C)	180 days <i>until</i> lab extraction 180 days <i>after</i> lab extraction
Mercury for Sludge (<i>TCLP</i>)				28 days <i>until</i> lab extraction 28 days <i>after</i> lab extraction

NOTE: For further information, refer to U.S. EPA SW-846.

9.0 DECONTAMINATION AND INVESTIGATION DERIVED WASTE MANAGEMENT

9.1 Decontamination of Equipment

To prevent cross contamination, all down-hole equipment (drilling tools, soil and groundwater sampling tools, water level meters, etc.) shall be properly decontaminated prior to and between boreholes.

9.2 Waste Management Summary

Provide a summary of the handling and storage of material generated during the field investigation (development/purge water, soil cuttings, etc.), and submit documentation regarding the proper management of the waste (e.g., chain of custody, waste manifest, receipts, etc.). If wastes are determined to be hazardous, contact the Hazardous Waste Branch, Division of Waste Management, at (502) 564-6716, for additional requirements pertaining to waste disposal, manifesting, registration, etc.

All submitted reports shall include a summary of the amount of investigation derived waste (IDW) generated, stored on-site, and disposed, recycled, or treated at a permitted facility.

10.0 APPENDICES

Appendix A – Removed Underground Storage Tank(s) Bill of Sale Example

Agency Interest (AI) Number _____

I _____ acknowledge purchase of the following tank(s).

The intended use for the tank(s) is: _____

The referenced tank(s) was removed from the following address:

Name: _____ Address: _____

Phone: _____

The tank(s) will now be located at the following address:

Name: _____ Address: _____

Phone: _____

Tank Number	Capacity (gal)	Removal Date	All Products Ever Stored in UST

Certification of New Owner

As the new tank(s) owner, I understand that I assume responsibility for the tank(s) and acknowledge that its use will be in compliance with regulatory requirements. I also understand that in accordance with API Recommended Practice 1604, removed underground storage tank(s) shall not be used for drainage culverts or the subsequent storage of food or liquids intended for animal or human consumption. I understand that I may become a generator of hazardous waste if and when any remaining residues are removed from the underground storage tank(s).

Signature: _____ Address: _____

Date: _____

Appendix B – Analytical Data Table Examples

Historic Soil Analytical Data Table Example

Sample ID	Sample Interval (ft)	Date Sampled	On-site or Off-site	B	T	E	X	Resample Status/Comments
				(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	
N. Wall	--	4/9/2003	On-site	<0.01	0.17	<0.01	<0.01	Below screening levels; CAR sample
S. Wall	--	4/9/2003	On-site	0.23	0.02	0.04	0.11	Below screening levels; CAR sample
E. Wall	--	4/9/2003	On-site	3.2	1.9	4.7	9.2	Resampled; below screening levels 6/29/2006
W. Wall	--	4/9/2003	On-site	1.4	0.23	0.94	1.3	Below screening levels; CAR sample
Bottom	--	4/9/2003	On-site	0.97	0.55	0.72	1.1	Below screening levels; CAR sample
PT/PI	--	4/9/2003	--	<i>no sample - pump island above tank pit</i>				
SB1	8-10	7/6/2003	On-site	3.1	0.37	0.44	0.95	Resampled; below screening levels 6/9/2006
SB2	8-10	7/6/2003	On-site	<0.01	<0.01	<0.01	<0.01	SI sample; below screening levels
SB3	6-8	7/6/2003	Off-site	<0.01	<0.01	<0.01	<0.01	SI sample; below screening levels
EW-R	--	1/22/2006	On-site	0.93	0.56	3.2	3.1	Resample of E. Wall; invalid sample - improper preservation
SB1-R	8-10	1/22/2006	On-site	0.42	0.22	0.21	0.53	Resample of SB1; invalid sample - improper preservation
EW-RR	--	6/29/2006	On-site	0.59	0.61	2.9	3	Resample of E. Wall; below screening levels
SB1-RR	8-10	6/29/2006	On-site	0.38	0.49	0.18	0.48	Resample of SB1; below screening levels
<i>Class A Adjusted Screening Levels (mg/kg)</i>			<i>On-site</i>	2	35	30	210	
<i>Class B Soil Matrix Table I Screening Levels (mg/kg)</i>			<i>Off-site</i>	0.1	35	30	210	

Historic Groundwater Gauging Data Table Example

Well Name (AKGWA number)	Date	Well Diameter (in)	(A)* Top of Casing Elevation (ft)	(B) Depth to Hydrocarbon (ft)	(C) Depth to Water (ft)	Depth of Bore (ft)	Purged Volume (gal)	Depth of Screened Interval (ft)	(A)-(B) Hydrocarbon Surface Elevation (ft)	(A)-(C) Water Surface Elevation (ft)	(C)-(B) Hydrocarbon Thickness (ft)	(See Note) Potentiometric Surface Elevation (ft)	Sample Description (turbidity, odor, sheen, etc.)
MW1 8004-1372	1/30/01	2-inch	98.45	5.64	5.93	15.00	4.6	5-15	92.81	92.52	0.29	92.73	free product, strong odor
	9/12/01			5.91	5.95		4.5		92.54	92.50	0.04	92.53	free product, strong odor
	11/13/02			N/A	6.01		4.4		N/A	92.44	N/A	92.44	globules, odor
	3/15/04			N/A	5.84		4.5		N/A	92.61	N/A	92.61	sheen, odor
	6/16/05			N/A	6.39		4.2		N/A	92.06	N/A	92.06	slightly cloudy, odor
MW2 8004-1373	1/30/01	2-inch	97.55	N/A	7.67	15.00	3.6	5-15	N/A	89.88	N/A	89.88	clear, no odor
	9/12/01			N/A	7.89		3.5		N/A	89.66	N/A	89.66	clear, no odor
	11/13/02			N/A	8.01		3.4		N/A	89.54	N/A	89.54	clear, no odor
	3/15/04			N/A	7.55		3.6		N/A	90.00	N/A	90.00	clear, no odor
	6/16/05			N/A	6.79		4.0		N/A	90.76	N/A	90.76	cloudy, slight odor
MW3 8004-1374	1/30/01	2-inch	97.96	N/A	7.88	17.00	4.5	5-17	N/A	90.08	N/A	90.08	clear, no odor
	9/12/01			N/A	7.54		4.6		N/A	90.42	N/A	90.42	clear, no odor
	11/13/02			N/A	7.97		4.4		N/A	89.99	N/A	89.99	clear, no odor
	3/15/04			N/A	7.25		4.8		N/A	90.71	N/A	90.71	clear, no odor
	6/16/05			N/A	6.89		4.9		N/A	91.07	N/A	91.07	clear, no odor

* Identify the reference point utilized to determine the top of casing elevations: _____
 N/A: Not Applicable

Potentiometric Surface Elevation = (A)-(C)+S.G.[(C)-(B)]
 Water/hydrocarbon level measurements are recorded to 0.01 ft accuracy
 Specific gravity of hydrocarbons (S.G.) - 0.73

Historic Groundwater Analytical Data Table Example

Sample ID	Date Sampled	On-site or Off-site	B	T	E	X	cPAH	nPAH	NAP	Lead
			(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Pit Water	11/9/2003	On-site	3.6	0.99	0.77	2.1	<0.005	<0.005	<0.005	<0.005
MW1 8004-1372	4/12/2005	On-site	1.7	0.33	0.84	0.011	<0.005	0.25	0.003	<0.005
	8/15/2005		1.57	0.45	0.04	<0.005	<0.005	<0.005	0.004	<0.005
	12/5/2005		1.03	0.14	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	3/21/2006		0.88	0.02	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	6/29/2006		0.56	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	9/30/2006		0.66	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	1/8/2007		0.39	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
MW2 8004-1373	4/12/2005	On-site	0.004	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	8/15/2005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	12/5/2005		0.008	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	3/21/2006		0.009	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	6/29/2006		0.003	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	9/30/2006		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	1/8/2007		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
MW3 8004-1374	4/12/2005	On-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	8/15/2005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	12/5/2005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	3/21/2006		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	6/29/2006		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	9/30/2006		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	1/8/2007		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
MW4 8004-1375	1/8/2007	Off-site	0.004	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
MW5 8004-1376	1/8/2007	Off-site	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
<i>Groundwater Table 3 Screening Levels (mg/L):</i>		<i>On-site</i>	0.31	101	148	719	0.005	3.0	0.3	0.015
<i>Groundwater Table 1 Screening Levels (mg/L):</i>		<i>Off-site</i>	0.007	0.94	0.47	5.89	0.005	3.0	0.3	0.015

Historic Indoor Air and Soil Vapor Analytical Data Table Example

Sample ID / Location	Date Sampled	Sample Type ¹	Sample Duration ²	B	T	E	X	NAP	PCE	TCE	Vinyl Chloride
				($\mu\text{g}/\text{m}^3$)	($\mu\text{g}/\text{m}^3$)	($\mu\text{g}/\text{m}^3$)	($\mu\text{g}/\text{m}^3$)	($\mu\text{g}/\text{m}^3$)	($\mu\text{g}/\text{m}^3$)	($\mu\text{g}/\text{m}^3$)	($\mu\text{g}/\text{m}^3$)
Background	1/25/2016	-	8-hr	<0.64	1.2	0.87	2.52	<3.3	<1.4	<1.1	<0.51
	2/8/2016			0.52	0.86	0.11	1.63	<3.3	<1.4	<1.1	<0.51
	4/13/2016			1.1	2.6	<0.87	<1.7	<3.3	<1.4	<1.1	<0.51
	7/4/2016			1.33	2.43	<0.87	<1.7	<3.3	<1.4	<1.1	<0.51
Stock Room	1/25/2016	Indoor Air	8-hr	19	23	2.1	7.4	<3.3	<1.4	<1.1	<0.51
	2/8/2016			8.0	12	1.1	4.3	<3.3	<1.4	<1.1	<0.51
	4/13/2016			1.9	3.7	<0.87	2.2	<3.3	<1.4	<1.1	<0.51
	7/4/2016			1.4	3.7	<0.87	<1.7	<3.3	<1.4	<1.1	<0.51
Kitchen	1/25/2016	Indoor Air	8-hr	67	57	5.2	22	<3.3	<1.4	<1.1	<0.51
	2/8/2016			42	15	3.0	12	<3.3	<1.4	<1.1	<0.51
	4/13/2016			2.4	9.6	2.1	<1.7	<3.3	<1.4	<1.1	<0.51
	7/4/2016			1.8	8.3	<0.87	<1.7	<3.3	<1.4	<1.1	<0.51
SS01	6/12/2016	Sub-slab	grab	66	440	85	480	<3.1	<4.0	<3.1	<0.66
	9/15/16	Sub-slab	grab	24	128	44	120	<3.1	<4.0	<3.1	<0.66
SS02	6/12/2016	Sub-slab	grab	2.2	11	2.3	10.9	<3.1	<4.0	<3.1	<0.66
	9/15/16	Sub-slab	grab	1.9	8	2.2	12.9	<3.1	<4.0	<3.1	<0.66
SG01	6/12/2016	Exterior	grab	<0.02	<0.02	<0.26	<0.02	<3.3	<1.4	<1.1	<1.1
	9/15/16	Exterior	grab	<0.02	<0.02	<0.26	<0.02	<3.3	<1.4	<1.1	<1.1
SG02	6/12/2016	Exterior	grab	2.3	14	6.3	120	<3.3	<1.4	<1.1	<1.1
	9/15/16	Exterior	grab	1.2	4.3	1.2	98	<3.3	<1.4	<1.1	<1.1
SG03	6/12/2016	Exterior	grab	0.20	0.32	0.09	0.44	0.07	<1.4	<1.1	<1.1
	9/15/16	Exterior	grab	<0.02	<0.02	<0.26	<0.02	<0.05	<1.4	<1.1	<1.1
Commercial Sub-Slab & Exterior Soil Gas VISLs³				52	730,000	1,600	15,000	12	1,600	100	93
Commercial Indoor Air VISLs³				1.6	2,200	4.9	4,400	0.36	47	3.0	2.8

Note:* Additional tables may be necessary for additional parameters.
 $\mu\text{g}/\text{m}^3$: Micrograms per cubic meter

¹ Sample Type – Indoor air, crawlspace, sub-slab soil gas, near-slab soil gas, exterior, etc. All indoor air sampling events shall include at least one (1) background or ambient air sample.

² Sample Duration – Grab (sample), 8-hr, 12-hr, 24-hr, etc. (based on residential, commercial, or industrial land use).

³ Screening Levels – Specific to the appropriate sample type and setting, and based upon U.S. EPA Vapor Intrusion Screening Levels (VISL), incorporating Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, May 2016 RSLs.

Appendix C – Notice of Vapor Intrusion Assessment Example

The Division of Waste Management has requested a vapor intrusion assessment on your property. As requested by the Division of Waste Management, _____ (*contracting company*) is providing this notice at least seven (7) days in advance of the sampling event.

Sample Date:	
Arrival Time:	
Duration of Sampling:	
Contracting Company:	
Contact Person:	
Phone Number:	
Sample Technician:	
Type of samples to be collected:	<input type="checkbox"/> Indoor Air Samples <input type="checkbox"/> Sub-Slab Samples <input type="checkbox"/> Soil Vapor Samples <input type="checkbox"/> Near-Slab Samples

You are being supplied with this notice because you are the owner or occupant of a property or building that will be assessed in a vapor intrusion investigation. Soil vapor samples, including sub-slab and near-slab samples, do not require any preparation by the owner or occupant, however, please note the scheduled sampling time if you wish to be present during the assessment.

Please be aware that sub-slab soil vapor sampling requires gaining access to the inside of the building for sample point installation and separate access in order to perform sampling.

If indoor air sampling is scheduled, your compliance with the following guidelines is requested. By following these guidelines, the best possible air sample data may be obtained. Forty-eight (48) hours prior to and during an indoor air sampling event, please:

- A. Operate your furnace and whole house air conditioner as appropriate for the current weather conditions.
- B. Do not use wood stoves, fireplaces or auxiliary heating equipment.
- C. Do not open windows or keep doors open.
- D. Avoid using window air conditioners, fans or vents.
- E. Do not smoke tobacco products in the building.
- F. Do not use air fresheners or odor eliminators.
- G. Do not use paints or varnishes (up to a week in advance, if possible).
- H. Do not use cleaning products (e.g., bathroom cleaners, furniture polish, appliance cleaners, all-purpose cleaners, floor cleaners).
- I. Do not use cosmetics including hair spray, nail polish remover, or perfume.
- J. Do not participate in hobbies indoors that use solvents.
- K. Do not store containers of gasoline, oil or petroleum based or other solvents within the building or attached garages (except for fuel oil tanks).
- L. Do not operate or store automobiles in an attached garage.
- M. Do not operate gasoline powered equipment within the building, attached garage or around the immediate perimeter of the building.

By following the suggestions above, air samples will be more likely to indicate a possible environmental impact on the air in your residence as opposed to the contribution of airborne chemicals from everyday household activities.

Sample results will be submitted by the contracting company listed above to Division of Waste Management. Division of Waste Management personnel will evaluate the data and provide a copy of all data to you via U.S. Mail.

Appendix D – Acronyms

AI	Agency Interest
AKGWA	Well number designations for DOW and Kentucky Groundwater Data Repository identification number
API	American Petroleum Institute
ASTM	American Society for Testing and Materials
B(a)A	Benzo(a)anthracene
BTEX	Benzene, Toluene, Ethylbenzene, and Xylene (Total)
CAP	Corrective Action Plan
CAR	Closure Assessment Report
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act (known also as Superfund)
Ch	Chrysene
COD	Chemical oxygen demand
cPAH	Carcinogenic polynuclear aromatic hydrocarbons
DOW	Division of Water
EPA	Environmental Protection Agency
ERT	Emergency Response Team
FID	Flame ionization detector
FRA	Financial Responsibility Account
GMR	Groundwater Monitoring Report
IDW	Investigation derived waste
KAR	Kentucky Administrative Regulations
KGS	Kentucky Geological Survey
KPDES	Kentucky Pollutant Discharge Elimination System
KRS	Kentucky Revised Statutes
ml	Milliliter
MTBE	Methyl Tertiary-Butyl Ether
NAP	Naphthalene
NFA	No further action
NOI	Notice of intent
nPAH	Noncarcinogenic polynuclear aromatic hydrocarbons
PAH	Polynuclear Aromatic Hydrocarbons
PCE	Tetrachloroethylene
PE	Professional Engineer
PG	Professional Geologist
PID	Photoionization detector

ppb	Parts per billion; µg/L
ppm	Parts per million; mg/kg
PSTEAF	Petroleum Storage Tank Environmental Assurance Fund
PVA	Property value administrator
ROW	Right-of-way
RSL	Regional screening level
SFMO	State Fire Marshal's Office
SOTRA	Small Owners Tank Removal Account
SVOC	Semi-volatile organic compounds
TCE	Trichloroethylene
TCLP	Toxicity characteristic leaching procedure
TSD	Treatment, storage, or disposal
USCS	Unified Soil Classification System
USGS	United States Geological Survey
UST	Underground storage tank
VISL	Vapor intrusion screening level
VOC	Volatile organic carbon
µg/L	Micrograms per liter
µg/m³	Micrograms per cubic meter