COMPREHENSIVE GUIDELINES APPENDICES

PETROLEUM AND HAZARDOUS SUBSTANCE UST RELEASES

PETROLEUM NON-UST RELEASES

UST Section

North Carolina Department of Environmental Quality

Division of Waste Management

January 19, 2021 Version

Appendices

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# Appendix A - Reports

The assessment and remediation of a site with groundwater **and/or** soil contamination should be documented by following the reporting requirements presented in Appendix A. Unless otherwise indicated, these reporting requirements apply to all releases. **Reports must be submitted in the format specified in Appendix A, or they will not be approved.** *The regional office may deny approval of a report if any of the elements of the report format specified in Appendix A have not been included or have not been sufficiently addressed. The regional office may require that additional information be submitted to support a report. A report will not be approved until it is submitted in a complete form. The report formats are listed below and presented in the following pages of Appendix A in the order in which they usually are required.*

1. **Site Check Report** – A Site Check Report must be submitted to the Permits and Inspection Branch *AND* appropriate regional office of the UST Section within thirty (30) days of receipt of the Notice of Regulatory Requirements in which the site check is requested. If the results of the site check indicate that no contamination is present meeting or exceeding any of the following criteria: no non-aqueous phase liquid (NAPL) was observed, no soil contamination was detected at or above - 50 mg/kg TPH GRO, 100 mg/kg TPH DRO, or any applicable MSCCs (where sampled), and no groundwater contamination was detected at or above the applicable 2L standards (where groundwater has been sampled), then the report format for the Site Check Report should be used. If the results indicate contamination exceeding the above criteria, then an Initial Abatement Action Report Appendix A, Report 8, which incorporates the information required by the Site Check Report format) must be submitted within 90 days of release discovery, instead.
2. **UST-3 - Notice of Intent: UST Permanent Closure or Change-in-Service** - Complete and submit to the DEQ Regional Office where the tank is located and to the Raleigh Central Office at least thirty (30) days prior to closure or change-in-service activities. If a Professional Engineer (P.E.) or a Licensed Geologist (L.G.) provides supervision for closure or change-in-service site assessment activities and signs and seals all closure reports, then at least a five (5) working-days notice is acceptable.
3. **24-Hour Release and UST Leak Reporting Form** (UST 61 Form) - For UST Releases in NC. This form should be completed and submitted to the UST Section’s regional office following a known or suspected release from an underground storage tank (UST) system. This form is required to be submitted within 24 hours of discovery of a known or suspected release.
4. **24-Hour Notification of Discharge Form** (UST 62 Form) - For Non-UST Releases of Petroleum in NC. This form should be completed and submitted to the UST Section’s regional office following a known or suspected release of petroleum from a source other than an underground storage tank. This form is required to be submitted within 24 hours of discovery of a known or suspected petroleum release.
5. **20-Day Report -** The responsible party for regulated USTs and non-regulated commercial USTs must submit a 20-Day Report summarizing the initial abatement actions that were performed within 20 days following release confirmation to the appropriate regional office of the Corrective Action Branch of the UST Section. The responsible party for non-regulated noncommercial USTs is not required to perform any initial abatement actions or additional reporting except where directed by the Department based on the risk posed by the site.
6. **UST Closure Report** (following UST-12 format) and Site Investigation Report for Permanent Closure or Change-in-Service of UST (UST-2 Form)
7. **Site Investigation Report for Permanent Closure or Change-in-Service of UST**
8. **Initial Abatement Action** (Site Check, UST Closure with UST-2 Form, Excavation, Post-Excavation Soil Contamination Assessment) Report
9. **45-Day Report** *(for non-petroleum UST releases only)*: The RP must prepare and submit this report to the appropriate regional office within 45 days of confirmation of a release. This report documents the results of the free product investigation, a receptor survey and initial site characterization activities. The priority ranking of a non-petroleum UST release will be based on the information in this report.
10. **Free Product Recovery Report:** This report presents information on free product recovery activities following the initial and any subsequent recovery event whenever the timing is appropriate. This report should be prepared and submitted only when reporting of free product recovery cannot not be achieved within a reasonable time period by incorporation in the **Initial Abatement Report**, the **Comprehensive Site Assessment Report**, the **Corrective Action Plan**, or routine **Monitoring Reports**. A separate **Free Product Recovery Report** is required only when a more comprehensive report is not due simultaneously.
11. **Free Product Recovery System Specification Report:** Following the initial free product recovery event and report (a **Free Product Recovery Report** or, if the timing is appropriate, an **Initial Assessment Report**, **Comprehensive Site Assessment Report**, or pre-CAP **Monitoring Report**), the responsible party must investigate to determine the product type, thickness, rate of recovery, and lateral extent of free product; relevant hydrogeological factors; and potential receptors and then must submit the results of this investigation to the appropriate regional office of the UST Section in a **FP Recovery System Specification Report**. This report should evaluate the results of the investigation and possible active free product recovery system options (e.g., excavation, SVE, MMPE, AFVR); propose a recovery plan which incorporates the most appropriate recovery system option; and conclude with a schedule for the recovery plan. (Eventually, this recovery plan will be superseded by any recovery plan incorporated in the **Corrective Action Plan**.)
12. **Initial Site Assessment Report (For non-UST petroleum releases only):** Present information relevant to site history and characterization, ***updating information provided in previous reports.***
13. **Limited Site Assessment Report:** The Limited Site Assessment (LSA) Report documents initial site assessment activities and risk characterization performed in accordance with 15A NCAC 2L .0405. This report should be completed and submitted to the appropriate regional office within 120 days of the discovery of a release.
14. **Request for Water Supply Well Information**
15. **Additional Risk Assessment Report:** *Upon receipt of a Phase I LSA for the first release at a site the incident manager will determine the risk for the release. If the release is ranked below the UST Funding Level the incident manger will issue a stop funding notice to the responsible party. If the release is ranked above the UST Funding Level the incident manager may request information (Additional Risk Assessment Report) pursuant to l5A NCAC 02L .0407 to determine potential exposure of receptors to the discharge or release*
16. **Comprehensive Site Assessment Report** *(for high and intermediate risk petroleum UST releases, all non-petroleum UST releases, and non-UST petroleum releases)***:** The Comprehensive Site Assessment (CSA) Report documents investigation activities performed to characterize the cause, significance, and extent of contamination from a release**.** The CSA Report should be completed and submitted to the Division of Waste Management regional office within 90 Days of the date of a Notice of Regulatory Requirements (NORR) requiring the report*. The CSA will not be approved until it is submitted in a complete form.*
17. **Soil Assessment Report** *(for low risk petroleum UST releases only)*: The Soil Assessment Report (SAR) documents investigation activities performed to characterize the cause, significance and extent of soil contamination from a release of petroleum from a UST system and incorporates a proposal for soil remediation. The SAR should be completed and submitted to the regional office within 90 days of receipt of a Notice of Regulatory Requirements classifying the release as low risk*. The SAR will not be approved until it is submitted in a complete form.* (The responsible party for a release that is reclassified as low risk after review of a CSA, should submit a Soil Cleanup Plan; in that case, a SAR would not be appropriate as the extent of soil contamination would have been delineated during the CSA.
18. **Corrective Action Plan** *(for high and intermediate risk petroleum UST releases, all non-petroleum UST releases, and all non-UST petroleum releases)***:** The Corrective Action Plan (CAP) proposes and evaluates actions to cleanup contamination caused by a release. The CAP addresses both soil and groundwater contamination**.**  For releases involving **only** soil contamination, only the sections of the CAP format that address soil contamination should be included. The CAP should be completed and submitted to the Division of Waste Management regional office within 60 Days of the date of a Notice of Regulatory Requirements (NORR) requiring the report. *The CAP will not be approved until it is submitted in a complete form.*

The responsible party must receive approval of any CAP before the CAP is implemented. Approval of a CAP is conditional upon issuance of any required permits, etc.

For State Trust Fund reimbursement, innovative technologies must have prior approval before the CAP is written. To obtain a list of remediation technologies that have been approved or that are under consideration by the Department, contact the UST Section Central Office at (919) 707-8171 and request the Innovative Technology Roster.

1. **Multi-Part Corrective Action Plan:** The multi-part corrective action plan outlines the typical information that should be provided in three standalone documents submitted in lieu of a full Corrective Action Plan (CAP) at an eligible site operating under the current Reasonable Rate Document to maintain access to the Commercial Leaking Petroleum Underground Storage Tank Trust Fund (Trust Fund).
   * ***Feasibility Study:*** *The objective of the standalone Feasibility Study (CA Study) portion of this multi-part CAP process at Trust Fund-eligible sites is to provide a robust evaluation of the remedial strategy that was provided in the ‘Conclusion and Recommendations’ section of the preceding Comprehensive Site Assessment (CSA) Report. It should include a very brief summary of any previous abatement efforts (for example, soil excavations or free product recovery events, etc.) and site conditions, along with a more thorough description of any work performed since the completion of the CSA that may help verify the applicability of the recommended remedial alternative.*
   * ***CA Design:*** *The objective of the standalone CA Design portion of this multi-part CAP process at Trust Fund-eligible sites is to provide a formal design for the remedial strategy in the preceding CA Study, as approved by the Department. Please note that any CA Design incorporating engineering practices must be sealed by the professional engineer who developed the remediation system design.*
   * ***CA Decision:*** *The objective of the standalone CA Decision portion of this multi-part CAP process at Trust Fund-eligible sites is to provide a formal statement of objectives, schedules, and milestones for the selected remedial strategy and the associated remedial system design that were provided in the preceding CAP CA Study and CA Design steps, as approved by the Department.*
2. **Soil Cleanup Plan** *(for petroleum UST releases classified as low risk* *following review of a CSA Report*): The Soil Cleanup Plan is a proposal for soil remediation. The Soil Cleanup Plan should be completed and submitted to the Division of Waste Management regional office within 60 Days of the date of a Notice of Regulatory Requirements (NORR) requiring the report.
3. **Monitoring Reports** *(for high and intermediate risk petroleum UST releases, all non-petroleum UST releases, and all non-UST petroleum releases)***:** Monitoring Reports document the periodic monitoring of groundwater and soil in order to evaluate changes in contaminant concentration over time at specific locations. The information presented in a series of Monitoring Reports is used to monitor plume migration, evaluate the effectiveness of corrective action, account for the effects of fluctuating water table elevation versus contaminant concentrations, etc. Submittal of periodic Monitoring Reports may be requested by the appropriate regional office or, if applicable, may be required as part of an approved **Corrective Action Plan**. There are two types of Monitoring Report:

* **Pre-CAP Monitoring Report**: Pre-CAP monitoring should be conducted if required by the appropriate regional office. Pre-CAP monitoring primarily involves sampling monitoring wells at the site before developing a CAP. The **Pre-CAP Monitoring Report** describes the monitoring event and presents and evaluates the analytical results. The **Pre-CAP Monitoring Report** should be submitted semi-annually, unless the regional office indicates a different schedule, by the end of the month subsequent to that of the monitoring event.
* **CAP Monitoring Report**: CAP monitoring should be conducted only after the CAP has been approved. The primary functions of CAP monitoring are to monitor the progress of an active remediation system or of remediation by natural attenuation in achievement of cleanup goals and to verify that cleanup levels have been achieved. The **CAP Monitoring Report** describes the monitoring event and presents and evaluates the analytical results. ***The report also presents a calculation of the percentage of the contaminant reduction achieved at the site at the time of the monitoring event, and it compares the percentage of contaminant reduction achieved to that proposed as the cleanup milestone for this time period in the CAP***. (The regional office must approve the selection of key monitoring wells and contaminants of concern for use in this calculation.) If a combination of active treatment and remediation by natural attenuation is being used to remediate contamination, monitoring results should be submitted in one report of this type. The **CAP Monitoring Reports** should be submitted semi-annually, unless the regional office indicates a different schedule, by the end of the month subsequent to that of the monitoring event.

1. **Corrective Action Performance Report**: This report is used to outline the remedial action plan in use at the site and indicate the relative effectiveness of the selected technology at reducing the estimated contaminant mass based on the calculated mass removal rates.
2. **System Enhancement Recommendation Report**. This report is used, when directed by Department, to propose a material change or major enhancement to an existing remediation system.
3. **New Technology Cleanup Plan**. This report is used when an existing remediation system is determined to be effective no longer, to propose replacement by a new technology or addition of a new technology.
4. **Soil Cleanup Report with Site Closure Request** *(for low risk petroleum UST releases only)*: This report documents that contaminated soil has been cleaned up to applicable soil cleanup levels while incorporating a request for the Department to issue a no further action notice in accordance with 15A NCAC 2L .0407. *The Soil Cleanup Report will not be approved until it is submitted in a complete form.*
5. **Site Closure Report** *(for high and intermediate risk petroleum UST releases, all non-petroleum UST releases, and all non-UST petroleum releases)*: The Site Closure Report documents remediation of contaminated soil and groundwater to the cleanup goals. The Site Closure Report also incorporates a request for the Department to issue a notice of no further action. For releases where groundwater does not require remediation, only those reporting requirements related to soil cleanup are applicable. *The Site Closure Report will not be approved until it is submitted in a complete form.*

**NOTE:** *A Licensed Geologist and/or Professional Engineer Certification is required for all of the above reports, except for specifically-approved reports of analytical data where no hydrogeological evaluations, interpretations or recommendations are made. CSA reports, groundwater monitoring reports, and CAPs that do not contain plans or designs for active groundwater remediation systems may be prepared and sealed by either a North Carolina Professional Engineer or Licensed Geologist. For the purpose of clarifying certification requirements, active groundwater remediation is defined to mean any remediation method that employs the use of pumps to move liquids and/or gases at a site. All plans and specifications intended for use in construction of or for obtaining regulatory authorization to construct an active remediation system must be prepared under responsible charge of a Professional Engineer and must bear the seal of the same. The applicable report must display the seal and signature of the certifying P.E. or L.G. and the name and certification number of the company or corporation on the title page [see 15A NCAC 2L .0103(e)].*

1. **Format of Individual Public Notice (15A NCAC 2L .0409(a))**
2. **Format of Public Notice by Posting (15A NCAC 2L .0409(a))**
3. **Format of Individual Public Notice for Non-Petroleum UST Releases (15A NCAC 2L .0114(b))**
4. **VPH (Aliphatics/Aromatics) Laboratory Reporting Form**
5. **EPH (Aliphatics/Aromatics) Laboratory Reporting Form**

### Site Check Report

A Site Check Report following the format outlined below must be submitted to the Permits and Inspection Branch *AND* appropriate regional office of the UST Section within thirty (30) days of receipt of the Notice of Regulatory Requirements in which the site check is requested. If the results of the site check indicate that ***no contamination is present*** meeting or exceeding any of the following criteria:

1. no non-aqueous phase liquid (NAPL) was observed,
2. no soil contamination was detected at or above -
   1. 50 mg/kg TPH GRO,
   2. 100 mg/kg TPH DRO, or
   3. any applicable MSCCs (where sampled), and
3. no groundwater contamination was detected at or above the applicable 2L standards (where groundwater has been sampled), then the report format that follows should be used to prepare a Site Check Report.

If contamination in excess of any of these limits ***is present***, then initial response and abatement actions must be performed, and an Initial Abatement Action Report (Appendix A, Report 8, which incorporates the information required by the Site Check Report format) must be submitted within 90 days of release discovery, instead.

*(Note that if, as a consequence of the site check, all or part of the UST system is closed, a UST Closure Report and UST-2A or UST-2B form (Appendix A, p. 82) must be submitted to both the Permits and Inspection Branch AND the appropriate regional office of the UST Section within 30 days of completion of closure. Where the results of the investigation meet the standards described above, the UST Closure Report requirements should be incorporated into the Site Check Report. Where the investigation results in a requirement to perform initial response and abatement actions, both the Site Check Report and UST Closure Report requirements should be incorporated into the Initial Abatement Action Report.)*

Complete the minimum elements of the Site Check Report format as presented in Sections A-J below.

1. **Site Information**
2. Site Identification

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Date of Report: |  | | | | Site Risk: | |  |
| Facility I.D.: |  | | UST Incident Number (if known): | | | |  |
| Site Name: |  | | | | | | |
| Street Address: |  | | | | | | |
| City/Town: |  | | Zip Code: |  | County: | |  |
| Description of Geographical Data Point (e.g., diesel fill port): | | | |  | | | |
| Location Method (GPS, topographical map, other): | | | |  | | | |
| Latitude (***decimal degrees***): | |  | Longitude (***decimal degrees***): | | |  | |

1. Information about Contacts Associated with the Leaking UST System *(Addresses must include street, city, state, zip code and mailing address, if different.)*

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UST/AST Owner: | |  | Email: | |  | | | | |
| Address: |  | | | | | Tel: |  | | |
| UST/AST Operator: | |  | Email: | |  | | | | |
| Address: |  | | | | | Tel: |  | | |
| Property Owner: | |  | Email: | |  | | | | |
| Address: |  | | | | | Tel: |  | | |
| Property Occupant: | |  | Email: | |  | | | | |
| Address: |  | | | | | Tel: |  | | |
| Consultant/Contractor: | |  | Email: | |  | | | | |
| Address: |  | | | | | Tel: |  | | |
| Analytical Laboratory: | |  | | State Certification No: | | | | |  |
| Address: |  | | | | | Tel: | |  | |

1. Information about Release

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date Discovered: |  | | | |
| Estimated Quantity of Release: | |  | | |
| Cause of Release: |  | | | |
| Source of Release (e.g., Dispenser/Piping/UST): | | |  | |
| Sizes and Contents of Tanks or Other Containment from which the Release Occurred: | | | |  |

1. **Executive Summary**

*<Provide Executive Summary here.>*

1. **Table of Contents**

*<Create Table of Contents here.>*

1. **Site History and Characterization**

Present information relevant to site history and characterization, using the following outline:

1. Provide information for UST/AST owners/operators and other responsible parties.

List the names, addresses, telephone numbers, and dates of ownership/operation of all previous UST/AST owners, UST/AST operators, and other responsible parties. Present in table form in Section I (Use Reporting Table B-2, Site History, UST/AST Owner/Operator and Other Responsible Party Information, from *Guidelines*, Appendix B.).

2. Provide UST information (inclusive of all USTs, currently and historically in place at facility). For each UST, provide the following information in table form in Section I (Use Reporting Table B-1, Site History- UST/AST System and Other Release Information, from the *Guidelines*, Appendix B.):

* Tank identification number (keyed to a site map showing the locations of all UST systems);
* Last contents of tank;
* Previous contents of tank (if any);
* Capacity of tank in gallons;
* Construction (material and structure);
* Tank dimensions;
* Installation date;
* Description of piping and pump(s) associated with each UST;
* Status of UST (in use or not in use, closed in place, closed by removal; date of last use, date of closure, etc.); and
* Indication of a release.

Provide a discussion (to supplement Table B-1 and the UST location map) of the spatial and historical relationships among tanks and between tanks and piping and dispensers and a brief description of all historical compliance issues and releases (indicate incident number).

3. Provide information about petroleum AST systems, petroleum spills, and other non-UST petroleum releases (inclusive of all ASTs, currently and historically in place at site and all spills at site)., as indicated:

* List, describe, and indicate location of ASTs and associated piping and pump(s) currently and historically in place at facility) and describe historical releases (indicate incident number). For each AST, present the information in table form in Section I (Use Reporting Table B-1, Site History- UST/AST System and Other Release Information, from the *Guidelines*, Appendix B.).; and
* List, describe, and indicate location and date of spills that have occurred at site). For each spill, present the information in table form in Section I (Use Reporting Table B-1, Site History- UST/AST System and Other Release Information, from the Guidelines, Appendix B.).

4. Provide a brief description of site characteristics (including land use of site and surrounding area, topography, vegetation, surface water, wells, buildings, surface cover, soil type, depth to and nature of bedrock, depth to groundwater, direction of groundwater flow, etc.).

1. **Site Check Procedures**
2. Present and summarize the results of tank and line tightness testing (referring to Section J, Appendix A, Tightness testing results and supporting documentation). If these tightness testing results did not indicate a leak and if instead environmental contamination was the basis for suspecting a release, describe the environmental contamination.
3. Describe site check procedure (For guidance, refer to the *Guidelines*, Section 4.3, Site Check Requirements). Reference site and sampling location maps and cross-sections in Section H of this report. Explain how the selection of sample types and locations was influenced by the nature of the stored substance, the type of initial alarm or cause for suspicion, the type of backfill, the depth to groundwater, and other factors appropriate for identifying the presence and source of a release. Describe the condition of the UST system (pitting, holes, etc.) where it can be observed.

3. Document any soil excavation activities

* Describe excavation procedures noting the condition of the soil encountered and the dimensions of the excavation in relation to the tanks, piping, and/or pumps;
* Note the depth from the land surface to the top and to the base of the tank and to the piping;
* Note the volume of soil excavated;
* Describe the soil type(s) encountered;
* Describe the type and source of backfill used;
* Note if groundwater, NAPL, or bedrock was encountered during the excavation process; and
* Describe the method of temporary storage, sampling, and treatment/disposal of soil.

1. **Site Investigation**

1. Describe field screening, including:

* Physical characteristics of the soil samples, as observed during collection;
* Field instrumentation used to screen soils;
* Field instrument calibration procedures; and
* Screening results (Refer to table provided in Section I.).

2. Document soil sampling information (Refer to tables and appendices provided in Sections I and J.), including:

* Lithological descriptions from logs for borings, excavations;
* Type of samples (from excavation, borehole, direct push boring, stockpiled soil, etc.);
* Sample collection procedures (grab, split spoon, hand auger, etc.);
* Location of soil samples;
* Depth of soil samples (feet below land surface);
* Time/date collected;
* Sample identification; and
* Method(s) of soil sample analysis.

3. Document groundwater and surface water sampling information (Refer to tables and appendices provided in Sections I and J.), including:

* Location of water samples (e.g., of monitoring well, water supply well, stream sampling point);
* Field measurements (pH, dissolved oxygen, specific conductivity, temperature, etc.);
* Sample collection procedures (grab, bailer, etc.);
* Time/date collected;
* Sample identification; and
* Method(s) of water sample analysis.

4. Document quality-control measures information (Refer to tables and appendices provided in Sections I and J.), including:

* Sample handling procedures including sample preservation techniques and sample transport procedures;
* Decontamination procedures;
* Time and date samples were submitted to lab; and
* Collection of samples for quality control purposes (e.g., duplicates, field blanks, trip blanks).

5. Describe soil and groundwater investigation results, including:

* Presentation of analytical results for soil and groundwater samples (Refer to table(s) provided in Section I and to appendix with laboratory analytical results provided in Section J.) and discussion of the results in relation to the cleanup levels or action levels, as appropriate; and
* Discussion pertaining to the effect of quality control sample results on the interpretation of soil, groundwater, or surface water analytical results.

**G. Conclusions and Recommendation**

1. Present conclusions, referencing maps, tables, and appendices in Sections H-J, as follows:

* Indicate that soil contaminant levels are below the action level of 50 mg/kg TPH GRO and 100 mg/kg DRO, with no soil MSCC exceedances (if sampled);
* Indicate that NAPL is not present;
* Indicate if groundwater or bedrock was encountered during investigation and, if so, at what depth below land surface;
* Indicate if groundwater assessment was necessary due to the proximity of the UST system to groundwater or bedrock (or to the presence of a slab or tank for which removal was determined to be economically or technologically unfeasible), thereby preventing the reliable determination of a release by soil assessment alone;

2. If soil contaminant levels were below the action levels, and if groundwater contamination and NAPL were not encountered, then no further action should be requested.

**H. Figures**

Provide the following:

1. A topographic map illustrating the area within 1500-foot radius of the UST system, showing:

* Topographic contours;
* Site location;
* Buildings;
* Adjacent streets, roads, highways (identified by street names and numbers);
* Surface water bodies;
* Groundwater flow direction (if determined); and
* North arrow and scale.

2. A site map\* and cross-sections illustrating the UST/AST system(s), drawn to scale, showing:

* Buildings and property boundaries;
* Underground utilities, such as sewer lines and other conduits; basements; and vaults;
* Water supply wells, surface water bodies
* Location and orientation of current and former UST(s)/AST(s), pumps, product lines, sumps, etc.;
* Length, diameter and volume of current and former UST(s)/AST(s);
* Type of material(s) stored in UST(s)/AST(s) (currently and formerly);
* Soil sample identification (unique letter and/or numerical code), location, and depth;
* Groundwater monitoring locations, if applicable;
* Groundwater flow direction, if determined; and
* North arrow; and scale.

3. Map(s)\* and geological cross-sections, drawn to scale, depicting all soil analytical results obtained to date and final confirmatory sample results, to include:

* Description of soil and bedrock lithology (as determined by investigation to date);
* Location and orientation of UST(s)/AST(s), pumps, piping, sumps, etc.(current and former); spills:
* Soil sample identification (unique letter and/or numerical code), location, and depth;
* Final limits of any excavations:
* Soil sample analytical results; and
* North arrow and scale.

4. Map(s)\* and geological cross-sections, drawn to scale, depicting the groundwater and surface water analytical results,\*\* to include;

* Location and orientation of UST(s)/AST(s), pumps, piping, sumps, etc. (current and former); spills;
* Groundwater sample identification (unique letter and/or numerical code referencing monitoring or water supply well) and location;
* Surface water sample identification (unique letter and/or numerical code) and location; and
* Groundwater and surface water sample analytical results.

5. A potential receptor map that clearly identifies water supply wells (municipal or public/private wells, etc.) and other potential receptors (surface water bodies, basements, utilities, etc.) which are at risk.

***\*Note:*** *Use a single base map to prepare site plans using a map scale of 1 in. = 40 ft.; use a smaller scale for large sites. Maps and figures should include conventional symbols, notations, labeling, legends, scales, and north arrows and should conform to accepted practices of map presentation described in the USGS Geological Survey publication "Topographic Map Symbols”,* <http://store.usgs.gov>. *Scale should be expressed as a graphic scale and a verbal statement (e.g., 1 in.= 40 ft) or ratio. Refer to* <http://geokov.com/Education/map-scale.aspx>.

**\*\*** *If applicable*

##### I. Tables

Provide the following:

1. Site History (Complete Tables B-1 and B-2 from *Guidelines*, Appendix B);
2. Public and Private Water Supply Well and Other Receptor Information (Complete Table B-5 from *Guidelines*, Appendix B)\*;
3. Field Screening Results
4. Soil Sample Identification, Location, Depth, Analytical Methods
5. Summary of Soil Sampling Results (Complete Table B-3 from *Guidelines*, Appendix B);
6. Summary of Groundwater and Surface Water Sampling Results (Complete Table B-4 from *Guidelines*, Appendix B)\*;
7. Monitoring and Remediation Well Construction Information (Complete Table B-7 from *Guidelines*, Appendix B)\*;

*\*If applicable*

##### J. Appendices

Provide the following:

Appendix A Tightness testing results and supporting documentation

Appendix B Notification of Intent: UST Permanent Closure or Change-in-Service (UST-3 Form)\*

Appendix C Site Investigation Report for Permanent Closure or Change-in-Service of UST (UST-2 Form)\*

Appendix D Site Specific Health and Safety Plan (HASP)

Appendix E Certificate of UST disposal\*

Appendix F Groundwater field measurements (pH, dissolved oxygen, specific conductivity, temperature, etc.)\*

Appendix G Standard procedures (sampling, field equipment decontamination, field screening, etc.)

Appendix H Soil, water, NAPL, and sludge disposal manifests and soil treatment permits\*

Appendix I Complete chain-of-custody records

Appendix J Copy of all laboratory analytical records

Appendix K Photographs of site check activities (optional)

Appendix L Geologic logs for excavation(s)/borings

*\*If applicable*

### UST-3 - Notice of Intent: UST Permanent Closure or Change-in-Service

Official version of UST-3 form is available at:

<https://deq.nc.gov/about/divisions/waste-management/ust/forms>

### 24-Hour Release and UST Leak Reporting Form (UST 61 Form)

Official version of UST-61 form is available at:

<https://deq.nc.gov/about/divisions/waste-management/ust/forms>

### 24-Hour Notification of Discharge Form (UST 62 Form)

Official version of UST-62 form is available at:

<https://deq.nc.gov/about/divisions/waste-management/ust/forms>

### 20-Day Report

**Within 20 days** after release confirmation, the responsible party must submit a ***20-Day Report*** to the appropriate UST Section regional office summarizing the initial response and abatement steps taken within the first 20 days and any data or information available within that time period. Please note that this status report should not be submitted at the same time as a completed ***Initial Abatement Action Report.*** Failure to properly submit this report on schedule may affect any applicable reimbursement for these costs.

Complete the minimum elements of the ***20-Day Report*** format as presented in Sections A-I.

1. **Site Information**
2. Site Identification

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Date of Report: |  | | | | Site Risk: | |  |
| Facility I.D.: |  | | UST Incident Number (if known): | | | |  |
| Site Name: |  | | | | | | |
| Street Address: |  | | | | | | |
| City/Town: |  | | Zip Code: |  | County: | |  |
| Description of Geographical Data Point (e.g., diesel fill port): | | | |  | | | |
| Location Method (GPS, topographical map, other): | | | |  | | | |
| Latitude (***decimal degrees***): | |  | Longitude (***decimal degrees***): | | |  | |

2. Information about Contacts Associated with the Leaking UST System

*(Addresses must include street, city, state, zip code and mailing address, if different)*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| UST/AST Owner: | |  | | | Tel: |  | |
| Address: |  | | | | | | |
| UST/AST Operator: | |  | | | Tel: |  | |
| Address: |  | | | | | | |
| Property Owner: | |  | | | Tel: |  | |
| Address: |  | | | | | | |
| Property Occupant: | |  | | | Tel: |  | |
| Address: |  | | | | | | |
| Consultant/Contractor: | | |  | | Tel: |  | |
| Address: |  | | | | | | |
| Analytical Laboratory: | | |  | State Certification No: | | |  |
| Address: |  | | | | Tel: |  | |

3. Information about the Release

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date Discovered: |  | | | |
| Estimated Quantity of Release: | |  | | |
| Cause of Release: |  | | | |
| Source of Release (e.g., Dispenser/Piping/UST): | | |  | |
| Sizes and Contents of Tanks or Other Containment from which the Release Occurred: | | | |  |

4. Certification **(*The title page must display the seal and signature of the certifying P.E. or L.G., and the name and certification number of the company or corporation, if applicable [See 15A NCAC 2L .0103(e)].)***

I, , a Professional Engineer/Licensed Geologist *(circle one)* for *(company of employment)*, do certify that the information contained in this report is correct and accurate to the best of my knowledge.

*(Please Affix Seal and Signature)*

*(Name of company)* is licensed to practice geology/engineering *(circle one or both)* in North Carolina*.* The certification number of the company or corporation is: .

##### B. Executive Summary

*(Provide Executive Summary here.)*

**C. Table of Contents**

*(Create Table of Contents here.)*

**D. Site History and Characterization**

Present information relevant to site history and characterization, using the following outline:

1. Provide information for UST/AST owners/operators and other responsible parties.

List the names, addresses, telephone numbers, and dates of ownership/operation of all previous UST/AST owners, UST/AST operators, and other responsible parties. Present in table form in Section H (Use Reporting Table B-2, Site History, UST/AST Owner/Operator and Other Responsible Party Information, from *Guidelines*, Appendix B.).

2. Provide UST information (inclusive of all USTs, currently and historically in place at facility). For each UST, provide the following information in table form in Section H (Use Reporting Table B-1, Site History- UST/AST System and Other Release Information, from the *Guidelines*, Appendix B.):

* Tank identification number (keyed to a site map showing the locations of all UST systems);
* Last contents of tank;
* Previous contents of tank (if any);
* Capacity of tank in gallons;
* Construction (material and structure);
* Tank dimensions;
* Installation date;
* Description of piping and pump(s) associated with each UST;
* Status of UST (in use or not in use, closed in place, closed by removal; date of last use, date of closure); and
* Indication of a release.

Provide a discussion (to supplement Table B-1 and the UST location map) of the spatial and historical relationships among tanks and between tanks and piping and dispensers and a brief description of all historical compliance issues and releases (indicate incident number).

3. Provide information about petroleum AST systems, petroleum spills, and other non-UST petroleum releases (inclusive of all ASTs, currently and historically in place at site and all spills at site)., as indicated:

* List, describe, and indicate location of ASTs and associated piping and pump(s) currently and historically in place at facility) and describe historical releases (indicate incident number). For each AST, present the information in table form in Section H (Use Reporting Table B-1, Site History- UST/AST System and Other Release Information, from the *Guidelines*, Appendix B.).; and
* List, describe, and indicate location and date of spills that have occurred at site). For each spill, present the information in table form in Section H (Use Reporting Table B-1, Site History- UST/AST System and Other Release Information, from the Guidelines, Appendix B.).

1. Provide a comprehensive description of the release, including date discovered, cause and source (including tank identification number and contents), and the relationship of historical UST releases, non-UST releases, and off-site releases (indicate incident number) to contamination from current release.
2. Provide a brief description of site characteristics (including status of facility (active or inactive), land use of site and surrounding area, water supply, topography, vegetation, surface water, wells, buildings, surface cover, soil type, depth to and nature of bedrock, depth to groundwater, direction of groundwater flow, etc.)
3. Summarize initial abatement actions, assessment activities, and corrective actions performed to date.

##### E. Initial Response and Abatement Activities

Discuss the following items:

1. Removal of regulated substance from UST;
2. Source control actions;
3. Contaminant migration control measures (sorbants, berms, etc.);
4. Measures taken to mitigate fire/safety hazards;
5. Measures taken to identify and mitigate pollution hazards (survey to determine potential receptors, sampling of potential receptors, provision of alternate water)
6. Contaminated soil storage, treatment, and/or disposal; and
7. Status of NAPL investigation and associated removal (if applicable).

* If NAPL is, or has been, present at the site, describe its current and historical status (product distribution, thickness, recovery activities). Refer to tables in Section H: Table B-7, Monitoring and Remediation Well Construction Information; and Table B-8A, NAPL Recovery Information; Table B-8B, Cumulative Volume of NAPL Recovered from Site; and Table B-9, Current and Historical Groundwater Elevations and NAPL Thickness. Also refer to map(s) showing extent of NAPL.
* Identify any on-site or off-site effluent discharges, treatment used, effluent quality, permitting actions taken, and location of such discharges and identify the disposition of recovered NAPL (refer to attached product disposal manifests);
* Document the performance, total cost, and cost per gallon to date of each method of NAPL recovery used at site. Justify why the technology is or was used; and
* Provide conclusions and recommendations concerning historical, current, and future recovery activities, including:
* Any proposal to change the current method of NAPL recovery to a better or more cost-effective technology;
* A justification for continued product recovery, if planned; and
* Any determination that NAPL has been eliminated from the site with a recommendation to reclassify the risk posed by the release, if applicable.

**F. Source Investigation**

1. Describe the investigation performed to date to determine the source of the release. Reference maps, tables, and appendices provided in Sections G-I. Discuss the rationale for the assessment performed. To the extent information is available, describe soil sampling performed to confirm the presence and determine the source of the release, including:

* Location of soil samples;
* Type of soil samples (from excavation, borehole, direct push, etc.);
* Date of sampling
* Phase of sampling (site check, UST closure, etc.);
* Soil sample collection procedures (split spoon, grab, hand auger, etc.);
* Depth of soil samples below land surface;
* Soil sample identification;
* Soil sample analytical methods; and
* Soil sample analytical results (Refer to table in Section H using the Table B-3 format, *Guidelines*, Appendix B, and list all parameters required for method.).

2. Describe any groundwater sampling performed to date to confirm the presence and source of the release including:

* Location of groundwater samples/monitoring wells/water supply wells;
* Date of sampling;
* Groundwater sample collection procedures (bailer, pump, etc.);
* Groundwater sample identification;
* Groundwater sample analyses;
* Groundwater sample analytical results (Refer to table in Section H using the Table B-4 format, *Guidelines*, Appendix B, and list all parameters required for method.).

**G. Figures**

Provide the following:

1. A topographic map illustrating the area within 1500-foot radius of the source of the UST/AST system or spill, showing:

* Topographic contours;
* Site location;
* Buildings;
* Adjacent streets, roads, highways (identified by street names and numbers);
* Surface water bodies;
* Groundwater flow direction (if determined); and
* North arrow and scale.

2. A site map\* and cross-sections illustrating the UST/AST system or spill, drawn to scale, showing:

* Buildings and property boundaries;
* Underground utilities, such as sewer lines and other conduits; basements; and vaults;
* Water supply wells, surface water bodies;
* Location and orientation of UST(s)/AST(s), pumps, piping, sumps, etc. (current and former); spills;
* Length, diameter and volume of current and former UST(s)/AST(s);
* Type of material(s) stored in UST(s)/AST(s) (currently and formerly);
* Soil sample identification (unique letter and/or numerical code), location, and depth;
* Groundwater monitoring locations, if applicable;
* Groundwater flow direction, if determined;
* Final limits of any excavation on site; and
* North arrow and scale

3. Map(s)\* and geological cross-sections, drawn to scale, depicting any soil analytical results obtained to date, including:

* Description of soil and bedrock lithology (as determined by investigation to date);
* Location and orientation of UST(s)/AST(s), pumps, piping, sumps, etc. (current and former); spills;
* Soil sample identification (unique letter and/or numerical code), location, and depth;
* Soil sample analytical results; and
* North arrow and scale.

4. Map(s)\* and geological cross-sections, drawn to scale, depicting any groundwater and surface water analytical results,\*\* to include;

* Location and orientation of UST(s), pumps, piping, sumps, etc. (current and former);
* Groundwater sample identification (unique letter and/or numerical code referencing monitoring or water supply well) and location;
* Surface water sample identification (unique letter and/or numerical code) and location; and
* Groundwater and surface water sample analytical results.

1. A NAPL map\* showing thickness (in feet) and extent of NAPL\*\* using contour lines.

6. A potential receptor map that clearly identifies water supply wells (municipal or public/private wells,

*\** ***Note:*** *Use a single base map to prepare site plans using a map scale of 1 in. = 40 ft.; use a smaller scale for large sites. Maps and figures should include conventional symbols, notations, labeling, legends, scales, and north arrows and should conform to accepted practices of map presentation described in the USGS Geological Survey publication "Topographic Map Symbols”,* <http://store.usgs.gov>. *Scale should be expressed as a graphic scale and a verbal statement (e.g., 1 in.= 40 ft) or ratio. Refer to* <http://geokov.com/Education/map-scale.aspx>.

**\*\*** *If applicable*

##### H. Tables

Provide the following:

1. Site History (Complete Tables B-1 and B-2, *Guidelines*, Appendix B);
2. Public and Private Water Supply Well and Other Receptor Information (Complete Table B-5, *Guidelines*, Appendix B);
3. Field Screening Results
4. Summary of Soil Sampling Results (Complete Table B-3, *Guidelines*, Appendix B);
5. Summary of Groundwater and Surface Water Sampling Results\* (Complete Table B-4, *Guidelines*, Appendix B);
6. Monitoring and Remediation Well Construction Information (Complete Table B-7, *Guidelines*, Appendix B)\*;
7. NAPL Recovery Information (Complete Table B-8A, *Guidelines*, Appendix B)\*;
8. Cumulative Volume of NAPL Recovered from Site (Complete Table B-8B, *Guidelines*, Appendix B)\*;
9. Current and Historical Groundwater Elevations and NAPL Thickness (Complete Table B-9, *Guidelines*, Appendix B)\*.

*\*If applicable*

##### I Appendices

Provide the following:

Appendix A Site Specific Health and Safety Plan (HASP) (if not provided for site check or closure)

Appendix B Groundwater field measurements (pH, dissolved oxygen, specific conductivity, temperature)\*

Appendix C Standard procedures (sampling, field equipment decontamination, field screening, etc.)

Appendix D Soil, water, NAPL, and sludge disposal manifests and soil treatment permits\*

Appendix E Complete chain-of-custody records\*

Appendix F Copy of all laboratory analytical records

Appendix G Photographs (optional)

Appendix H Geologic logs for excavation(s)/borings

Appendix I Copy of deed

*\*If applicable*

### UST Closure Report (following UST-12 format) and Site Investigation Report for Permanent Closure or Change-in-Service of UST (UST-2 Form)

A ***UST Closure Report*** (following the ***UST-12*** format outlined below) must be submitted to the appropriate regional office of the UST Section **within thirty (30) days** following completion of closure, if the results of the UST closure investigation indicate that **no soil contamination remains equal to or exceeding the action levels at 50 mg/kg TPH GRO and 100 mg/kg TPH DRO, or exceeding any applicable MSCCs (where sampled), and no groundwater contamination was detected in exceedance of 2L or with NAPL present.** *(If contamination in exceedance of these limits is present, then initial response and abatement actions, followed by an* Initial Abatement Action Report *which incorporates the information required by the* UST Closure Report *format, are required within 90 days of release discovery.)*

Complete the minimum elements of the ***UST Closure Report*** format as presented in Sections A-J.

1. **Site Information**
2. Site Identification

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Date of Report: |  | | | | Site Risk: | |  |
| Facility I.D.: |  | | UST Incident Number (if known): | | | |  |
| Site Name: |  | | | | | | |
| Street Address: |  | | | | | | |
| City/Town: |  | | Zip Code: |  | County: | |  |
| Description of Geographical Data Point (e.g., diesel fill port): | | | |  | | | |
| Location Method (GPS, topographical map, other): | | | |  | | | |
| Latitude (***decimal degrees***): | |  | Longitude (***decimal degrees***): | | |  | |

2. Information about Contacts Associated with the Leaking UST System

*(Addresses must include street, city, state, zip code and mailing address, if different)*

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UST/AST Owner: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| UST/AST Operator: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Property Owner: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Property Occupant: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Consultant/Contractor: | | |  | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Analytical Laboratory: | | |  | | State Certification No: | | | | |  |
| Address: |  | | | | | | Tel: | |  | |

3. Information about the Release

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date Discovered: |  | | | |
| Estimated Quantity of Release: | |  | | |
| Cause of Release: |  | | | |
| Source of Release (e.g., Dispenser/Piping/UST): | | |  | |
| Sizes and Contents of Tanks or Other Containment from which the Release Occurred: | | | |  |

##### B. Executive Summary

*(Provide Executive Summary here.)*

**C. Table of Contents**

*(Create Table of Contents here.)*

**D. Site History and Characterization**

Present information relevant to site history and characterization, using the following outline:

1. Provide information for UST/AST owners/operators and other responsible parties.

List the names, addresses, telephone numbers, and dates of ownership/operation of all previous UST/AST owners, UST/AST operators, and other responsible parties. Present in table form in Section I (Use Reporting Table B-2, Site History, UST/AST Owner/Operator and Other Responsible Party Information, from *Guidelines*, Appendix B.).

2. Provide UST information (inclusive of all USTs, currently and historically in place at facility). For each UST, provide the following information in table form in Section I (Use Reporting Table B-1, Site History- UST/AST System and Other Release Information, from the *Guidelines*, Appendix B.):

* Tank identification number (keyed to a site map showing the locations of all UST systems);
* Last contents of tank;
* Previous contents of tank (if any);
* Capacity of tank in gallons;
* Construction (material and structure);
* Tank dimensions;
* Installation date;
* Description of piping and pump(s) associated with each UST;
* Status of UST (in use or not in use, closed in place, closed by removal; date of last use, date of closure); and
* Indication of a release (Indicate which UST, piping, and/or pump leaked.).
* Provide a discussion (to supplement Table B-1 and the UST location map) of the spatial and historical relationships among tanks and between tanks and piping and dispensers and a brief description of all historical compliance issues and releases (indicate incident number).

3. Provide information about petroleum AST systems, petroleum spills, and other non-UST petroleum releases (inclusive of all ASTs, currently and historically in place at site and all spills at site)., as indicated:

* List, describe, and indicate location of ASTs and associated piping and pump(s) currently and historically in place at facility) and describe historical releases (indicate incident number). For each AST, present the information in table form in Section I (Use Reporting Table B-1, Site History- UST/AST System and Other Release Information, from the *Guidelines*, Appendix B.).; and
* List, describe, and indicate location and date of spills that have occurred at site). For each spill, present the information in table form in Section I (Use Reporting Table B-1, Site History- UST/AST System and Other Release Information, from the Guidelines, Appendix B.).

1. Provide a comprehensive description of the release, including date discovered, cause and source (including tank identification number and contents), and the relationship of historical UST releases, non-UST releases, and off-site releases (indicate incident number) to contamination from current release.
2. Provide a brief description of site characteristics (including status of facility (active or inactive), land use of site and surrounding area, water supply, topography, vegetation, surface water, wells, buildings, surface cover, soil type, depth to and nature of bedrock, depth to groundwater, direction of groundwater flow, etc.)
3. Summarize initial abatement actions, assessment activities, and corrective actions performed to date and list all reports previously submitted.

**E. Closure Procedure**

1. Describe preparations for closure including steps taken to notify authorities, permits obtained, and steps taken to clean and purge the tanks.
2. Describe the closure procedure (For guidance, see the *Guidelines*, Section 5.0.), referencing site and sampling location maps and cross-sections presented in Section H of this report. Clearly state how the selection of sample types and locations was influenced by the nature of the stored substance, any initial alarm or cause for suspicion, the type of backfill, the depth to groundwater, and other factors appropriate for identifying the presence and source of a release. Describe the condition of the UST system (pitting, holes, etc.) where it could be observed. If it was necessary to install and sample monitoring well(s), explain.

Note the amount of residual material pumped from the tank and describe the storage, sampling and disposal of the residual material and the disposal of the tank, pumps and piping (Refer to appendices with disposal manifests and certificate of tank disposal in Section J.).

1. Document any soil excavation activities.

* Describe excavation procedures noting the condition of the soil encountered and the dimensions of the excavation in relation to the tanks, piping, and/or pumps;
* Note the depth from the land surface to the top and to the base of the tank and to the piping;
* Note the volume of soil excavated;
* Describe the soil type(s) encountered;
* Describe the type and source of backfill used;
* Note if groundwater, NAPL, or bedrock was encountered during the excavation process; and
* Describe the method of temporary storage, sampling, and treatment/disposal of soil.

**F. Site Investigation**

1. Describe field screening, including:

* Physical characteristics of the soil samples, as observed during collection;
* Field instrumentation used to screen soils;
* Field instrument calibration procedures; and
* Screening results (Refer to table provided in Section I.).

2. Document soil sampling information (Refer to tables and appendices provided in Sections I and J.), including:

* Lithological descriptions from logs for borings, excavations;
* Type of samples (from excavation, borehole, direct push boring, stockpiled soil, etc.);
* Sample collection procedures (grab, split spoon, hand auger, etc.);
* Location of soil samples;
* Depth of soil samples (feet below land surface);
* Time/date collected;
* Sample identification; and
* Method(s) of soil sample analysis.

3. Document groundwater and surface water sampling information (Refer to tables and appendices provided in Sections I and J.), including:

* Location of water samples (e.g., of monitoring well, water supply well, stream sampling point);
* Field measurements (e.g., pH, dissolved oxygen, specific conductivity, temperature)
* Sample collection procedures (grab, bailer, etc.);
* Time/date collected.
* Sample identification; and
* Method(s) of water sample analysis.

4. Document quality-control measure information (Refer to tables and appendices provided in Sections I and J.), including:

* Sample handling procedures including sample preservation techniques and sample transport procedures;
* Decontamination procedures;
* Time and date samples were submitted to lab; and
* Collection of samples for quality control purposes (e.g., duplicates, field blanks, trip blanks).

5. Describe soil and groundwater investigation results, including:

* Presentation of analytical results for soil and groundwater samples (Refer to table(s) provided in Section I. and to appendix with laboratory analytical results provided in Section J.) and discussion of the results in relation to the cleanup levels or action levels, as appropriate; and
* Discussion pertaining to the effect of quality control sample results on the interpretation of soil, groundwater, or surface water analytical results.

1. **Conclusions and Recommendation**

1. Present conclusions, referencing maps, tables, and appendices in Sections H-J, as follows:

* Indicate that soil contaminant levels are below the action level;
* Indicate that NAPL is not present;
* Indicate if groundwater or bedrock was encountered during investigation and, if so, at what depth below land surface;
* Indicate if groundwater assessment was necessary due to the proximity of the UST system to groundwater or bedrock (or to the presence of a slab or tank for which removal was determined to be economically or technologically unfeasible), thereby preventing the reliable determination of a release by soil assessment alone;

1. If soil contaminant levels in the system closure soil samples were below the applicable TPH action limits, and, where sampled, groundwater contamination was not found to exceed the applicable 2L standards and NAPL was not encountered in the excavation(s), monitoring well(s), or on nearby surface water bodies, then no further action should be requested.
2. **Figures**

Provide the following:

1. A topographic map illustrating the area within 1500-foot radius of the UST system, showing:

* Topographic contours;
* Site location;
* Buildings;
* Adjacent streets, roads, highways (identified by street names and numbers);
* Surface water bodies;
* Groundwater flow direction (if determined); and
* North arrow and scale.

2. A site map and cross-sections illustrating the UST/AST system(s), drawn to scale, showing:

* Buildings and property boundaries;
* Underground utilities, such as sewer lines and other conduits; basements; and vaults;
* Water supply wells, surface water bodies;
* Location and orientation of UST(s)/AST(s), pumps, piping, sumps, etc. (current and former); spills;
* Length, diameter and volume of current and former UST(s)/AST(s)
* Type of material(s) stored in UST(s)/AST(s) (currently and formerly);
* Soil sample identification (unique letter and/or numerical code), location, and depth;
* Groundwater monitoring locations, if applicable;
* Groundwater flow direction, if determined;
* Final limits of each stage of excavation for each excavation on site; and
* North arrow and scale.

3. Map(s)\* and geological cross-sections, drawn to scale, depicting all soil analytical results obtained to date and final confirmatory sample results, to include:

* Description of soil and bedrock lithology (as determined by investigation to date);
* Location and orientation of UST(s)/AST(s), pumps, piping, sumps, etc. (current and former); spills;
* Soil sample identification (unique letter and/or numerical code), location, and depth;
* Soil sample analytical results;
* Final limits of UST pits, piping trenches, etc. after system removal; and
* North arrow and scale.

4. Map(s)\* and geological cross-sections, drawn to scale, depicting the groundwater and surface water analytical results,\*\* to include;

* Location and orientation of UST(s)/AST(s), pumps, piping, sumps, etc. (current and former); spills;
* Groundwater sample identification (unique letter and/or numerical code referencing monitoring or water supply well) and location;
* Surface water sample identification (unique letter and/or numerical code) and location; and
* Groundwater and surface water sample analytical results.

1. A potential receptor map that clearly identifies water supply wells (municipal or public/private wells, etc.) and other potential receptors (surface water bodies, basements, utilities, etc.) which are at risk.

***\*Note:*** *Use a single base map to prepare site plans using a map scale of 1 in. = 40 ft.; use a smaller scale for large sites. Maps and figures should include conventional symbols, notations, labeling, legends, scales, and north arrows and should conform to accepted practices of map presentation described in the USGS Geological Survey publication "Topographic Map Symbols”,* <http://store.usgs.gov>. *Scale should be expressed as a graphic scale and a verbal statement (e.g., 1 in.= 40 ft) or ratio. Refer to* <http://geokov.com/Education/map-scale.aspx>.

**\*\*** *If applicable*

##### Tables

Provide the following:

1. Site History (Complete Tables B-1 and B-2 from *Guidelines*, Appendix B);

2. Public and Private Water Supply Well and Other Receptor Information (Complete Table B-5 from *Guidelines*, Appendix B);

1. Field Screening Results;
2. Soil Sample Identification, Location, Depth, Analytical Methods;
3. Summary of Soil Sampling Results (Complete Table B-3 from *Guidelines*, Appendix B);
4. Summary of Groundwater and Surface Water Sampling Results (Complete Table B-4 from *Guidelines*, Appendix B)\*; and
5. Monitoring and Remediation Well Construction Information (Complete Table B-7 from *Guidelines*, Appendix B)\*;

*\*If applicable*

##### Appendices

Provide the following:

Appendix A Tightness testing results and supporting documentation\*

Appendix B Notification of Intent: UST Permanent Closure or Change-in-Service (UST-3 Form)

Appendix C Site Investigation Report for Permanent Closure or Change-in-Service of UST (UST-2 Form)

Appendix D Site Specific Health and Safety Plan (HASP)

Appendix E Certificate of UST disposal

Appendix F Groundwater field measurements (pH, dissolved oxygen, specific conductivity, temperature)\*

Appendix G Standard procedures (sampling, field equipment decontamination, field screening, etc.)

Appendix H Soil, water, and sludge disposal manifests and soil treatment permits\*

Appendix I Complete chain-of-custody records

Appendix J Copy of all laboratory analytical records

Appendix K Photographs of closure activities (optional)

Appendix L Geologic logs for excavation(s)/borings

*\*If applicable*

### Site Investigation Report for Permanent Closure or Change-in-Service of UST

UST-2A (Registered Tanks) or UST-2B (Unregistered Tanks) Form

Official version of UST-2A and UST-2B forms are available at:

<https://deq.nc.gov/about/divisions/waste-management/ust/forms>

### Initial Abatement Action (Site Check, UST Closure with UST-2 Form, Excavation, Post-Excavation Soil Contamination Assessment) Report

In addition to reporting initial response and abatement actions and assessment actions, and presenting an initial site characterization, when a release has been discovered, this newly-created ***Initial Abatement Action Report*** must fulfill the requirements for the following individual reports: ***Site Check Report*** (Section E)**, *UST Closure Report (UST-12) with UST-2 Form*** (Section F), ***Post-Excavation Soil Contamination Assessment Report*** (Section J), and ***Free Product Recovery Report*** (Section G). If needed, check with your regional office to determine which report format is required.

Complete Sections A-N, as required, including the sections specifically designated for the reports you have indicated. The ***Initial Abatement Action Report*** must be submitted to the appropriate regional office **within 90 days** following discovery of release.

1. **Site Information**
2. Site Identification

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Date of Report: |  | | | | Site Risk: | |  |
| Facility I.D.: |  | | UST Incident Number (if known): | | | |  |
| Site Name: |  | | | | | | |
| Street Address: |  | | | | | | |
| City/Town: |  | | Zip Code: |  | County: | |  |
| Description of Geographical Data Point (e.g., diesel fill port): | | | |  | | | |
| Location Method (GPS, topographical map, other): | | | |  | | | |
| Latitude (***decimal degrees***): | |  | Longitude (***decimal degrees***): | | |  | |

2. Information about Contacts Associated with the Leaking UST System

*(Addresses must include street, city, state, zip code and mailing address, if different)*

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UST/AST Owner: | |  | Email: | |  | | | | |
| Address: |  | | | | | Tel: |  | | |
| UST/AST Operator: | |  | Email: | |  | | | | |
| Address: |  | | | | | Tel: |  | | |
| Property Owner: | |  | Email: | |  | | | | |
| Address: |  | | | | | Tel: |  | | |
| Property Occupant: | |  | Email: | |  | | | | |
| Address: |  | | | | | Tel: |  | | |
| Consultant/Contractor: | |  | Email: | |  | | | | |
| Address: |  | | | | | Tel: |  | | |
| Analytical Laboratory: | |  | | State Certification No: | | | | |  |
| Address: |  | | | | | Tel: | |  | |

3. Information about the Release

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date Discovered: |  | | | |
| Estimated Quantity of Release: | |  | | |
| Cause of Release: |  | | | |
| Source of Release (e.g., Dispenser/Piping/UST): | | |  | |
| Sizes and Contents of Tanks or Other Containment from which the Release Occurred: | | | |  |

4. Certification (The title page must display the seal and signature of the certifying P.E. or L.G., and the name and certification number of the company or corporation, if applicable [See 15A NCAC 2L .0103(e)].)

I, , a Professional Engineer/Licensed Geologist *(circle one)* for *(company of employment)*, do certify that the information contained in this report is correct and accurate to the best of my knowledge.

*(Please Affix Seal and Signature)*

*(Name of company)* is licensed to practice geology/engineering *(circle one or both)* in North Carolina*.* The certification number of the company or corporation is: .

##### B. Executive Summary

Present a brief summary of the most pertinent information about the site and the release, using the following outline:

1. Describe the source, date of discovery, and quantity and type(s) of contaminant released;

2. Summarize initial abatement actions, including closure, soil removal, NAPL recovery, and provision of alternate water;

3. Describe the results of the hydrogeological investigation;

4. Summarize the results of soil, groundwater, and surface water assessment and NAPL measurement, indicating the nature and extent of contamination, the estimated rate of migration, and potential for impacting receptors;

5. Indicate the risk classification and the criteria for that determination (if known); and

6. Indicate the soil, groundwater, and surface water concentration levels to which contamination must be remediated.

**C. Table of Contents**

Provide a table of contents, as follows:

1. List sections, indicating page numbers;

2. List figures, identifying each by number;

3. List tables; identifying each by number; and

4. List appendices, identifying each by letter.

**D. Site History and Characterization**

Present information relevant to site history and characterization, using the following outline:

1. Provide information for UST/AST owners/operators and other responsible parties.

List the names, addresses, telephone numbers, and dates of ownership/operation of all previous UST/AST owners, UST/AST operators, and other responsible parties. Present in table form in Section M (Use Reporting Table B-2, Site History, UST/AST Owner/Operator and Other Responsible Party Information, from *Guidelines*, Appendix B.).

2. Provide UST information (inclusive of all USTs, currently and historically in place at facility). For each UST, provide the following information in table form in Section M (Use Reporting Table B-1, Site History- UST/AST System and Other Release Information, from the *Guidelines*, Appendix B.):

* Tank identification number (keyed to a site map showing the locations of all UST systems);
* Last contents of tank;
* Previous contents of tank (if any);
* Capacity of tank in gallons;
* Construction (material and structure);
* Tank dimensions;
* Installation date;
* Description of piping and pump(s) associated with each UST;
* Status of UST (in use or not in use, closed in place, closed by removal; date of last use, date of closure); and
* Indication of a release (Indicate which UST, piping, and/or pump leaked.).

Provide a discussion (to supplement Table B-1 and the UST location map) of the spatial and historical relationships among tanks and between tanks and piping and dispensers and a brief description of all historical compliance issues and releases (indicate incident number).

3. Provide information about petroleum AST systems, petroleum spills, and other non-UST petroleum releases (inclusive of all ASTs, currently and historically in place at site and all spills at site)., as indicated:

* List, describe, and indicate location of ASTs and associated piping and pump(s) currently and historically in place at facility) and describe historical releases (indicate incident number). For each AST, present the information in table form in Section M (Use Reporting Table B-1, Site History- UST/AST System and Other Release Information, from the *Guidelines*, Appendix B.).; and
* List, describe, and indicate location and date of spills that have occurred at site). For each spill, present the information in table form in Section M (Use Reporting Table B-1, Site History- UST/AST System and Other Release Information, from the Guidelines, Appendix B.).

4. Provide a comprehensive description of the release, including date discovered, cause and source (including tank identification number and contents), and the relationship of historical UST releases, non-UST releases, and off-site releases (indicate incident number) to contamination from current release.

1. Provide a brief description of site characteristics (including status of facility (active or inactive), land use of site and surrounding area, water supply, topography, vegetation, surface water, wells, buildings, surface cover, soil type, depth to and nature of bedrock, depth to groundwater, direction of groundwater flow, etc.)

6. Summarize initial abatement actions, assessment activities, and corrective actions performed to date and list all reports previously submitted.

**E. Site Check Report** (if applicable)

Incorporate the minimum requirements of a ***Site Check Report***, as outlined in the G*uidelines,* Appendix A, p. 68 if a site check revealed a release and initiated the initial response and abatement action.

1. Present and summarize the results of tank and line tightness testing (Refer to Section N, Appendix A, Tightness testing results and supporting documentation). If these tightness testing results did not indicate a release, and if, instead, environmental contamination was the basis for suspecting a release, describe the environmental contamination.
2. Describe the site check procedure. (For guidance refer to the *Guidelines*, Section 4.3, Site Check Requirements). Reference site and sample location maps provided in Section L, Figures, and summaries of soil and groundwater analytical results provided in Section M, Tables*.* Explain how the selection of sample types and locations was influenced by the nature of the stored substance, the type of initial alarm or cause for suspicion, the type of backfill, the depth to groundwater, and other factors appropriate for identifying the presence and source of a release. Describe the condition of the UST system (i.e., pitting, holes, etc.) where it can be observed.
3. If a release is determined, document initial response actions (submittal of ***24-Hour Release and Report Form***; repair, replacement, or upgrading of system to prevent further release; mitigation of hazards) and initial abatement actions (NAPL removal; submittal of ***20-Day Report***) performed in Section I, Initial Response and Abatement Actions;
4. Document any soil excavation activities in Section J, Excavation of Contaminated Soil.
5. Documentsite investigation.

* Describe field screening, including:
* Physical characteristics of the soil samples, as observed during collection;
* Field instrumentation used to screen soils;
* Field instrument calibration procedures; and
* Screening results (Refer to table provided in Section M.).
* Document soil sampling information (Refer to figures, tables, and appendices provided in Sections L, M, and N.), including:
* Lithological descriptions from logs for borings, excavations;
* Type of samples (from excavation, borehole, direct push boring, stockpiled soil, etc.);
* Sample collection procedures (grab, split spoon, hand auger, etc.);
* Location of soil samples;
* Depth of soil samples (feet below land surface);
* Time/date collected;
* Sample identification; and
* Method(s) of soil sample analysis.
* Document groundwater and surface water sampling information (Refer to figures, tables, and appendices provided in Sections L, M, and N.), including:
* Location of water samples (e.g., of monitoring well, water supply well, stream sampling point);
* Field measurements (e.g., pH, dissolved oxygen, specific conductivity, temperature)
* Sample collection procedures (grab, bailer, etc.);
* Time/date collected.
* Sample identification; and
* Method(s) of water sample analysis.
* Document quality-control measures information (Refer to tables and appendices provided in Sections M and N.), including:
* Sample handling procedures including sample preservation techniques and sample transport procedures;
* Decontamination procedures;
* Time and date samples were submitted to lab; and
* Collection of samples for quality control purposes (e.g., duplicates, field blanks, trip blanks).
* Describe soil and groundwater investigation results, including:
* Presentation of analytical results for soil and groundwater samples (Refer to table(s) provided in Section M and to appendix with laboratory analytical results provided in Section N.) and discussion of the results in relation to the cleanup levels or action levels, as appropriate; and
* Discussion pertaining to the effect of quality control sample results on the interpretation of soil, groundwater, or surface water analytical results.

1. Present conclusions and recommendations, referencing maps and cross-sections in Section L, as follows:

* Describe source and estimated or pre-screened extent of soil contamination (If there are multiple sources of release, then describe the extent of contamination from each source);
* Indicate if groundwater or bedrock was encountered during investigation and at what depth below land surface;
* Indicate if groundwater assessment was necessary due to the proximity of the UST system to groundwater or bedrock (or to the presence of a slab or tank for which removal was determined to be economically or technologically unfeasible), thereby preventing the reliable determination of a release by soil assessment alone;
* Describe source(s) and estimated extent of any groundwater or surface water contamination;
* Describe source(s) and estimated thickness and extent of any NAPL;
* Indicate what initial response and abatement actions are required; and
* Discuss the need for further investigation or remediation.

**F. UST Closure Report following UST-12 Format) and Site Investigation Report for Permanent Closure or Change-in-Service of UST (UST-2 Form)** (if applicable).

Incorporate the minimum requirements of a ***UST Closure Report*** and complete the ***UST-2A or UST-2B Form***, as outlined in Appendix A, p.82 of the *Guidelines*), if UST closure indicated a release and initiated the initial response and abatement action.

1. Describe preparations for closure including steps taken to notify authorities, permits obtained, and steps taken to clean and purge the tanks.
2. Describe the closure procedure (For guidance, refer to the *Guidelines*, Section 5.), referencing site and sampling location maps and cross-sections presented in Section L of this report. Clearly state how the selection of sample types and locations was influenced by the nature of the stored substance, the type of initial alarm or cause for suspicion, the type of backfill, the depth to groundwater, and other factors appropriate for identifying the presence and source of a release. If presence of groundwater or bedrock require the installation and sampling of monitoring well(s), describe the process.
3. Note the amount of residual material pumped from the tank and describe the storage, sampling and disposal of the residual material and the disposal of the tank, pumps and piping (Refer to appendices with disposal manifests and certificate of tank disposal in Section N.).
4. If a release is determined, document initial response actions (submittal of ***24-Hour Release and Report Form***; repair, replacement, or upgrading of system to prevent further release; mitigation of hazards) and initial abatement actions (NAPL removal; submittal of ***20-Day Report***) performed in Section I, Initial Response and Abatement Actions.
5. Document any soil excavation activities in Section J, Excavation of Contaminated Soil.
6. Documentsite investigation.

* Describe field screening, including:
* Physical characteristics of the soil samples, as observed during collection;
* Field instrumentation used to screen soils;
* Field instrument calibration procedures; and
* Screening results (Refer to table provided in Section M.).
* Document soil sampling information (Refer to figures, tables, and appendices provided in Sections L, M and N.), including:
* Lithological descriptions from logs for borings, excavations;
* Type of samples (from excavation, borehole, direct push boring, stockpiled soil, etc.);
* Sample collection procedures (grab, split spoon, hand auger, etc.);
* Location of soil samples;
* Depth of soil samples (feet below land surface);
* Time/date collected;
* Sample identification; and
* Method(s) of soil sample analysis.
* Document groundwater and surface water sampling information (Refer to figures, tables, and appendices provided in Sections L, M, and N.), including:
* Location of water samples (e.g., of monitoring well, water supply well, stream sampling point);
* Field measurements (e.g., pH, dissolved oxygen, specific conductivity, temperature)
* Sample collection procedures (grab, bailer, etc.);
* Time/date collected.
* Sample identification; and
* Method(s) of water sample analysis.
* Document quality-control measures information (Refer to tables and appendices provided in Sections M and N, including:
* Sample handling procedures including sample preservation techniques and sample transport procedures;
* Decontamination procedures;
* Time and date samples were submitted to lab; and
* Collection of samples for quality control purposes (e.g., duplicates, field blanks, trip blanks).
* Describe soil and groundwater investigation results, including:
* Presentation of analytical results for soil and groundwater samples (Refer to table(s) provided in Section M and to appendix with laboratory analytical results provided in Section N.) and discussion of the results in relation to the cleanup levels or action levels, as appropriate; and
* Discussion pertaining to the effect of quality control sample results on the interpretation of soil, groundwater, or surface water analytical results.

1. Present conclusions and recommendations, referencing maps and cross-sections in Section L as follows:

* Describe source and estimated extent of soil contamination, referencing maps and cross-sections in Section L (If there are multiple sources of release, then describe the extent of contamination from each source.);
* Indicate if groundwater or bedrock was encountered during investigation and at what depth below land surface;
* Indicate if groundwater assessment was necessary due to the proximity of the UST system to groundwater or bedrock (or to the presence of a slab or tank for which removal was determined to be economically or technologically unfeasible), thereby preventing the reliable determination of a release by soil assessment alone;
* Describe source(s) and estimated extent of any groundwater or surface water contamination;
* Describe source(s) and estimated thickness and extent of any NAPL;
* Indicate what initial response and abatement actions are required; and
* Discuss the need for further investigation or remediation.

##### G. NAPL Investigation and Free Product Recovery Report (if applicable)

Discuss the status of NAPL at the site, as follows:

1. If NAPL is, or has been, present at the site, describe its current and historical status (product distribution, thickness, recovery activities). Refer to tables in Section M: Table B-7, Monitoring and Remediation Well Construction Information; and Table B-8A, NAPL Recovery Information; Table B-8B, Cumulative Volume of NAPL Recovered from Site; and Table B-9, Current and Historical Groundwater Elevations and NAPL Thickness. Also refer to map(s) showing extent of NAPL in Section L;
2. Identify any on-site or off-site effluent discharges, treatment used, effluent quality, permitting actions taken, and location of such discharges and identify the disposition of recovered NAPL (refer to attached product disposal manifests);
3. Document the performance, total cost, and cost per gallon to date of each method of NAPL recovery used at site. Justify why the technology is or was used; and
4. Provide conclusions and recommendations concerning historical, current, and future recovery activities, including:

* Any proposal to change the current method of NAPL recovery to a better or more cost-effective technology;
* A justification for continued product recovery, if planned; and
* Any determination that NAPL has been eliminated from the site with a recommendation to reclassify the risk posed by the release, if applicable.

**H. Groundwater and Surface Water Investigation** (if applicable)

1. If groundwater or bedrock was encountered in pits, trenches or shallow boring during site check, UST system closure, or initial abatement investigation, if monitoring or water supply wells were found to be contaminated, or if at-risk surface water is present nearby, then indicate actions taken to investigate suspected contamination from a release (e.g., installation of monitoring wells, groundwater or surface sampling and analysis, etc.).
2. Document groundwater and surface water investigations (or, if applicable, refer to groundwater investigations under Section E, ***Site Check Report***, or Section F, ***UST Closure Report***), as follows:

* Present groundwater and surface water sampling information (Refer to tables and appendices provided in Sections M and N.), including:
* Location of water samples (e.g., of monitoring well, water supply well, stream sampling point);
* Field measurements (e.g., pH, dissolved oxygen, specific conductivity, temperature)
* Sample collection procedures (grab, bailer, etc.);
* Time/date collected.
* Sample identification; and
* Method(s) of water sample analysis.
* Document quality-control measure information (Refer to tables and appendices provided in Sections M and N), including:
* Sample handling procedures including sample preservation techniques and sample transport procedures;
* Decontamination procedures;
* Time and date samples were submitted to lab; and
* Collection of samples for quality control purposes (e.g., duplicates, field blanks, trip blanks).
* Describe groundwater or surface water investigation results, including:
* Presentation of analytical results (Refer to table(s) provided in Section M and to appendix with laboratory analytical results provided in Section N.) and discussion of the results in relation to the cleanup levels (groundwater quality or surface water quality standards); and
* Discussion of the effect of quality control sample results on the interpretation of groundwater or surface water analytical results.

**I. Initial Response and Abatement Action**

1. Describe initial response actions performed within 24 hours of discovery of the release, including:

* Submittal of ***24-Hour Release Report and UST Leak Reporting Form (UST-61)***;
* Action to prevent further release and to determine source of the release;
* Identification and mitigation of hazards due to exposure to pollutants (e.g. Responsible party must identify and sample water supply wells at risk of impact by the release and provide supply of alternate water, if wells are impacted.); and
* Identification and mitigation of hazards due to fire, explosion, and vapor hazards.

1. Describe initial abatement actions performed, including:

* Completion of investigation to confirm presence and determine source of the release;
* Investigation and recovery of NAPL;
* Continued mitigation and monitoring of fire, explosion, and vapor hazards;
* Remediation of hazards posed by exposed contaminated soil;
* Submittal of ***20-Day Report*** summarizing the progress of the initial actions performed within the 20-day period following discovery of the release; and
* Soil excavation activities (Document in Section J, Excavation of Contaminated Soil.).

**J. Excavation of Contaminated Soil**

1. Describe source and estimated extent of soil contamination determined in initial investigations (e.g., site check, UST system closure, pre-screening events), referencing maps and cross-sections in Section L and tables presenting soil sampling or screening information and results in Section M (If there are multiple sources of release, then describe the extent of contamination from each source.), including:

* Sampling or pre-screening location and depths; locations of tanks, piping dispensers, sumps, areas of staining (indicate if above or below tank); utility lines; potential receptors; buildings; relationship of area(s) of contaminated soil to groundwater and bedrock; and
* If part or all of UST system was removed, indicate dimensions of resulting pits and trenches.

1. Describe excavation process, referencing maps and cross-sections in Section L, tables presenting soil screening and sampling information and results in section M and disposal manifests and geological logs in Section N, as follows:

* Describe type of equipment used (e.g., back hoe, track hoe, dump truck);
* Describe field screening, if used to determine limits of excavation, including:
* Physical characteristics of the soil samples, as observed during collection;
* Field instrumentation or mobile laboratory systems used to screen soils;
* Field instrument or mobile laboratory system calibration procedures;
* Screening results (Refer to table provided in Section M.);
* Indicate the final dimensions of the excavation(s);
* Indicate the volume (in cubic yards) and weight (in tons) of soil excavated from each excavation (show calculations), including documentation where, based on mobile lab screening, an additional volume was approved in excess of the initial abatement limit if Trust Fund reimbursement is anticipated;
* Describe the relationship of the final excavation pit to the former UST system, to groundwater, to bedrock, and to structures; and
* Indicate if the excavation operation ceased on encountering clean soil, groundwater, bedrock, or an obstruction or other condition that rendered further excavation infeasible or impracticable (including the allowable excavation volume being reached at site seeking State Trust Fund eligibility.)

1. Describe post-excavation confirmation soil sampling, referencing maps and cross-sections in Section L, tables presenting soil sampling information and results in Section M, and geological logs in Section N as follows:

* Describe sample location and depth, and methods of collection and analysis for each excavation;
* Note if multiple excavations were performed sequentially in an area of contaminated soil, (i.e., if confirmatory sampling following primary excavation indicated that contaminated soil remained,) so that further excavation was performed and a second set of confirmatory samples was collected and analyzed; and
* If contaminated soil was allowed to remain after final excavation, indicate precisely the location and depth of the residual contamination and explain why it was not removed, (i.e., why it was not economically and/or technologically feasible to excavate it?)

1. Document Soil Investigation.

* Provide soil sampling information for all samples collected for field screening prior to or during the excavation (where applicable) and for confirmation following excavation, and for any samples collected during previous investigations. Refer to table provided in Section M: Table B-3, Summary of Soil Sampling Results; to figures, in Section L; and to appendices, in Section N. Information should include:
* Lithological descriptions from logs for borings, excavations:
* Type of samples (from excavation, borehole, direct push boring, stockpiled soil, etc.);
* Sample collection procedures (grab, split spoon, hand auger, etc.);
* Location of soil samples;
* Depth of soil samples (feet below land surface);
* Time/date collected;
* Sample identification;
* Indication of phase of sampling, site check; closure, IAA, etc.; and
* Method(s) of soil sample analysis.
* Document quality-control measures information (Refer to tables and appendices provided in Sections M and N.), including:
* Sample handling procedures including sample preservation techniques and sample transport procedures;
* Decontamination procedures;
* Time and date samples were submitted to lab; and
* Collection of samples for quality control purposes (e.g., duplicates, field blanks, trip blanks).
* Describe soil investigation results, including:
* Presentation of analytical results for soil samples (Refer to table provided in Section M and to appendix with laboratory analytical results provided in Section N.);
* Discussion of the results in relation to the appropriate cleanup levels, identifying the samples that exceed the lower of:
* the residential MSCCs or
* the soil-to-groundwater MSCCs.
* Discussion of effect of quality control sample results on the interpretation of soil analytical results.

1. Describe disposal of contaminated soil, referencing tables presenting soil sampling information and results in Section M and disposal manifests in Section N as follows:

* Indicate volume and weight of contaminated soil removed from each excavation at site;
* Describe construction of any stockpile of contaminated soil, describe collection and analysis of any stockpile samples, and, where applicable, any samples collected from soils hauled offsite for disposal;
* Indicate if soil was treated onsite (Reference permit in Section N.);
* Indicate if soil was transported offsite for disposal and, if so, by whom and to what destination; and
* Confirm that excavation was back-filled with clean soil.

1. Present conclusions, as follows;

* Briefly summarize excavation process;
* Describe extent of final excavation(s) and collection of confirmatory samples;
* Indicate if excavation ceased on encountering groundwater, bedrock, or an obstruction that hindered further reasonable access; and
* Indicate whether soil contaminant levels in exceedance of the lowest MSCCs remain in the excavation(s), further excavation being determined infeasible by the UST Section, or soil contaminant levels in final excavation confirmatory soil samples were equal to below the lowest MSCCs.

**K. Conclusions**

1. If soil contaminant levels in exceedance of the lowest MSCCs remain in the excavation(s) (with further excavation being determined infeasible by the UST Section), if groundwater contamination in exceedance of the applicable 2L standards or surface water contamination in exceedance of the applicable 2B standards has been encountered, or if NAPL is present, it should be concluded that a ***Limited Site Assessment*** must be performed and a report submitted **within 120 days** of discovery of the release; However,
2. If soil contaminant levels in final excavation confirmatory soil samples were equal to or below the lowest MSCCs and if groundwater contamination is not found to exceed the applicable 2L standards and surface water is not found to exceed the applicable 2B standards, and if NAPL was not encountered in the excavation(s), monitoring well(s), or on nearby surface water bodies, then no further action should be requested.

**L. Figures**

Provide the following:

1. A topographic map illustrating the area within 1500-foot radius of the source of the release, showing:

* Topographic contours;
* Site location;
* Buildings;
* Adjacent streets, roads, highways (identified by street names and numbers);
* Surface water bodies;
* Groundwater flow direction (if determined); and
* North arrow and scale.

2. A site map\* and cross-sections illustrating the UST system(s)/excavation area(s), drawn to scale, showing:

* Buildings and property boundaries;
* Underground utilities, such as sewer lines and other conduits; basements; and vaults;
* Water supply wells, surface water bodies;
* Location and orientation of UST(s)/AST(s), pumps, piping, sumps, etc. (current and former); spills;
* Length, diameter and volume of current and former UST(s)/AST(s);
* Type of material(s) stored in UST(s)/AST(s) (currently and formerly);
* Names or descriptions of properties adjacent to the site; and
* North arrow and scale.

3. Map(s)\* and geological cross-sections, drawn to scale, depicting all soil analytical results obtained to date and final confirmatory sample results, to include:

* Description of soil and bedrock lithology (as determined by investigation to date);
* Location and orientation of UST(s)/AST(s), pumps, piping, sumps, etc. (current and former); spills;
* Soil sample identification (unique letter and/or numerical code), location, and depth;
* Soil sample analytical results;
* Final limits of each stage of excavation for each excavation on site\*\*; and
* Two geological cross-sections, drawn across the contaminated area and intersecting at right angles, showing the vertical distribution of the contaminants in the unsaturated zone. (Indicate vertical and horizontal scale, orientation of each section, location of water table, soil types and lithology, all borings and sample locations represented by the sections, and soil analytical results for each represented sample, and show sections as labeled lines on the map.)

4. Map(s)\* and geological cross-sections, drawn to scale, depicting the groundwater and surface water analytical results,\*\* to include;

* Location and orientation of UST(s)/AST(s), pumps, piping, sumps, etc. (current and former); spills;
* Groundwater sample identification (unique letter and/or numerical code referencing monitoring or water supply well) and location;
* Surface water sample identification (unique letter and/or numerical code) and location; and
* Groundwater and surface water sample analytical results.

1. A NAPL map\* showing thickness (in feet) and extent of NAPL\*\* using contour lines; and
2. A potential receptor map that clearly identifies water supply wells (municipal or public/private wells, etc.) and other potential receptors (surface water bodies, basements, utilities, etc.) which are at risk.

***\*Note:*** *Use a single base map to prepare site plans using a map scale of 1 in. = 40 ft.; use a smaller scale for large sites. Maps and figures should include conventional symbols, notations, labeling, legends, scales, and north arrows and should conform to accepted practices of map presentation described in the USGS Geological Survey publication "Topographic Map Symbols”,* <http://store.usgs.gov>. *Scale should be expressed as a graphic scale and a verbal statement (e.g., 1 in.= 40 ft) or ratio. Refer to* <http://geokov.com/Education/map-scale.aspx>.

**\*\*** *If applicable*

**M. Tables**

Provide the following:

1. Site History (Complete Tables B-1 and B-2 from *Guidelines*, Appendix B);

1. Public and Private Water Supply Well and Other Receptor Information (Complete Table B-5 from *Guidelines*, Appendix B);
2. Field Screening Results;
3. Summary of Soil Sampling Results (Complete Table B-3 from *Guidelines*, Appendix B);
4. Summary of Groundwater and Surface Water Sampling Results\* (Complete Table B-4 from *Guidelines*, Appendix B)\*;

6. Monitoring and Remediation Well Construction Information (Complete Table B-7 from *Guidelines*, Appendix B)\*;

7. NAPL Recovery Information (Complete Table B-8A from *Guidelines*, Appendix B)\*;

8. Cumulative Volume of NAPL Recovered from Site (Complete Table B-8B from *Guidelines*, Appendix B)\*;

9. Current and Historical Groundwater Elevations and NAPL Thickness (Complete Table B-9 from *Guidelines*, Appendix B)\*.

*\* If applicable*

**N. Appendices**

Provide the following:\*

Appendix A Tightness testing results and supporting documentation\*

Appendix B Notification of Intent: UST Permanent Closure or Change-in-Service (UST-3 Form) \*

Appendix C Site Investigation Report for Permanent Closure or Change-in-Service of UST (UST-2 Form)\*

Appendix D Site Specific Health and Safety Plan (HASP)

Appendix E Certificate of UST disposal\*

Appendix F Groundwater field measurements (pH, dissolved oxygen, specific conductivity, temperature)\*

Appendix G Standard procedures (sampling, field equipment decontamination, field screening, etc.)

Appendix H Soil, water, NAPL, and sludge disposal manifests and soil treatment permits\*

Appendix I Complete chain-of-custody records

Appendix J Copy of all laboratory analytical records, including (if applicable) any mobile laboratory analytical records

Appendix K Photographs of site check, closure, and excavation activities (optional)

Appendix L Geologic logs for excavation(s)/borings (related to IAA investigation only)

Appendix M Monitoring Well Construction Forms (for all wells constructed to date)

*\* If applicable*

### 45-Day Report (For non-petroleum UST releases only)

**45-Day Report** *(for non-petroleum UST releases only)*: The RP must prepare and submit this report to the appropriate regional office within 45 days of confirmation of a release. This report documents the results of the free product investigation, a receptor survey and initial site characterization activities. The priority ranking of a non-petroleum UST release will be based on the information in this report.

1. **Site Information**
2. Site Identification

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Date of Report: |  | | | | Site Risk: | |  |
| Facility I.D.: |  | | UST Incident Number (if known): | | | |  |
| Site Name: |  | | | | | | |
| Street Address: |  | | | | | | |
| City/Town: |  | | Zip Code: |  | County: | |  |
| Description of Geographical Data Point (e.g., diesel fill port): | | | |  | | | |
| Location Method (GPS, topographical map, other): | | | |  | | | |
| Latitude (***decimal degrees***): | |  | Longitude (***decimal degrees***): | | |  | |

1. Information about Contacts Associated with the Leaking UST System (Addresses must include street, city, *state, zip code and mailing address, if different.)*

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UST/AST Owner: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| UST/AST Operator: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Property Owner: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Property Occupant: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Consultant/Contractor: | | |  | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Analytical Laboratory: | | |  | | State Certification No: | | | | |  |
| Address: |  | | | | | | Tel: | |  | |

1. Information about Release

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date Discovered: |  | | | |
| Estimated Quantity of Release: | |  | | |
| Cause of Release: |  | | | |
| Source of Release (e.g., Dispenser/Piping/UST): | | |  | |
| Sizes and Contents of Tanks or Other Containment from which the Release Occurred: | | | |  |

4. Certification (***The title page must display the seal and signature of the certifying P.E. or L.G. and the name and certification number of the company or corporation [See 15A NCAC 2L .0103(e).]****)*

I, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, a Professional Engineer/Licensed Geologist *(circle one)* for (firm or company of employment), do certify that the information contained in this report is correct and accurate to the best of my knowledge.

*(Please Affix Seal and Signature)*

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(Name of company or corporation) is licensed to practice geology/engineering *(circle one or both)* in North Carolina*.* The certification number of the company or corporation is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

1. **Site History and Characterization**

Present information relevant to site history and characterization, updating information provided in earlier reports, using the following outline

1. Provide UST owner and operator information

List the names, addresses, telephone numbers, and dates of ownership/operation of all previous UST owners and operators of the UST system(s). Present in table form (Use Reporting Table B-2, Site History – UST/AST Owner/Operator and Other Responsible Party Information, from the *Guidelines*, Appendix B.).

1. Provide UST information (inclusive of all USTs, currently and historically in place at facility). For each UST, provide the following information in table form (Use Reporting Table B-1, Site History- UST/AST System and Other Release Information, from the *Guidelines*, Appendix B.):
   * Tank identification number (keyed to a site map showing the locations of all UST systems);
   * Last contents of tank;

* Previous contents of tank (if any);
* Capacity of tank in gallons;
* Construction (material and structure);
* Tank dimensions;
* Installation date;
* Description of piping and pump(s) associated with each UST;
* Status of UST (in use or not in use, closed in place, closed by removal; date of last use, date of closure); and,
* Indication that a release was or was not associated with the tank or associated piping or pump(s).
  + Provide discussion to supplement Table B-1 and the UST location map in order to clarify the spatial and historical relationships among tanks and between tanks and piping and dispensers. Provide information about any historical compliance issues.

3. Provide non-UST information.

* List, describe, and indicate location of ASTs and associated piping and pump(s) currently and historically in place at facility) and describe historical releases. For each AST, present the information in table form (Use Reporting Table B-1, Site History- UST/AST System and Other Release Information, from the *Guidelines*, Appendix B); and
* List, describe, and indicate location and date of spills that have occurred at facility.

4. Provide a comprehensive description of the release, including date discovered, cause and source (including tank identification number and contents), and the relationship of historical UST releases, non-UST releases, and off-site releases (indicate incident number) to contamination from current release.

5. Provide a brief description of site characteristics (including status of facility (active or inactive), land use of site and surrounding area, water supply, topography, vegetation, surface water, wells, buildings, surface cover, soil type, depth to and nature of bedrock, depth to groundwater, direction of groundwater flow, etc.)

6. Summarize initial abatement actions, assessment activities, and corrective actions performed to date and list all reports previously submitted.

1. **Initial Abatement Measures**

1. Describe initial response actions performed within 24 hours of discovery of the release, including:

* Submittal of 24-Hour Release Report and UST Leak Reporting Form (UST-61);
* Action to prevent further release and to determine source of the release;
* Identification and mitigation of hazards due to exposure to pollutants (e.g. Responsible party must identify and sample water supply wells at risk of impact by the release and provide supply of alternate water, if wells are impacted.); and
* Identification and mitigation of hazards due to fire, explosion, and vapor hazards.

2. Describe initial abatement actions performed, including:

* Completion of investigation to confirm presence and determine source of the release;
* Investigation and recovery of free product;
* Continued mitigation and monitoring of fire, explosion, and vapor hazards;
* Remediation of hazards posed by exposed contaminated soil;
* Submittal of 20-Day Report summarizing the progress of the initial actions performed within the 20-day period following discovery of the release; and
* Soil excavation activities.

1. **Priority Characterization**

Submit the following questionnaire in its entirety. Answer all questions completely. Attach additional pages as needed to fully explain answers. Base answers/explanations on information obtained (or updated from preceding reports) during the current investigation. (*Notes: Non-petroleum UST releases are not currently allowed to use risk-based levels for cleanup.**Source area means point of release from a UST system.)*

**45-Day Site Assessment Priority Classification Questionnaire**

**High Priority**

1. Has the release contaminated any water supply well including any used for non-drinking purposes (e.g., irrigation, washing cars, industrial cooling water, filling swimming pools)? **YES/NO**
2. Is a water supply well used for any purpose located within 1,500 feet of the source area of the release? **YES/NO**
3. Does groundwater within 1,000 feet of the source area of the release have the potential for future use (there is no other source of water supply other than the groundwater)? **YES/NO**
4. Does exposure to vapors from the release pose a serious threat to public health, public safety or the environment? **YES/NO**

If yes, describe. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. Are there any other factors that would cause the release to pose an imminent danger to public health, public safety, or the environment? **YES/NO**

If yes, describe. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Intermediate Priority**

1. Is a surface water body located within 500 feet of the source area of the release? **YES/NO**

If **YES**, does the maximum groundwater contaminant concentration exceed the surface water quality standards and criteria found in 15A NCAC 2B .0200 by a factor of 10? **YES/NO**

1. Is the source area of the release located within a planned or approved wellhead protection area as defined in 42 USC 300h-7(e)? YES/NO

If **YES**, describe. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. Is the source area of the release located in an area in which there is recharge to an unconfined or semi-confined deeper aquifer that is being used or may be used as a source of drinking water?

**YES/NO**

If **YES**, describe. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Is the release located in the Coastal Plain physiographic region as designated on a map entitled “Geology of North Carolina” published by the Department in 1985? **YES/NO**

1. Is free product present? **YES/NO**
2. Do the levels of groundwater contamination for any contaminant exceed the gross contamination levels (see Table 2) established by the Department or a factor of 10 times the groundwater quality standards established under 2L .0200? **YES/NO**

Receptor Information

Determine and describe all potential receptors, including those in the categories listed below. Compile this information in a table entitled Public and Private Water Supply Well and Other Receptor Information (Complete Table B-5 from the *Guidelines*, Appendix B.) in which an identification code is assigned to each potential receptor. Indicate the locations of each potential receptor, using the identification code, on a potential receptor map. Use information from all available sources and from site investigations.

Water Supply Wells

Determine and describe the location, use, and ownership of public and private water supply wells in the area within 1,500 feet of the source of the release. Compile this information in Table B-5 and indicate the well locations on the potential receptor map. Note whether well users are also served by a municipal water supply. Refer to the instructions for a water supply well survey in Section 2.4 of the *Guidelines*.

Public Water Supplies

Determine the existence and availability of public water supplies within 1,500 feet of the source area of the release. Compile this information in Table B-5 and indicate the locations of the nearest public water lines and the source(s) of the public water supply on the potential receptor map.

Surface Water

Identify all surface water bodies (e.g., ditch, pond, stream, lake, river) located within 1,500 feet of the source area of the release and indicate distance from source of release in Table B-5 and indicate locations on the potential receptor map.

Wellhead Protection Areas

Indicate whether or not the UST release source area is located within an approved wellhead protection area. Refer to Section 2.4 of the *Guidelines* for instructions on how to access the list of currently approved wellhead protection plans and generate a map of UST and wellhead protection area locations. List any identified wellhead protection area in Table B-5 by PWS ID number and PWS system name and show the wellhead protection area on the potential receptor map. To document performance of the wellhead protection area investigation append to the potential receptor map a copy of the map generated using ArcIMS Viewer to show 1) the UST location, 2) the wellhead protection area, and 3) community wells.

Deep Aquifers in the Coastal Plain Physiographic Region

Indicate if the source area of the release is located in an area in which there is recharge to an unconfined or semi-confined deeper aquifer and indicate if that aquifer is being used or may be used as a source of drinking water, referring to Section 2.4 of the *Guidelines*. Based on a review of scientific literature on the regional hydrogeology and well construction records and lithologic logs for deeper wells in the area, identify and describe the deep aquifers underlying the release. Include information on the depth of the deep aquifer in relation to the surficial saturated zone, the lithology and hydraulic conductivity of the strata between the surficial aquifer and the deeper aquifer, and the difference in groundwater head between the surficial aquifer and the deeper aquifer. Discuss the local and regional usage of the deep aquifer and the draw down from major pumping influences. Also, specify the distance from the source area of the release to major discharge areas, such as streams and rivers. Cite all sources and references used for this discussion.

***Note****:**This requirement only pertains to releases in the Coastal Plain physiographic region as designated on a map entitled “Geologic Map of North Carolina” published by the Department in 1985*. *This map can be obtained for a fee from the North Carolina Geologic Survey, 1612 MSC, Raleigh, NC 27699-1612* or at <https://www.nc-maps.com/>

Subsurface Structures

Describe subsurface features, including sewers, utility lines, conduits, basements, vaults, septic tanks, drainfields, etc., referring to Section 2.3 of the *Guidelines.* Compile this information in Table B-5 and indicate the locations on the potential receptor map. Discuss the risk of explosion due to the accumulation of vapors in confined space and the threat to public health, public safety or the environment posed by vapors in the subsurface features.

Land Use

**Property Owners and Occupants**

Determine the names and addresses of property owners and occupants within or contiguous to the area containing contamination and all property owners and occupants within or contiguous to the area where the contamination is expected to migrate. Compile this information in Table B-6 from the *Guidelines*, Appendix B, and indicate the property locations on the land use map.

**Sensitive Land Use Features**

List features sensitive to impact from the release (schools, daycare centers, nursing homes, hospitals, playgrounds, parks and recreation areas, churches, camps and other places of assembly) and show the zoning status of the area within 1500’ of the source of the release. Compile this information in Table B-10 from the *Guidelines*, Appendix B, and indicate the feature locations on the land use map.

**Site Investigation**

1. Discuss the site geology, hydrogeology and soil lithology including, if available:

* Subsurface soil conditions;
* Groundwater flow direction;
* Hydraulic gradient (dh/dl); and
* The distance between the deepest contaminated soil and the water table.

1. Describe all soil sampling performed to date. Use maps and tables whenever possible and include:

* Location of soil samples;
* Type of soil samples (from excavation, borehole, geoprobe, etc.);
* Soil sample analytical results (Refer to Table B-3).

1. Describe any groundwater sampling performed to date. Use maps and tables whenever possible and include:

* Location of groundwater samples, monitoring wells and water supply wells;
* Monitoring well construction information (Refer to Table B-7); and
* Groundwater sampling analytical results (Refer to Table B-4).

**Free Product Investigation and Recovery (if applicable)**

Discuss the status of free product at the site, as follows:

1. If free product is, or has been, present at the site, describe its current and historical status (product distribution, thickness, recovery activities). Refer to tables in Section J: Table B-7, Monitoring and Remediation Well Construction Information; Table B-8A, Free Product Recovery Information; Table B-8B, Cumulative Volume of Free Product Recovered from Site; and Table B-9, Current and Historical Groundwater Elevations and Free Product Thickness. Also refer to map(s) showing extent of free product in Section I;

1. Identify any on-site or off-site effluent discharges, treatment used, effluent quality, permitting actions taken, and location of such discharges and identify the disposition of recovered free product (refer to attached product disposal manifests);
2. Document the performance, total cost, and cost per gallon to date of each method of free product recovery used at site. Justify why the technology is or was used; and
3. Provide conclusions and recommendations concerning historical, current, and future recovery activities, including:

* Any proposal to change the current method of free product recovery to a better or more cost-effective technology;
* A justification for continued product recovery, if planned; and
* Any determination that free product has been eliminated from the site and a recommendation to reclassify the risk posed by the release, if applicable.

**Figures**

Provide the following:

1. A topographic map illustrating the area within 1500-foot radius of the UST system, showing:

* Topographic contours;
* Site location;
* Buildings;
* Adjacent streets, roads, highways (identified by street names and numbers);
* Surface water bodies;
* Groundwater flow direction (if determined); and
* North arrow and scale.

2. A site map\* and cross-sections illustrating the UST system(s), drawn to scale, showing:

* Buildings and property boundaries;
* Underground utilities, such as sewer lines and other conduits; basements; and vaults;
* Water supply wells, surface water bodies;
* Location and orientation of current and former UST(s), pumps, product lines, sumps, etc.;
* Length, diameter and volume of current and former UST(s);
* Type of material(s) stored in UST(s) (currently and formerly);
* Names or descriptions of properties adjacent to the site; and
* North arrow and scale.

3. Map(s)\* and geological cross-sections, drawn to scale, depicting all soil analytical results obtained to date, to include:

* Description of soil and bedrock lithology (as determined by investigation to date);
* Location and orientation of UST(s), pumps, piping, sumps, etc. (current and former);
* Soil sample identification (unique letter and/or numerical code), location, and depth;
* Soil sample analytical results;
* Final limits of each stage of excavation for each excavation on site; and
* Two geological cross-sections, drawn across the contaminated area and intersecting at right angles, showing the vertical distribution of the contaminants in the unsaturated zone. (Indicate vertical and horizontal scale, orientation of each section, location of water table, soil types and lithology, all borings and sample locations represented by the sections, and soil analytical results for each represented sample, and show sections as labeled lines on the map.)

4. Map(s)\* and geological cross-sections, drawn to scale, depicting the groundwater and surface water analytical results,\*\* to include;

* Location and orientation of UST(s), pumps, piping, sumps, etc. (current and former);
* Groundwater sample identification (unique letter and/or numerical code referencing monitoring or water supply well) and location;
* Surface water sample identification (unique letter and/or numerical code) and location; and
* Groundwater and surface water sample analytical results.

5. Map(s)\*depicting groundwater elevations,\*\* to include

* Potentiometric contour lines (if sufficient data points exist); and
* Groundwater flow direction.

6. A free product map\* depicting thickness and extent of free product;\*\*

7. A potential receptor map that clearly identifies water supply wells (municipal or public/private wells, etc.) and other potential receptors (surface water bodies, basements, utilities, etc.) which are at risk; and

8. A land use map that identifies the following items within 1500’ of the source of the release:

* Features sensitive to impact from the release (schools, daycare centers, nursing homes, hospitals, playgrounds, parks and recreation areas, churches, camps and other places of assembly):
* Properties within or contiguous to the area containing contamination or within and contiguous to the area where the contamination is expected to migrate; and
* Zoning status.

***\*Note:*** *Use a single base map to prepare site plans using a map scale of 1 in. = 40 ft.; use a smaller scale for large sites. Maps and figures should include conventional symbols, notations, labeling, legends, scales, and north arrows and should conform to accepted practices of map presentation described in the USGS Geological Survey publication "Topographic Map Symbols”,* [http://store.usgs.gov](http://store.usgs.gov/). *Scale should be expressed as a graphic scale and a verbal statement (e.g., 1 in.= 40 ft) or ratio. Refer to* <http://geokov.com/Education/map-scale.aspx>.

\*\* *If applicable*

**Tables**

Provide the following:

1. Site History (Complete Tables B-1 and B-2 from *Guidelines*, Appendix B);
2. Public and Private Water Supply Well and Other Receptor Information (Complete Table B-5 from *Guidelines*, Appendix B);
3. Field Screening Results;
4. Summary of Soil Sampling Results (Complete Table B-3 from *Guidelines*, Appendix B);
5. Summary of Groundwater and Surface Water Sampling Results (Complete Table B-4 from *Guidelines*, Appendix B)\*;
6. Monitoring and Remediation Well Construction Information (Complete Table B-7 from *Guidelines*, Appendix B)\*;
7. Free Product Recovery Information (Complete Table B-8A from *Guidelines*, Appendix B)\*;
8. Cumulative Volume of Free Product Recovered from Site (Complete Table B-8B from *Guidelines*, Appendix B)\*;
9. Current and Historical Groundwater Elevations and Free Product Thickness (Complete Table B-9 from *Guidelines*, Appendix B)\*; and
10. Land Use (Complete Table B-10 from *Guidelines*, Appendix B).

*\* Include if applicable*

**Appendices**

Provide the following:\*

Appendix A Tightness testing results and supporting documentation\*

Appendix B Notification of Intent: UST Permanent Closure or Change-in-Service (UST-3 form)\*

Appendix C Site Investigation Report for Permanent Closure or Change-in-Service of UST (UST-2 form)\*

Appendix D Site Specific Health and Safety Plan (HASP)

Appendix E Certificate of UST disposal\*

Appendix F Groundwater field measurements (pH, dissolved oxygen, specific conductivity, temperature)\*

Appendix G Standard procedures (sampling, field equipment decontamination, field screening, etc.)

Appendix H Soil, water, free product, and sludge disposal manifests and soil treatment permits\*

Appendix I Complete chain-of-custody records

Appendix J Copy of all laboratory analytical records

Appendix K Photographs of closure activities (optional)

Appendix L Geologic logs for excavation(s)/borings (related to current stage of investigation only)

Appendix M Monitoring Well Construction Forms (for all wells constructed to date)\*

***\**** *Include if applicable*

### Free Product Recovery Report

Minimum elements of the report:

**A. Site Information**

1. Site Identification

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Date of Report: |  | | | | Site Risk: | |  |
| Facility I.D.: |  | | UST Incident Number (if known): | | | |  |
| Site Name: |  | | | | | | |
| Street Address: |  | | | | | | |
| City/Town: |  | | Zip Code: |  | County: | |  |
| Description of Geographical Data Point (e.g., diesel fill port): | | | |  | | | |
| Location Method (GPS, topographical map, other): | | | |  | | | |
| Latitude (***decimal degrees***): | |  | Longitude (***decimal degrees***): | | |  | |

2. Information about Contacts Associated with the Release *(Addresses must include street, city, state, zip code and mailing address, if different)*

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UST/AST Owner: | |  | Email: | |  | | | | |
| Address: |  | | | | | Tel: |  | | |
| UST/AST Operator: | |  | Email: | |  | | | | |
| Address: |  | | | | | Tel: |  | | |
| Property Owner: | |  | Email: | |  | | | | |
| Address: |  | | | | | Tel: |  | | |
| Property Occupant: | |  | Email: | |  | | | | |
| Address: |  | | | | | Tel: |  | | |
| Consultant/Contractor: | |  | Email: | |  | | | | |
| Address: |  | | | | | Tel: |  | | |
| Analytical Laboratory: | |  | | State Certification No: | | | | |  |
| Address: |  | | | | | Tel: | |  | |

3. Information about Release

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date Discovered: |  | | | |
| Estimated Quantity of Release: | |  | | |
| Cause of Release: |  | | | |
| Source of Release (e.g., Dispenser/Piping/UST): | | |  | |
| Sizes and Contents of Tanks or Other Containment from which the Release Occurred: | | | |  |

4. Certification (***The title page must display the seal and signature of the certifying P.E. or L.G. and the name and certification number of the company or corporation [See 15A NCAC 2L .0103(e).]****)*

I, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, a Professional Engineer/Licensed Geologist *(circle one)* for (firm or company of employment), do certify that the information contained in this report is correct and accurate to the best of my knowledge.

*(Please Affix Seal and Signature)*

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(Name of company or corporation) is licensed to practice geology/engineering *(circle one or both)* in North Carolina*.* The certification number of the company or corporation is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

##### Site Status and Conclusions

Discuss the status of free product at the site, as follows:

1. If free product is, or has been, present at the site, describe its current and historical status (product distribution, thickness, recovery activities). For an initial report, provide the results of a free product evaluation based on bail-down test(s) at the most highly impacted location(s), to include free product thickness and recovery rate. Refer to tables (from *Guidelines*, Appendix B) in Section D: Table B-7, Monitoring and Remediation Well Construction Information; and Table B-8A, Free Product Recovery Information; Table B-8B, Cumulative Volume of Free Product Recovered from Site; and Table B-9, Current and Historical Groundwater Elevations and Free Product Thickness. Also refer to map(s) showing extent of free product in Section C.

2. Identify any on-site or off-site effluent discharges, treatment used, effluent quality, permitting actions taken, and location of such discharges and identify the disposition of recovered free product (refer to attached product disposal manifests).

3. Document the performance, total cost, and cost per gallon to date of each method of free product recovery used at site. Justify why the technology is or was used.

4. Provide conclusions and recommendations concerning historical, current, and future recovery activities, including:

* Any proposal to change the current method of free product recovery to a better or more cost-effective technology;
* Any determination that free product has been eliminated from the site with a recommendation to reclassify the risk posed by the release, if applicable.

##### Figures

Provide the following:

1. A topographic map illustrating the area within 1500-foot radius of the source of the release, showing:

* Topographic contours;
* Site location;
* Buildings;
* Adjacent streets, roads, highways (identified by street names and numbers);
* Surface water bodies;
* Groundwater flow direction (if determined); and
* North arrow and scale.

2. A site map\* and cross-sections illustrating the release site (AST system(s), UST system(s), location of spill, etc.) drawn to scale, showing:

* Buildings and property boundaries;
* Underground utilities, such as sewer lines and other conduits; basements; and vaults;
* Water supply wells, surface water bodies;
* Location and orientation of current and former ASTs, UST(s), pumps; product lines, sumps, etc.;
* Length, diameter and volume of current and former ASTs and UST(s);
* Type of material(s) (currently and formerly) in AST(s) and UST(s) or spilled;
* Groundwater monitoring locations, if applicable;
* Groundwater flow direction, if determined; and
* North arrow and scale.

3. Provide a free product map\* showing thickness (in feet) and extent of free product using contour lines.

4. Provide a potential receptor map that clearly identifies water supply wells (municipal or public/private wells, etc.) and other potential receptors (surface water bodies, basements, utilities, WHP areas, etc.) which are at risk.

***\*Note:*** *Use a single base map to prepare site plans using a map scale of 1 in. = 40 ft.; use a smaller scale for large sites. Maps and figures should include conventional symbols, notations, labeling, legends, scales, and north arrows and should conform to accepted practices of map presentation described in the USGS Geological Survey publication "Topographic Map Symbols”,* [http://store.usgs.gov](http://store.usgs.gov/). *Scale should be expressed as a graphic scale and a verbal statement (e.g., 1 in.= 40 ft) or ratio. Refer to* <http://geokov.com/Education/map-scale.aspx>.

\*\* *If applicable*

##### Tables

Provide the following:

1. Monitoring and Remediation Well Construction Information (Complete Table B-7 from *Guidelines*, Appendix B);

2. Free Product Recovery Information (Complete Table B-8A from *Guidelines*, Appendix B);

3. Cumulative Volume of Free Product Recovered from Site (Complete Table B-8B from *Guidelines*, Appendix B);

4. Current and Historical Groundwater Elevations and Free Product Thickness (Complete Table B-9 from *Guidelines*, Appendix B).

##### Appendices

Provide the following:

Appendix A Site Specific Health and Safety Plan (HASP)

Appendix B Standard procedures (sampling, field equipment decontamination, field screening, etc.)

Appendix C Free product disposal manifests

Appendix D Bail-down test procedure and calculations\*

*\* If applicable*

### Free Product Recovery System Specification Report

Minimum elements of the report:

**A. Site Information**

1. Site Identification

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Date of Report: |  | | | | Site Risk: | |  |
| Facility I.D.: |  | | UST Incident Number (if known): | | | |  |
| Site Name: |  | | | | | | |
| Street Address: |  | | | | | | |
| City/Town: |  | | Zip Code: |  | County: | |  |
| Description of Geographical Data Point (e.g., diesel fill port): | | | |  | | | |
| Location Method (GPS, topographical map, other): | | | |  | | | |
| Latitude (***decimal degrees***): | |  | Longitude (***decimal degrees***): | | |  | |

2. Information about Contacts Associated with the Release *(Addresses must include street, city, state, zip code and mailing address, if different)*

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UST/AST Owner: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| UST/AST Operator: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Property Owner: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Property Occupant: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Consultant/Contractor: | | |  | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Analytical Laboratory: | | |  | | State Certification No: | | | | |  |
| Address: |  | | | | | | Tel: | |  | |

3. Information about Release

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date Discovered: |  | | | |
| Estimated Quantity of Release: | |  | | |
| Cause of Release: |  | | | |
| Source of Release (e.g., Dispenser/Piping/UST): | | |  | |
| Sizes and Contents of Tanks or Other Containment from which the Release Occurred: | | | |  |

4. Certification (***The title page must display the seal and signature of the certifying P.E. or L.G. and the name and certification number of the company or corporation [See 15A NCAC 2L .0103(e).]****)*

I, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, a Professional Engineer/Licensed Geologist *(circle one)* for (firm or company of employment), do certify that the information contained in this report is correct and accurate to the best of my knowledge.

*(Please Affix Seal and Signature)*

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(Name of company or corporation) is licensed to practice geology/engineering *(circle one or both)* in North Carolina*.* The certification number of the company or corporation is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

##### B. Executive Summary

Present a brief summary of the most pertinent information about the site and the release and indicate the recommended free product recovery system option, using the following outline:

1. Describe the source, date of discovery, and quantity and type(s) of contaminant released;

2. Summarize initial abatement actions, including closure, soil removal, free product recovery, and provision of alternate water;

3. Describe the results of the hydrogeological investigation;

4. Summarize the results of soil, groundwater, and surface water assessment and free product measurement, indicating the nature and extent of contamination, the estimated rate of migration, and potential for impacting receptors;

5. Indicate the risk classification (or non-UST petroleum/non-petroleum UST rank) and the criteria for that determination;

6. Discuss all free product recovery actions performed to date, documenting performance, cost per gallon, and total cost for each method used; and

7. Present the selected option for free product recovery and discuss the basis for selection, schedule for implementation, recovery progress milestones, and cost.

##### Table of Contents

Provide a table of contents, as follows:

1. List sections, indicating page numbers;

2. List figures, identifying each by number;

3. List tables; identifying each by number; and

4. List appendices, identifying each by letter.

**D. Site History and Characterization**

Present information relevant to site history and characterization, ***updating information provided in previous reports,*** using the following outline:

1. Provide information for UST/AST owners/operators and other responsible parties.

* Refer to table (Use Table B-2, Site History, UST/AST Owner/Operator and Other Responsible Party Information, from Guidelines, Appendix B).

2. Provide information about UST systems (inclusive of all USTs, currently and historically in place at site).

* Refer to table (Use Table B-1, Site History, UST/AST System and Other Release Information, from *Guidelines*, Appendix B) and to site map.

3. Provide information about petroleum AST systems, petroleum spills, and other non-UST petroleum releases (inclusive of all ASTs, currently and historically in place at site and all spills at site).

* Refer to table (Use Table B-1, Site History, UST/AST System and Other Release Information, from *Guidelines*, Appendix B) and to site map.

4. Provide a description of the release, including date discovered, cause and source.

5. Provide a brief description of site characteristics (including land use of site, topography, vegetation, surface water, wells, buildings, surface cover, soil type, depth to and nature of bedrock, depth to groundwater, direction of groundwater flow, etc.).

6. Present information on receptors/potential receptors.

* Refer to table (Use Reporting Table B-5, Public and Private Water Supply Well and Other Receptor Information, from *Guidelines*, Appendix B) and to potential receptor map.

7. List all reports previously submitted.

8. Summarize initial abatement and corrective actions performed to date, including excavation of contaminated soil and free product removal (Refer to free product recovery information tables; use Reporting Table B-8A and Reporting Table B-8B from *Guidelines*, Appendix B).

**E. Summary of Site Assessment Information**

1. Summarize groundwater and free product assessment information acquired to date.

* Refer to tables (Use Reporting Table B-4, Summary of Groundwater and Surface Water Sampling Results; Reporting Table B-9, Current and Historical Groundwater Elevations and FP Thickness, from *Guidelines*, Appendix B) and to map(s) showing groundwater elevation and flow; maps and geological cross-sections showing groundwater analytical results and the horizontal and vertical extent of contamination; and map(s) depicting free product thickness and extent.

2. Describe the geology and hydrogeology of the region and the site.

* Describe soil and bedrock encountered at the site. (Refer to geologic cross sections of map illustrating soil contamination and to geologic logs for borings.)
* Discuss site hydrogeology, as determined from groundwater monitoring and from hydrogeological investigations (include the following information: groundwater flow direction, hydraulic gradient (vertical and horizontal), hydraulic conductivity, groundwater velocity, and FP recovery rate.).
* Describe the relationship of the geological and hydrogeological characteristics of the site to the potential migration of free product.

3. Summarize and evaluate assessment information:

* Describe free product thickness and lateral extent; and
* Indicate potential for contaminant migration and for impact of receptors.

**F. Objectives of Free Product Recovery at the Site**

1. Indicate the NORR requiring preparation and submittal of the Free Product Recovery System Specification Report (Refer to Appendix D.); and

2. State purpose and objectives of free product recovery.

**G. Evaluation of Free Product Recovery System Options**

1. Present and comprehensively evaluate free product recovery system options.

1. The responsible party must evaluate a minimum of **three** viable options for free product recovery, each of which can consist of any single technology or any combination of a technology (or technologies).
2. **The responsible party must evaluate each option separately; the evaluation of *each option* must include the following**:
3. Consideration of the nature of the contamination at the site, including:
4. Type, thickness and extent of free product;
5. Horizontal and vertical extent of individual contaminants dissolved in groundwater (if known);
6. Accessibility of contamination; and
7. Estimated volume of free product to be recovered.
8. Description of each recovery technology or mechanism included within an option;
9. Presentation of system design and specifications (for each technology or mechanism, e.g., AFVR, MMPE, SVE, etc.), inclusive of:

* System design and process;
* Radius of influence of system and estimated rates of recovery;
* Anticipated flow rates and pressures;
* Anticipated effluent concentration after each unit of treatment;
* Plan for waste disposal;
* Determination of permits necessary for implementation of the recovery option and assessment of feasibility for permit approval;
* Figures and tables to illustrate system design and present specifications. (Refer to Section H, I, and J.)

1. Presentation of plan for excavation, including:

* Excavation specifications;
* Estimated volumes of soil/free product/groundwater to be treated/disposed of;
* Waste treatment/disposal plan;
* Sampling/analysis of contaminated soil prior to treatment/disposal;
* Name, and address of and distance to treatment/disposal facility;
* Determination of permits necessary for implementation of the excavation option and assessment of feasibility for permit approval; and
* Figures and tables to illustrate excavation specifications. (Refer to Section H, I, and J.)

1. Discussion of feasibility and effectiveness of ***each*** recovery technology or mechanism, based on:
2. Pilot test results;
3. Aquifer test results and hydrogeological information;
4. Water supply well user information;
5. Groundwater monitoring results;
6. Free product type, thickness, and extent;
7. Other relevant parameters;
8. Limitations of each remedial technology or mechanism (including access issues, technological feasibility, etc.) and proposed measures for dealing with limitations; and
9. Completed bids.
10. Free product recovery system operation and maintenance plan (with schedule and discussion of measures to reduce operation and maintenance activities/costs, such as use of automated controls and remote telemetry).
11. Waste treatment/disposal plan (for free product, contaminated soil, contaminated groundwater) with
12. Estimated volume to be treated/disposed of,
13. Treatment/disposal method,
14. Name and address of treatment/disposal facility,
15. Analytical results for any pre-treatment/disposal samples, and
16. Copies of approved permits necessary for implementation of the free product recovery option.
17. Monitoring plan for free product (with proposed sampling locations and gauging/reporting frequency).
18. Comprehensive, well-substantiated schedule for each remedial option describing the progression of all activities, from the date of report approval, through implementation of recovery plan to the date that free product is confirmed to be eliminated and including, but not be limited to, the performance or occurrence of the following actions and processes:
19. Soil excavation,
20. Free product recovery system installation and activation,
21. Operation and maintenance,
22. Monitoring,
23. Free product recovery progress milestones (dates by which progressively decreasing thicknesses and extents of free product are expected to be reached), and
24. Project completion.
25. Detailed cost estimate for full performance of the free product recovery option, from approval to attainment of free product cleanup goal, including the costs proposed as low bid for each recovery technology, costs for labor, free product measurements, operation and maintenance, periodic reporting, waste disposal, etc.

2. Select the best free product recovery option, discuss the basis for selection of the option, and indicate why it was determined to be the most effective and cost-efficient option for recovering free product at the site.

Provide a copy(s) of the approved permit(s) necessary for implementation of the selected remedial option.

##### H. Figures

Provide the following:

1. A topographic map illustrating the area within 1500-foot radius of the source of the release, showing:

* Topographic contours;
* Site location;
* Buildings;
* Adjacent streets, roads, highways (identified by street names and numbers);
* Surface water bodies;
* Groundwater flow direction (if determined); and
* North arrow and scale.

2. A site map\* and cross-sections illustrating the release site (AST system(s), UST system(s), location of spill, etc.) drawn to scale, showing:

* Buildings and property boundaries;
* Underground utilities, such as sewer lines and other conduits; basements; and vaults;
* Water supply wells, surface water bodies;
* Location and orientation of current and former ASTs, UST(s), pumps, product lines, sumps, etc., spills;
* Length, diameter and volume of current and former ASTs and UST(s);
* Type of material(s) stored (currently and formerly) in AST(s) or UST(s) or spilled; and
* North arrow and scale.

3. Map(s)\* and geological cross-sections, drawn to scale, depicting all soil analytical results obtained to date, to include:

* Description of soil and bedrock lithology (as determined by investigation to date);
* Location and orientation of AST(s), UST(s), pumps, piping, sumps, etc.(current and former), spills.

4. Map(s)\* depicting groundwater elevations, to include:

* Groundwater elevations (relative to MSL);
* Groundwater elevation data points (identified by monitoring well);
* Date of measurement (each map should represent a single water level measurement event);
* Potentiometric contour lines; and
* Groundwater flow direction.

5. Map\*, drawn to scale, depicting groundwater and surface water analytical results,\*\* to include:

* Location and orientation of AST(s), UST(s), pumps, piping, sumps, etc. (current and former), spills;
* Groundwater sample identification (unique letter and/or numerical code referencing monitoring or water supply well) and location;
* Date of sampling;
* Surface water sample identification (unique letter and/or numerical code) and location; and
* Groundwater and surface water sample analytical results.

6. A potential receptor map that identifies potential receptors (wells, surface water bodies, basements, utilities, wellhead protection areas, etc.) within 1500’ of the source of the release.

7. **A free product map\* and two geological cross-sections** depicting current thickness and extent of free product in the saturated zone (One cross-section should be drawn along the long axis of the plume and the second, across it at right angles. Vertical and horizontal scale, location of water table, gauging points/monitoring wells represented by the sections, and orientation should be indicated on each section, and the gauging points/wells and section placement should be shown on the map);

8. A map\* and cross-sections, to be used in conjunction with free product map/cross-sections in item #7, **illustrating 3-dimensional extent of proposed excavation area** to scale;\*\* and

9. Maps\* and cross-sections, to be used in conjunction with free product map/cross-sections in item #7, **illustrating each proposed free product recovery technology** (present a detailed plan of each system design and layout, which includes all major components of the system).\*\*

***\*Note:*** *Use a single base map to prepare site plans using a map scale of 1 in. = 40 ft.; use a smaller scale for large sites. Maps and figures should include conventional symbols, notations, labeling, legends, scales, and north arrows and should conform to accepted practices of map presentation described in the USGS Geological Survey publication "Topographic Map Symbols”,* [http://store.usgs.gov](http://store.usgs.gov/). *Scale should be expressed as a graphic scale and a verbal statement (e.g., 1 in.= 40 ft) or ratio. Refer to* <http://geokov.com/Education/map-scale.aspx>.

\*\* *If applicable*

##### I. Tables

Provide the following:

1. Site History (Complete Reporting Tables B-1 and B-2 from *Guidelines*, Appendix B);

2. Public and Private Water Supply Well and Other Receptor Information (Complete Table B-5 from *Guidelines*, Appendix B);

3. Field Screening Results;

4. Summary of Groundwater and Surface Water Sampling Results (Complete Table B-4 from *Guidelines*, Appendix B)\*;

5. Monitoring and Remediation Well Construction Information (Complete Table B-7 from *Guidelines*, Appendix B)\*;

6. Free Product Recovery Information (Complete Table B-8A from *Guidelines*, Appendix B)\*;

7. Cumulative Volume of Free Product Recovered from Site (Complete Table B-8B from *Guidelines*, Appendix B)\*;

8. Current and Historical Groundwater Elevations and Free Product Thickness (Complete Table B-9 from *Guidelines*, Appendix B)\*;

9. Free Product Recovery Schedules and Recovery Progress Milestones for Each Evaluated Remedial Option; and

10. Cost Estimate for Each Evaluated Free Product Recovery Option.

***\**** *If applicable*

**Provide additional tables as necessary to compile information critical to evaluating in detail each proposed remedial technology or mechanism.**

##### J. Appendices

Provide the following:

Appendix A Site Specific Health and Safety Plan (HASP);

Appendix B Copies of permits (soil treatment, wastewater treatment, etc.)\*;

Appendix C Geologic logs for borings;

Appendix D Copies of the NORR, NOV, etc. requiring the FP Recovery Specification Report;

Appendix E Cost estimate documentation for each technology or mechanism evaluated, including bid specification, invitations to bid, and bids received;

Appendix F Specifications for remedial system design and layout, with calculations, for each technology or mechanism evaluated; and

Appendix G Pilot test data/calculations.

\* If applicable

### Initial Site Assessment Report (For non-UST petroleum releases only)

Minimum elements of the report:

**A. Site Information**

1. Site Identification

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Date of Report: |  | | | | Site Risk: | |  |
| Facility I.D.: |  | | UST Incident Number (if known): | | | |  |
| Site Name: |  | | | | | | |
| Street Address: |  | | | | | | |
| City/Town: |  | | Zip Code: |  | County: | |  |
| Description of Geographical Data Point (e.g., diesel fill port): | | | |  | | | |
| Location Method (GPS, topographical map, other): | | | |  | | | |
| Latitude (***decimal degrees***): | |  | Longitude (***decimal degrees***): | | |  | |

2. Information about Contacts Associated with the Release *(Addresses must include street, city, state, zip code and mailing address, if different)*

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UST/AST Owner: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| UST/AST Operator: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Property Owner: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Property Occupant: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Consultant/Contractor: | | |  | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Analytical Laboratory: | | |  | | State Certification No: | | | | |  |
| Address: |  | | | | | | Tel: | |  | |

3. Information about Release

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date Discovered: |  | | | |
| Estimated Quantity of Release: | |  | | |
| Cause of Release: |  | | | |
| Source of Release (e.g., Dispenser/Piping/UST): | | |  | |
| Sizes and Contents of Tanks or Other Containment from which the Release Occurred: | | | |  |

4. Certification (***The title page must display the seal and signature of the certifying P.E. or L.G. and the name and certification number of the company or corporation [See 15A NCAC 2L .0103(e).]****)*

I, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, a Professional Engineer/Licensed Geologist *(circle one)* for (firm or company of employment), do certify that the information contained in this report is correct and accurate to the best of my knowledge.

*(Please Affix Seal and Signature)*

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(Name of company or corporation) is licensed to practice geology/engineering *(circle one or both)* in North Carolina*.* The certification number of the company or corporation is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**B. Site History and Characterization**

Present information relevant to site history and characterization, ***updating information provided in previous reports*** using the following outline:

1. Provide information for AST/UST owners/operators and/or other parties responsible for non-UST petroleum releases.

* Refer to table (Use Table B-2, Site History, UST/AST Owner/Operator and Other Responsible Party Information, from *Guidelines*, Appendix B)

2. Provide information about petroleum AST systems, petroleum spills, and other non-UST petroleum releases (inclusive of all ASTs, currently and historically in place at site and all spills at site).

* Refer to table (Use Table B-1, Site History, UST/AST System and Other Release Information, from *Guidelines*, Appendix B) and to site map;
* Briefly discuss the spatial and historical relationships among tanks and between tanks and piping and dispensers, describe all historical compliance issues and releases (indicate incident numbers), and indicate from which AST system(s) or spill(s) the currently investigated release originated.

3. Provide information about UST systems (inclusive of all USTs, currently and historically at site).

* Refer to table (Use Table B-1, Site History, UST/AST System and Other Release Information, from *Guidelines*, Appendix B) and to site map.

4. List, describe, and indicate location (refer to location on site map) of any non-UST, non-petroleum releases which have occurred at site (Use Table B-1, Site History, UST/AST System and Other Release Information, from *Guidelines*, Appendix B) and to site map.

5. Provide a comprehensive description of the release, including date discovered, cause and source (including tank identification number and contents), and the relationship of historical petroleum AST and other non-UST releases, UST releases, and off-site releases (indicate incident number) to contamination from current release.

6. Provide a brief description of site characteristics (including land use of site and surrounding area, topography, vegetation, surface water, wells, buildings, surface cover, soil type, depth to and nature of bedrock, depth to groundwater, direction of groundwater flow, etc.).

7. Summarize initial abatement actions, assessment activities, and corrective actions performed to date and list all reports previously submitted.

##### C. Free Product Investigation and Recovery Report (if applicable)

Discuss the status of free product at the site, as follows:

1. If free product is, or has been, present at the site, describe its current and historical status (product distribution, thickness, recovery activities). For an initial report, provide the results of a free product evaluation based on bail-down test(s) at the most highly impacted location(s), to include free product thickness and recovery rate. Refer to tables: Table B-7, Monitoring and Remediation Well Construction Information; and Table B-8A, Free Product Recovery Information; Table B-8B, Cumulative Volume of Free Product Recovered from Site; and Table B-9, Current and Historical Groundwater Elevations and Free Product Thickness. Also refer to map(s) showing extent of free product in Section H.
2. Identify any on-site or off-site effluent discharges, treatment used, effluent quality, permitting actions taken, and location of such discharges and identify the disposition of recovered free product (refer to attached product disposal manifests).
3. Document the performance, total cost, and cost per gallon to date of each method of free product recovery used at site. Justify why the technology is or was used.
4. Provide conclusions and recommendations concerning historical, current, and future recovery activities, including:

* Any proposal to change the current method of free product recovery;
* A justification for continued product recovery, if planned; and
* Any determination that free product has been eliminated from the site.

**D. Groundwater and Surface Water Investigation** (if applicable)

1. If groundwater or bedrock was encountered in pits, trenches or shallow borings during initial abatement activities, if monitoring or water supply wells were found to be contaminated, or if surface water is present nearby, then indicate actions taken to investigate suspected contamination from a release (e.g., installation of monitoring wells, groundwater or surface sampling and analysis).
2. Document groundwater investigation, as follows:

* Present groundwater and surface water sampling information (Refer to tables and appendices provided in Sections I and J.), including:
* Location of water samples (e.g., of monitoring well, water supply well, stream sampling point);
* Field measurements (pH, dissolved oxygen, specific conductivity, temperature, Eh, alkalinity, TPH; etc.);
* Sample collection procedures (grab, bailer, etc.);
* Time/date collected.
* Sample identification; and
* Method(s) of water sample analysis.
* Document quality-control measure information (Refer to tables and appendices provided in Sections I and J), including:
* Sample handling procedures including sample preservation techniques and sample transport procedures;
* Decontamination procedures;
* Time and date samples were submitted to lab; and
* Collection of samples for quality control purposes (e.g., duplicates, field blanks, trip blanks).
* Describe groundwater or surface water investigation results, including:
* Presentation of analytical results (Refer to table(s) provided in Section I and to appendix with laboratory analytical results provided in Section J.) and discussion of the results in relation to the cleanup levels (groundwater quality or surface water quality standards); and
* Discussion of the effect of quality control sample results on the interpretation of groundwater or surface water analytical results.

**E. Initial Response and Abatement Action**

1. Describe initial response actions performed, including:

* Submittal of Notification of Discharge Report
* Action to stop release and to determine source of the release;
* Identification and mitigation of hazards due to exposure to pollutants (e.g., Responsible party must identify and sample water supply wells at risk of impact by the release and provide supply of alternate water, if wells are impacted.); and
* Identification and mitigation of hazards due to fire, explosion, and vapor hazards.

1. Describe initial abatement actions performed, including:

* Completion of investigation to determine and eliminate source of the release;
* Investigation and recovery of free product;
* Continued mitigation and monitoring of fire, explosion, and vapor hazards;
* Remediation of hazards posed by exposed contaminated soil
* Soil excavation activities (Document in Section F, Excavation of Contaminated Soil).

**F. Excavation of Contaminated Soil**

1. Describe source and estimated extent of soil contamination determined in initial investigations, referencing maps and cross-sections in Section H and tables presenting soil sampling information and results in Section I (If there are multiple sources of release, then describe the extent of contamination from each source.), including:

* Sampling location and depths; locations of tanks, piping dispensers, sumps, areas of staining; utility lines; potential receptors; buildings; relationship of area(s) of contaminated soil to groundwater and bedrock; and
* If any soil was removed, indicate dimensions of resulting pits and trenches.

1. Describe excavation process, referencing maps and cross-sections in Section H, tables presenting soil sampling information and results in Section I and disposal manifests and geological logs in Section J, as follows:

* Describe type of equipment used (e.g., back hoe, track hoe, dump truck);
* Describe field screening, if used to determine limits of excavation, including:
* Physical characteristics of the soil samples, as observed during collection;
* Field instrumentation used to screen soils;
* Field instrument calibration procedures;
* Screening results (Refer to table provided in Section I);
* Indicate the final dimensions of the excavation(s);
* Indicate the volume (in cubic yards) and weight (in tons) of soil excavated from each excavation (show calculations);
* Describe relationship of final excavation pit to former AST system or point of discharge, to groundwater, to bedrock, and to structures; and
* Indicate if the excavation operation ceased on encountering clean soil, groundwater, or bedrock.

1. Describe post-excavation confirmation soil sampling, referencing maps and cross-sections in Section H, tables presenting soil sampling information and results in Section I, and geological logs in Section J, as follows:

* Describe sample location and depth and methods of collection and analysis for each excavation;
* Note if multiple excavations were performed sequentially in an area of contaminated soil, i.e., if confirmatory sampling following primary excavation indicated that contaminated soil remained, so that further excavation was performed and a second set of confirmatory samples was collected and analyzed; and
* If contaminated soil was allowed to remain after final excavation, indicate precisely the location and depth of the residual contamination and explain why it was not removed, i.e., why it was not economically and/or technologically feasible to excavate it

1. Document Soil Investigation.

* Provide soil sampling information for all samples collected following excavation and during previous investigations. Refer to table provided in Section I (Use Table B-3, Summary of Soil Sampling Results); to figures in Section H; and to appendices in Section J. Information should include
* Lithological descriptions from logs for borings, excavations;
* Type of samples (from excavation, borehole, geoprobe boring, stockpiled soil, etc.);
* Sample collection procedures (grab, split spoon, hand auger, etc.);
* Location of soil samples;
* Depth of soil samples (feet below land surface);
* Time/date collected;
* Sample identification;
* Indication of phase of sampling (initial investigation or post-excavation); and
* Method(s) of soil sample analysis.
* Document quality-control measure information (Refer to tables and appendices provided in I and J), including:
* Sample handling procedures including sample preservation techniques and sample transport procedures;
* Decontamination procedures;
* Time and date samples were submitted to lab; and
* Collection of samples for quality control purposes (e.g., duplicates, field blanks, trip blanks).
* Describe soil investigation results, including:
* Presentation of analytical results for soil samples (Refer to table provided in Section I and to appendix with laboratory analytical results provided in Section J);
* Discussion of the results in relation to the cleanup goals, identifying the samples that exceed the soil-to-groundwater MSCCs.
* Discussion of effect of quality control sample results on the interpretation of soil analytical results.

1. Describe disposal of contaminated soil, referencing tables presenting soil sampling information and results in Section I and disposal manifests in Section J as follows:

* Indicate volume and weight of contaminated soil removed from each excavation at site;
* Describe construction of any stockpile of contaminated soil, describe collection and analysis of stockpile samples;
* Indicate if soil was treated onsite (Reference permit in Section J.);
* Indicate if soil was transported offsite for disposal and, if so, by whom and to what destination; and
* Confirm that excavation was back-filled with clean soil.

1. Present conclusions, as follows;

* Briefly summarize excavation process;
* Describe extent of final excavation(s) and collection of confirmatory samples;
* Indicate if excavation ceased on encountering groundwater or bedrock; and
* Indicate whether soil contaminant levels in exceedance of the soil-to-groundwater MSCCs remain in the excavation(s), further excavation being determined infeasible by the UST Section, or soil contaminant levels in final excavation confirmatory soil samples were equal to or below the soil-to-groundwater MSCCs.

G. Conclusions

1. If soil contaminant levels in exceedance of the soil-to-groundwater MSCCs remain in the excavation(s) (further excavation being determined infeasible by the UST Section), if groundwater or bedrock has been encountered in proximity to contamination, if free product is present, or if groundwater is contaminated in exceedance of 2L standards, it should be concluded that a Comprehensive Site Assessment must be performed, but
2. If soil contaminant levels in final excavation confirmatory soil samples were equal to or below the lowest MSCCs and if groundwater, bedrock, and free product were not encountered in the excavation(s), then no further action should be requested.

H. Figures

Provide the following:

1. A topographic map illustrating the area within 1500-foot radius of the source of the release, showing:

* Topographic contours;
* Site location;
* Buildings;
* Adjacent streets, roads, highways (identified by street names and numbers);
* Surface water bodies;
* Groundwater flow direction (if determined); and
* North arrow and scale.

2. A site map\* and cross-sections illustrating the release site (AST system(s), UST system(s), location of spill, etc.) and the excavation area(s), drawn to scale, showing:

* Buildings and property boundaries;
* Underground utilities, such as sewer lines and other conduits; basements; and vaults;
* Water supply wells, surface water bodies
* Location and orientation of current and former AST(s), UST(s), pumps; product lines, sumps, etc.;
* Length, diameter and volume of current and former AST(s), UST(s);
* Type of material(s) stored in AST(s), UST(s) (currently and formerly) or spilled; and
* Names or descriptions of properties adjacent to the site; and
* North arrow and scale.

3. Map(s)\* and geological cross-sections, drawn to scale, depicting all soil analytical results obtained to date and final confirmatory sample results, to include:

* Description of soil and bedrock lithology (as determined by investigation to date);
* Location and orientation of AST(s), UST(s), pumps, piping, sumps, etc. (current and former), spills;
* Soil sample identification (unique letter and/or numerical code), location, and depth;
* Soil sample analytical results;
* Final limits of each stage of excavation for each excavation on site\*\*; and
* Two geological cross-sections, drawn across the contaminated area and intersecting at right angles, showing the vertical distribution of the contaminants in the unsaturated zone. (Indicate vertical and horizontal scale, orientation of each section, location of water table, soil types and lithology, all borings and sample locations represented by the sections, and soil analytical results for each represented sample, and show sections as labeled lines on the map.)

4. Map(s)\* and geological cross-sections, drawn to scale, depicting the groundwater and surface water analytical results,\*\* to include;

* Location and orientation of AST(s), UST(s), pumps, piping, sumps, etc. (current and former), or point of release;
* Groundwater sample identification (unique letter and/or numerical code referencing monitoring or water supply well) and location;
* Surface water sample identification (unique letter and/or numerical code) and location; and
* Groundwater and surface water sample analytical results.

1. A free product map\* showing thickness (in feet) and extent of free product\*\* using contour lines; and
2. A potential receptor map that clearly identifies water supply wells (municipal or public/private wells, etc.) and other potential receptors (surface water bodies, basements, utilities, etc.) which are at risk.

***\*Note:*** *If possible, use a single base map to prepare site plans using a map scale of 1 inch = 40 feet (or a smaller scale for large sites, if necessary). Maps and figures should include conventional symbols, notations, labeling, legends, scales, and north arrows and should conform to generally accepted practices of map presentation such as those enumerated in the USGS Geological Survey pamphlet, "Topographic Maps."*

*\*\* If applicable*

##### I. Tables

Provide the following:

1. Site History (Complete Tables B-1 and B-2 from *Guidelines*, Appendix B, Reporting Tables);

1. Public and Private Water Supply Well and Other Receptor Information (Complete Table B-5 from *Guidelines*, Appendix B, Reporting Tables);
2. Field Screening Results;
3. Summary of Soil Sampling Results (Complete Table B-3 from *Guidelines*, Appendix B, Reporting Tables);
4. Summary of Groundwater and Surface Water Sampling Results\* (Complete Table B-4 from *Guidelines*, Appendix B, Reporting Tables) \*;

6. Monitoring and Remediation Well Construction Information (Complete Table B-7 from *Guidelines*, Appendix B, Reporting Tables)\*;

7. Free Product Recovery Information (Complete Table B-8A from *Guidelines*, Appendix B, Reporting Tables)\*;

8. Cumulative Volume of Free Product Recovered from Site (Complete Table B-8B from *Guidelines*, Appendix B, Reporting Tables)\*;

9. Current and Historical Groundwater Elevations and Free Product Thickness (Complete Table B-9 from *Guidelines*, Appendix B, Reporting Tables)\*.

*\* If applicable*

##### J. Appendices

Provide the following:\*

Appendix A Site Specific Health and Safety Plan (HASP)

Appendix B Field measurements (pH, dissolved oxygen, specific conductivity, temperature, Eh, alkalinity in groundwater; TPH in soil or groundwater; etc.);\*

Appendix C Standard procedures (sampling, field equipment decontamination, field screening, etc.)

Appendix D Soil, water, free product, and sludge disposal manifests and soil treatment permits\*

Appendix E Complete chain-of-custody records

Appendix F Copy of all laboratory analytical records

Appendix G Photographs of site excavation activities (optional)

Appendix H Geologic logs for excavation(s)/borings

Appendix I Monitoring Well Construction Forms (for all wells constructed to date)

Appendix J Bail-down test procedure and calculations\*

*\* If applicable*

### Limited Site Assessment Report

*(For petroleum UST releases only)*

Minimum elements of the report:

**A. Site Information**

1. Site Identification

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Date of Report: |  | | | | Site Risk: | |  |
| Facility I.D.: |  | | UST Incident Number (if known): | | | |  |
| Site Name: |  | | | | | | |
| Street Address: |  | | | | | | |
| City/Town: |  | | Zip Code: |  | County: | |  |
| Description of Geographical Data Point (e.g., diesel fill port): | | | |  | | | |
| Location Method (GPS, topographical map, other): | | | |  | | | |
| Latitude (***decimal degrees***): | |  | Longitude (***decimal degrees***): | | |  | |

2. Information about Contacts Associated with the Release *(Addresses must include street, city, state, zip code and mailing address, if different)*

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UST/AST Owner: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| UST/AST Operator: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Property Owner: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Property Occupant: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Consultant/Contractor: | | |  | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Analytical Laboratory: | | |  | | State Certification No: | | | | |  |
| Address: |  | | | | | | Tel: | |  | |

3. Information about Release

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date Discovered: |  | | | |
| Estimated Quantity of Release: | |  | | |
| Cause of Release: |  | | | |
| Source of Release (e.g., Dispenser/Piping/UST): | | |  | |
| Sizes and Contents of Tanks or Other Containment from which the Release Occurred: | | | |  |

4. Certification (***The title page must display the seal and signature of the certifying P.E. or L.G. and the name and certification number of the company or corporation [See 15A NCAC 2L .0103(e).]****)*

I, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, a Professional Engineer/Licensed Geologist *(circle one)* for (firm or company of employment), do certify that the information contained in this report is correct and accurate to the best of my knowledge.

*(Please Affix Seal and Signature)*

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(Name of company or corporation) is licensed to practice geology/engineering *(circle one or both)* in North Carolina*.* The certification number of the company or corporation is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

##### B. Executive Summary

Present a brief summary of the most pertinent information about the site and the release.

**C. Table of Contents**

Provide a table of contents, as follows:

1. List sections, indicating page numbers;

2. List figures, identifying each by number;

3. List tables; identifying each by number; and

4. List appendices, identifying each by letter.

**D. Site History and Characterization**

Present information relevant to site history and characterization, ***updating information provided in previous reports*** (e.g., 20-Day, IAA, or Free Product Recovery Report), using the following outline:

1. Provide information for UST/AST owners/operators and other responsible parties.

List the names, addresses, telephone numbers, and dates of ownership/operation of all previous UST/AST owners, UST/AST operators, and other responsible parties. Present in table form in Section M (Use Reporting Table B-2, Site History, UST/AST Owner/Operator and Other Responsible Party Information, from *Guidelines*, Appendix B.).

2. Provide UST information (inclusive of all USTs, currently and historically in place at facility). For each UST, provide the following information in table form in Section M (Use Reporting Table B-1, Site History- UST/AST System and Other Release Information, from the *Guidelines*, Appendix B.):

* + Tank identification number (keyed to a site map showing the locations of all UST systems);
  + Last contents of tank;
* Previous contents of tank (if any);
* Capacity of tank in gallons;
* Construction (material and structure);
* Tank dimensions;
* Installation date;
* Description of piping and pump(s) associated with each UST;
* Status of UST (in use or not in use, closed in place, closed by removal; date of last use, date of closure); and
* Indication of a release from the tank or associated piping or pump(s).
  + Provide a discussion (to supplement Table B-1 and the UST location map) of the spatial and historical relationships among tanks and between tanks and piping and dispensers and a brief description of all historical compliance issues and releases (indicate incident number).

3. Provide information about petroleum AST systems, petroleum spills, and other non-UST petroleum releases (inclusive of all ASTs, currently and historically in place at site and all spills at site)., as indicated:

* List, describe, and indicate location of ASTs and associated piping and pump(s) currently and historically in place at facility) and describe historical releases (indicate incident number). For each AST, present the information in table form in Section M (Use Reporting Table B-1, Site History- UST/AST System and Other Release Information, from the *Guidelines*, Appendix B.).; and
* List, describe, and indicate location and date of spills that have occurred at site). For each spill, present the information in table form in Section M (Use Reporting Table B-1, Site History- UST/AST System and Other Release Information, from the Guidelines, Appendix B.).

4. Provide a comprehensive description of the release, including date discovered, cause and source (including tank identification number and contents), and the relationship of historical UST releases, non-UST releases, and off-site releases (indicate incident number) to contamination from current release.

5. Provide a brief description of site characteristics (including land use of site and surrounding area, topography, vegetation, surface water, wells, buildings, surface cover, soil type, depth to and nature of bedrock, depth to groundwater, direction of groundwater flow, etc.).

6. Summarize initial abatement actions, assessment activities, and corrective actions performed to date and list all reports previously submitted.

**E. Risk Characterization**

Submit the following questionnaire in its entirety. Answer all questions completely. Attach additional pages as needed to fully explain answers. Base answers/explanations on information obtained (or updated from preceding reports) during the current investigation. *Note:**Source area means point of release from a UST system.*

**Limited Site Assessment Risk Classification and Land Use Form**

**Part I – Groundwater/Surface Water/Vapor Impacts**

**High Risk**

1. Has the release contaminated any water supply well including any well used for non-drinking purposes? **YES/NO**
2. Is a water supply well used for drinking water located within 1,000 feet of the source area of the release? **YES/NO**
3. Is a water supply well not used for drinking water (e.g., irrigation, washing cars, industrial cooling water, filling swimming pools) located within 250 feet of the source area of the release? **YES/NO**
4. Does groundwater within 500 feet of the source area of the release have the potential for future use (there is no other source of water supply other than the groundwater)? **YES/NO**
5. Do vapors from the release pose a threat of explosion because of accumulation of the vapors in a confined space or pose any other serious threat to public health, public safety or the environment? **YES/NO**

If yes, describe.

|  |
| --- |
|  |

1. Are there any other factors that would cause the release to pose an imminent danger to public health, public safety, or the environment? YES **/NO**

If yes, describe.

|  |
| --- |
|  |

**Intermediate Risk**

1. Is a surface water body located within 500 feet of the source area of the release? **YES/NO**

If YES, does the maximum groundwater contaminant concentration exceed the surface water quality standards and criteria found in 15A NCAC 2B .0200 by a factor of 10? **YES/NO**

1. Is the source area of the release located within an approved or planned wellhead protection area as defined in 42 USC 300h-7(e)? **YES/NO**

If yes, describe. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Is the release located in the Coastal Plain physiographic region as designated on a map entitled “Geology of North Carolina” published by the Department in 1985? **YES/NO**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

If YES, is the source area of the release located in an area in which there is recharge to an unconfined or semi-confined deeper aquifer that is being used or may be used as a source of drinking water? YES /NO

If **YES**, describe. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Do the levels of groundwater contamination for any contaminant exceed the gross contamination levels (See Table 2.) established by the Department? YES **/NO**

Part II - Land Use

Property Containing Source Area of Release

The questions below pertain to the property containing the source area of the release.

1. Does the property contain one or more primary or secondary residences (permanent or temporary)? YES/NO

Describe. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Does the property contain a school, daycare center, hospital, playground, park, recreation area, church, nursing home, or other place of public assembly? YES /NO

Describe. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Does the property contain a commercial (e.g., retail, warehouse, office/business space, etc.) or industrial (e.g., manufacturing, utilities, industrial research and development, chemical/petroleum bulk storage, etc.) enterprise, an inactive commercial or industrial enterprise, or is the land undeveloped? YES /NO

Describe. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Do children visit the property? YES /NO

Explain. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Is access to the property reliably restricted consistent with its use (e.g., by fences, security personnel or both)? **YES/NO**

Explain.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Do pavement, buildings, or other structures cap the contaminated soil? YES /NO

Describe. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

If yes, what mechanisms are in place or can be put into place to ensure that the contaminated soil will remain capped in the foreseeable future?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. What is the zoning status of the property? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Is the use of the property likely to change in the next 20 years? YES /NO

Explain. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Property Surrounding Source Area of Release**

The questions below pertain to the area within 1,500 feet of the source area of the release (excludes property containing source area of the release):

1. What is the distance from the source area of the release to the nearest primary or secondary residence (permanent or temporary)? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. What is the distance from the source area of the release to the nearest school, daycare center, hospital, playground, park, recreation area, church, nursing home or other place of public assembly? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. What is the zoning status of properties in the surrounding area? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4. Briefly characterize the use and activities of the land in the surrounding area. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**F. Receptor Information**

Determine and describe all potential receptors, including those in the categories listed below. Compile this information in a table entitled Public and Private Water Supply Well and Other Receptor Information (Complete Table B-5 from the *Guidelines*, Appendix B.) in which an identification code is assigned to each potential receptor. Indicate the locations of each potential receptor, using the identification code, on a potential receptor map. Use information from all available sources and from site investigations.

**1. Water Supply Wells**

Determine and describe the location, use, and ownership of public and private water supply wells in the area within 1,500 feet of the source of the release. Compile this information in Table B-5 and indicate the well locations on the potential receptor map. Note whether well users are also served by a municipal water supply. Refer to the instructions for a water supply well survey in Section 2.4 of the *Guidelines*.

**2. Public Water Supplies**

Determine the existence and availability of public water supplies within 1,500 feet of the source area of the release. Compile this information in Table B-5 and indicate the locations of the nearest public water lines and the source(s) of the public water supply on the potential receptor map.

**3. Surface Water**

Identify all surface water bodies (e.g., ditch, pond, stream, lake, river) located within 1,500 feet of the source area of the release and indicate distance from source of release in Table B-5 and indicate locations on the potential receptor map.

**4. Wellhead Protection Areas**

Indicate whether or not the UST release source area is located within an approved wellhead protection area. Refer to Section 2.4 of the *Guidelines* for instructions on how to access the list of currently approved wellhead protection plans and generate a map of UST and wellhead protection area locations. List any identified wellhead protection area in Table B-5 by PWS ID number and PWS system name and show the wellhead protection area on the potential receptor map. To document performance of the wellhead protection area investigation append to the potential receptor map a copy of the map generated using ArcIMS Viewer to show 1) the UST location, 2) the wellhead protection area, and 3) community wells.

**5. Deep Aquifers in the Coastal Plain Physiographic Region**

Indicate if the source area of the release is located in an area in which there is recharge to an unconfined or semi-confined deeper aquifer and indicate if that aquifer is being used or may be used as a source of drinking water, referring to Section 2.4 of the *Guidelines*. Based on a review of scientific literature on the regional hydrogeology and well construction records and lithologic logs for deeper wells in the area, identify and describe the deep aquifers underlying the release. Include information on the depth of the deep aquifer in relation to the surficial saturated zone, the lithology and hydraulic conductivity of the strata between the surficial aquifer and the deeper aquifer, and the difference in groundwater head between the surficial aquifer and the deeper aquifer. Discuss the local and regional usage of the deep aquifer and the draw down from major pumping influences. Also, specify the distance from the source area of the release to major discharge areas, such as streams and rivers. Cite all sources and references used for this discussion.

***Note****:**This requirement only pertains to releases in the Coastal Plain physiographic region as designated on a map entitled “Geologic Map of North Carolina” published by the Department in 1985*. *This map can be obtained for a fee from the North Carolina Geologic Survey, 1612 MSC, Raleigh, NC 27699-1612* or at <https://www.nc-maps.com/>

**6. Subsurface Structures**

Describe subsurface features, including sewers, utility lines, conduits, basements, vaults, septic tanks, drain fields, etc., referring to Section 2.4 of the *Guidelines.* Compile this information in Table B-5 and indicate the locations on the potential receptor map. Discuss the risk of explosion due to the accumulation of vapors in confined space and the threat to public health, public safety or the environment posed by vapors in the subsurface features.

**G. Land Use**

**1. Property Owners and Occupants**

Determine the names and addresses of property owners and occupants within or contiguous to the area containing contamination and all property owners and occupants within or contiguous to the area where the contamination is expected to migrate. Compile this information in Table B-6 from the *Guidelines*, Appendix B, and indicate the property locations on the land use map.

**2. Sensitive Land Use Features**

List features sensitive to impact from the release (schools, daycare centers, nursing homes, hospitals, playgrounds, parks and recreation areas, churches, camps and other places of assembly) and show the zoning status of the area within 1500’ of the source of the release. Compile this information in Table B-10 from the *Guidelines*, Appendix B, and indicate the feature locations on the land use map.

**H. Site Geology and Hydrogeology**

Describe the soil and geology encountered at the site. Discuss the effects of soil and geological characteristics on the migration and attenuation of contaminants. Include information obtained during assessment activities (e.g., lithologic descriptions made during drilling, probe surveys, tank closure, etc). If a Stage II investigation is required include a discussion of groundwater flow direction and hydraulic gradient (vertical and horizontal).

**I. Sampling Results**

Phase I Investigation

*Responsible parties must perform a Stage I investigation for all releases.*

A Stage I investigation includes the installation of one monitoring well in the source area of a release. Soil samples are to be collected every five feet in the unsaturated zone and should be analyzed in accordance with the methods specified in Table 4 of the *Guidelines*, Approved Methods for Soil Analyses during Advanced Phases of Petroleum Release Investigation. If the water table is encountered at 25 feet or greater from the land surface, samples for laboratory analysis should be collected every 10 feet in the unsaturated zone. Groundwater should be analyzed in accordance with the methods specified in Table 5 of the *Guidelines*, Approved Methods for Groundwater Analyses at Petroleum UST Closures and Release Investigations.

1. Describe all soil sampling performed during the installation of the source well(s) as follows:

* Use tables and maps to illustrate;
* Indicate location of soil samples: from excavation, borehole, geoprobe, etc.;
* Complete Table B-3 from the *Guidelines*, Appendix B; and
* If multiple source areas have been identified, clearly distinguish the data collected from each source area in the table.

2. Describe any groundwater sampling from the source area monitoring well(s), as follows:

* Use tables and maps to illustrate;
* Indicate location of groundwater samples/monitoring wells/water supply wells;
* Complete and attach Table B-4 from the *Guidelines*, Appendix B; and
* If multiple source areas have been identified, clearly distinguish the data collected from each source area in the table.

*Note: If free product is present, do not sample the monitoring well. Report the estimated thickness, type, and quantity of free product present*.

3. Provide monitoring well construction information (Complete and attach Table B-7 from the *Guidelines*, Appendix B.).

**Phase II Investigation** *(if required)*

***A Stage II investigation should only be conducted if the release is from a high risk commercial UST and the levels of groundwater contamination detected in the source area monitoring well exceed the groundwater standards or interim standards by a factor of 10.***

The Stage II investigation includes the installation of three additional monitoring wells, which should be installed as follows: one upgradient of the source of contamination and two downgradient of the source of contamination of the source but within the area of contamination. The upgradient and downgradient wells must be placed so that groundwater flow direction can be determined. Groundwater should be analyzed in accordance with the methods specified in Table 5 of the *Guidelines.*

1. Describe any groundwater sampling from the monitoring well(s), as follows:

* Use tables and maps to illustrate;
* Indicate location of groundwater samples/monitoring wells/water supply wells;
* Complete and attach Table B-4 from the *Guidelines*, Appendix B; and
* If multiple source areas have been identified, clearly distinguish the data collected from each source area in the table.

*Note: If free product is present, do not sample the monitoring well. Report the estimated thickness, type, and quantity of free product present*.

2. Provide monitoring well construction information (Complete and attach Table B-7 from the *Guidelines*, Appendix B.).

##### J. Conclusions and Recommendations

Discuss the risk criteria that apply to the release and identify any other site-specific factors related to the release that may pose a risk to human health and the environment. Also, discuss any site-specific conditions or possible actions that could result in lowering the level of risk posed by the release.

##### K. Free Product Investigation and Recovery *(if applicable)*

Discuss the status of free product at the site, as follows:

1. If free product is, or has been, present at the site, describe its current and historical status (product distribution, thickness, recovery activities). For an initial report, provide the results of a free product evaluation based on bail-down test(s) at the most highly impacted location(s), to include free product thickness and recovery rate. Refer to tables (from *Guidelines*, Appendix B) in Section M. Table B-7, Monitoring and Remediation Well Construction Information; and Table B-8A, Free Product Recovery Information; Table B-8B, Cumulative Volume of Free Product Recovered from Site; and Table B-9, Current and Historical Groundwater Elevations and Free Product Thickness. Also refer to map(s) showing extent of free product in Section L.
2. Identify any on-site or off-site effluent discharges, treatment used, effluent quality, permitting actions taken, and location of such discharges and identify the disposition of recovered free product (refer to attached product disposal manifests).
3. Document the performance, total cost, and cost per gallon to date of each method of free product recovery used at site. Justify why the technology is or was used.
4. Provide conclusions and recommendations concerning historical, current, and future recovery activities, including:

* Any proposal to change the current method of free product recovery;
* A justification for continued product recovery, if planned; and
* Any determination that free product has been eliminated from the site with a recommendation to reclassify the risk posed by the release, if applicable.

L. Figures

Provide the following:

1. A topographic map illustrating the area within 1500-foot radius of the source of the release, showing:

* Topographic contours;
* Site location;
* Buildings;
* Adjacent streets, roads, highways (identified by street names and numbers);
* Surface water bodies;
* Groundwater flow direction (if determined); and
* North arrow and scale.

2. A site map\* and cross-sections illustrating the release site (UST system(s), AST system(s), location of spills, etc.), drawn to scale, showing:

* Buildings and property boundaries;
* Underground utilities, such as sewer lines and other conduits; basements; and vaults;
* Water supply wells, surface water bodies;
* Location and orientation of current and former UST(s), AST(s), pumps; product lines, sumps, etc.;
* Length, diameter and volume of current and former UST(s), AST(s);
* Type of material(s) stored in UST(s) (currently and formerly), AST(s))(currently and formerly), or spilled;
* Final limits of each stage of excavation for each excavation on site;
* Names or descriptions of properties adjacent to the site; and
  + North arrow and scale.

3. Map(s)\* and geological cross-sections, drawn to scale, depicting all soil analytical results obtained to date, to include:

* Description of soil and bedrock lithology (as determined by investigation to date);
* Location and orientation of UST(s), AST(s), pumps, piping, sumps, etc. (current and former), spills;
* Soil sample identification (unique letter and/or numerical code), location, and depth;
* Soil sample analytical results;
* Final limits of each stage of excavation for each excavation on site\*\*; and
* Two geological cross-sections, drawn across the contaminated area and intersecting at right angles, showing the vertical distribution of the contaminants in the unsaturated zone. (Indicate vertical and horizontal scale, orientation of each section, location of water table, soil types and lithology, all borings and sample locations represented by the sections, and soil analytical results for each represented sample, and show sections as labeled lines on the map.)

4. Map(s)\* and geological cross-sections, drawn to scale, depicting the groundwater and surface water analytical results\*\*, to include:

* Location and orientation of UST(s), AST(s), pumps, piping, sumps, etc. (current and former), or point of release;
* Groundwater sample identification (unique letter and/or numerical code referencing monitoring or water supply well) and location;
* Surface water sample identification (unique letter and/or numerical code) and location; and
* Groundwater and surface water sample analytical results.

5. Map(s)\* depicting groundwater elevations, to include:

* Potentiometric contour lines (if sufficient data points exist); and
* Groundwater flow direction.

6. A free product map\* depicting thickness (in feet) and extent of free product\*\*.

7. A potential receptor map that clearly identifies water supply wells (municipal or public/private wells, etc.) and other potential receptors (surface water bodies, basements, utilities, wellhead protection areas, etc.) within 1500’ of the source of the release.

8. A land use map that identifies the following items within 1500’ of the source of the release:

* Features sensitive to impact from the release (schools, daycare centers, nursing homes, hospitals, playgrounds, parks and recreation areas, churches, camps and other places of assembly);
* Properties within or contiguous to the area containing contamination or within and contiguous to the area where the contamination is expected to migrate; and
* Zoning status.

***\*Note:*** *Use a single base map to prepare site plans using a map scale of 1 in. = 40 ft.; use a smaller scale for large sites. Maps and figures should include conventional symbols, notations, labeling, legends, scales, and north arrows and should conform to accepted practices of map presentation described in the USGS Geological Survey publication "Topographic Map Symbols”,* [http://store.usgs.gov](http://store.usgs.gov/). *Scale should be expressed as a graphic scale and a verbal statement (e.g., 1 in.= 40 ft) or ratio. Refer to* <http://geokov.com/Education/map-scale.aspx>.

\*\* *If applicable*

##### M. Tables

Provide the following:

1. Site History (Complete Tables B-1 and B-2 from *Guidelines*, Appendix B, Reporting Tables);

1. Public and Private Water Supply Well and Other Receptor Information (Complete Table B-5 from *Guidelines*, Appendix B, Reporting Tables);
2. Field Screening Results;
3. Summary of Soil Sampling Results (Complete Table B-3 from *Guidelines*, Appendix B, Reporting Tables);
4. Summary of Groundwater and Surface Water Sampling Results\* (Complete Table B-4 from *Guidelines*, Appendix B, Reporting Tables) \*;

6. Monitoring and Remediation Well Construction Information (Complete Table B-7 from *Guidelines*, Appendix B, Reporting Tables)\*;

7. Free Product Recovery Information (Complete Table B-8A from *Guidelines*, Appendix B, Reporting Tables)\*;

8. Cumulative Volume of Free Product Recovered from Site (Complete Table B-8B from *Guidelines*, Appendix B, Reporting Tables)\*;

9. Current and Historical Groundwater Elevations and Free Product Thickness (Complete Table B-9 from *Guidelines*, Appendix B, Reporting Tables)\*; and

10. Land Use (Complete Table B-10 from *Guidelines*, Appendix B).

*\* If applicable*

##### N. Appendices

Provide the following:\*

Appendix A Site Specific Health and Safety Plan (HASP)

Appendix B Groundwater field measurements (pH, dissolved oxygen, specific conductivity, temperature)

Appendix C Standard procedures (sampling, field equipment decontamination, field screening, etc.)

Appendix D Soil, water, free product, and sludge disposal manifests and soil treatment permits

Appendix E Complete chain-of-custody records

Appendix F Copy of all laboratory analytical records

Appendix G Geologic logs for borings (related to LSA investigation only)

Appendix H Monitoring Well Construction Forms (for all wells constructed to date) *\* If applicable*

### Request for Water Supply Well Information

### Additional Risk Assessment Report

*Responsible parties must perform a Limited Site Assessment investigation for all releases. Upon receipt of a Phase I LSA for the first release at a site the incident manager will determine the risk for the release. If the release is ranked below the UST Funding Level the incident manger will issue a stop funding notice to the responsible party. If the release is ranked above the UST Funding Level the incident manager may request information (Additional Risk Assessment Report) pursuant to l5A NCAC 02L .0407 to determine potential exposure of receptors to the discharge or release.*

This report must include:

• The installation of three horizontal extent monitoring wells and one vertical extent monitoring well. One monitoring well shall be installed upgradient of the source of contamination and two monitoring wells shall be installed downgradient of the source of contamination, as best as can be determined, and located such that groundwater flow direction and hydraulic gradient may accurately be determined. The vertical extent monitoring well shall be installed immediately downgradient (as best as can be determined) of the source area of contamination, as best as can be determined, with any drilling greater than a depth of 75 feet requiring authorization from the regional office incident manager. Note, the vertical extent monitoring well shall not connect aquifers.

• The analysis of representative soil samples collected during the construction of the monitoring wells. One soil sample must be collected in the unsaturated zone and one in the smear/saturated zone from suspected worst-case locations exhibiting visible contamination or elevated levels of volatile organic compounds based on field screening techniques. Only the suspected most contaminated soil sample in each zone from each boring should be submitted for laboratory analysis using the EPA 8015 TPH (or equivalent) appropriate for the fuel types suspected in the release.

• The collection of groundwater samples from the new on-site monitoring wells, analyzed by the appropriate methods, for the constituents relevant to the release.

• The collection of groundwater samples from any onsite water supply wells and any water supply wells located adjacent to the site less than 250 feet from the source area of the release, analyzed by the appropriate method(s) for the constituents relevant to the release. Sampling of more than 5 water supply wells will require approval of the regional office incident manager.

• The survey of all monitoring wells and collection of potentiometric data for the completion of a potentiometric surface/groundwater elevation and flow map.

• The completion of one aquifer slug test to provide a calculation of hydraulic conductivity, transmissivity, and linear groundwater velocity.

1. Describe all soil sampling performed during the installation of the monitoring well(s) as follows:

* Use tables and maps to illustrate;
* Indicate location of soil samples: from excavation, borehole, direct push borehole, etc.;
* Complete Table B-3 from the *Guidelines*, Appendix B; and
* If multiple source areas have been identified, clearly distinguish the data collected from each source area in the table.

2. Describe any groundwater sampling from the source area monitoring well(s), as follows:

* Use tables and maps to illustrate;
* Indicate location of groundwater samples/monitoring wells/water supply wells;
* Complete and attach Table B-4 from the *Guidelines*, Appendix B; and
* If multiple source areas have been identified, clearly distinguish the data collected from each source area in the table.

*Note: If free product is present, do not sample the monitoring well. Report the estimated thickness, type, and quantity of free product present*.

**3. Provide monitoring well construction information (Complete and attach Table B-7 from the *Guidelines*, Appendix B.).**

**Conclusions and Recommendations**

Discuss the risk criteria that apply to the release and identify any other site-specific factors related to the release that may pose a risk to human health and the environment. Also, discuss any site-specific conditions or possible actions that could result in lowering the level of risk posed by the release.

**Free Product Investigation and Recovery *(if applicable)***

Discuss the status of free product at the site, as follows:

1. If free product is, or has been, present at the site, describe its current and historical status (product distribution, thickness, recovery activities). For an initial report, provide the results of a free product evaluation based on bail-down test(s) at the most highly impacted location(s), to include free product thickness and recovery rate. Refer to tables (from *Guidelines*, Appendix B) in Section M. Table B-7, Monitoring and Remediation Well Construction Information; and Table B-8A, Free Product Recovery Information; Table B-8B, Cumulative Volume of Free Product Recovered from Site; and Table B-9, Current and Historical Groundwater Elevations and Free Product Thickness. Also refer to map(s) showing extent of free product in Section L.
2. Identify any on-site or off-site effluent discharges, treatment used, effluent quality, permitting actions taken, and location of such discharges and identify the disposition of recovered free product (refer to attached product disposal manifests).
3. Document the performance, total cost, and cost per gallon to date of each method of free product recovery used at site. Justify why the technology is or was used.
4. Provide conclusions and recommendations concerning historical, current, and future recovery activities, including:

* Any proposal to change the current method of free product recovery;
* A justification for continued product recovery, if planned; and
* Any determination that free product has been eliminated from the site with a recommendation to reclassify the risk posed by the release, if applicable.

**Figures**

Provide the following:

1. A topographic map illustrating the area within 1500-foot radius of the source of the release, showing:

* Topographic contours;
* Site location;
* Buildings;
* Adjacent streets, roads, highways (identified by street names and numbers);
* Surface water bodies;
* Groundwater flow direction (if determined); and
* North arrow and scale.

2. A site map\* and cross-sections illustrating the release site (UST system(s), AST system(s), location of spills, etc.), drawn to scale, showing:

* Buildings and property boundaries;
* Underground utilities, such as sewer lines and other conduits; basements; and vaults;
* Water supply wells, surface water bodies;
* Location and orientation of current and former UST(s), AST(s), pumps; product lines, sumps, etc.;
* Length, diameter and volume of current and former UST(s), AST(s);
* Type of material(s) stored in UST(s)(currently and formerly), AST(s) )(currently and formerly), or spilled;
* Final limits of each stage of excavation for each excavation on site;
* Names or descriptions of properties adjacent to the site; and
* North arrow and scale.

3. Map(s)\* and geological cross-sections, drawn to scale, depicting all soil analytical results obtained to date, to include:

* Description of soil and bedrock lithology (as determined by investigation to date);
* Location and orientation of UST(s), AST(s), pumps, piping, sumps, etc.(current and former), spills;
* Soil sample identification (unique letter and/or numerical code), location, and depth;
* Soil sample analytical results;
* Final limits of each stage of excavation for each excavation on site\*\*; and
* Two geological cross-sections, drawn across the contaminated area and intersecting at right angles, showing the vertical distribution of the contaminants in the unsaturated zone. (Indicate vertical and horizontal scale, orientation of each section, location of water table, soil types and lithology, all borings and sample locations represented by the sections, and soil analytical results for each represented sample, and show sections as labeled lines on the map.)

4. Map(s)\* and geological cross-sections, drawn to scale, depicting the groundwater and surface water analytical results\*\*, to include:

* Location and orientation of UST(s), AST(s), pumps, piping, sumps, etc.(current and former), or point of release;
* Groundwater sample identification (unique letter and/or numerical code referencing monitoring or water supply well) and location;
* Surface water sample identification (unique letter and/or numerical code) and location; and
* Groundwater and surface water sample analytical results.

5. Map(s)\* depicting groundwater elevations, to include:

* Potentiometric contour lines (if sufficient data points exist); and
* Groundwater flow direction.

6. A free product map\* depicting thickness (in feet) and extent of free product\*\*.

7. A potential receptor map that clearly identifies water supply wells (municipal or public/private wells, etc.) and other potential receptors (surface water bodies, basements, utilities, wellhead protection areas, etc.) within 1500’ of the source of the release.

8. A land use map that identifies the following items within 1500’ of the source of the release:

* Features sensitive to impact from the release (schools, daycare centers, nursing homes, hospitals, playgrounds, parks and recreation areas, churches, camps and other places of assembly);
* Properties within or contiguous to the area containing contamination or within and contiguous to the area where the contamination is expected to migrate; and
* Zoning status.

***\*Note:*** *Use a single base map to prepare site plans using a map scale of 1 in. = 40 ft.; use a smaller scale for large sites. Maps and figures should include conventional symbols, notations, labeling, legends, scales, and north arrows and should conform to accepted practices of map presentation described in the USGS Geological Survey publication "Topographic Map Symbols”,* [http://store.usgs.gov](http://store.usgs.gov/). *Scale should be expressed as a graphic scale and a verbal statement (e.g., 1 in.= 40 ft) or ratio. Refer to* <http://geokov.com/Education/map-scale.aspx>.

\*\* *If applicable*

**Tables**

Provide the following:

1. Site History (Complete Tables B-1 and B-2 from *Guidelines*, Appendix B, Reporting Tables);

1. Public and Private Water Supply Well and Other Receptor Information (Complete Table B-5 from *Guidelines*, Appendix B, Reporting Tables);
2. Field Screening Results;
3. Summary of Soil Sampling Results (Complete Table B-3 from *Guidelines*, Appendix B, Reporting Tables);
4. Summary of Groundwater and Surface Water Sampling Results\* (Complete Table B-4 from *Guidelines*, Appendix B, Reporting Tables) \*;

6. Monitoring and Remediation Well Construction Information (Complete Table B-7 from *Guidelines*, Appendix B, Reporting Tables)\*;

7. Free Product Recovery Information (Complete Table B-8A from *Guidelines*, Appendix B, Reporting Tables)\*;

8. Cumulative Volume of Free Product Recovered from Site (Complete Table B-8B from *Guidelines*, Appendix B, Reporting Tables)\*;

9. Current and Historical Groundwater Elevations and Free Product Thickness (Complete Table B-9 from *Guidelines*, Appendix B, Reporting Tables)\*; and

10. Land Use (Complete Table B-10 from *Guidelines*, Appendix B).

*\* If applicable*

**Appendices**

Provide the following:\*

Appendix A Site Specific Health and Safety Plan (HASP)

Appendix B Groundwater field measurements (pH, dissolved oxygen, specific conductivity, temperature)

Appendix C Standard procedures (sampling, field equipment decontamination, field screening, etc.)

Appendix D Soil, water, free product, and sludge disposal manifests and soil treatment permits

Appendix E Complete chain-of-custody records

Appendix F Copy of all laboratory analytical records

Appendix G Geologic logs for borings (related to LSA investigation only)

Appendix H Monitoring Well Construction Forms (for all wells constructed to date)

*\* If applicable*

### Comprehensive Site Assessment Report

*(Or Comprehensive Site Assessment Addendum Report)*

Minimum elements of the report:

**A. Site Information**

1. Site Identification

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Date of Report: |  | | | | Site Risk: | |  |
| Facility I.D.: |  | | UST Incident Number (if known): | | | |  |
| Site Name: |  | | | | | | |
| Street Address: |  | | | | | | |
| City/Town: |  | | Zip Code: |  | County: | |  |
| Description of Geographical Data Point (e.g., diesel fill port): | | | |  | | | |
| Location Method (GPS, topographical map, other): | | | |  | | | |
| Latitude (***decimal degrees***): | |  | Longitude (***decimal degrees***): | | |  | |

2. Information about Contacts Associated with the Release *(Addresses must include street, city, state, zip code and mailing address, if different)*

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UST/AST Owner: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| UST/AST Operator: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Property Owner: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Property Occupant: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Consultant/Contractor: | | |  | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Analytical Laboratory: | | |  | | State Certification No: | | | | |  |
| Address: |  | | | | | | Tel: | |  | |

3. Information about Release

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date Discovered: |  | | | |
| Estimated Quantity of Release: | |  | | |
| Cause of Release: |  | | | |
| Source of Release (e.g., Dispenser/Piping/UST): | | |  | |
| Sizes and Contents of Tanks or Other Containment from which the Release Occurred: | | | |  |

4. Certification (***The title page must display the seal and signature of the certifying P.E. or L.G. and the name and certification number of the company or corporation [See 15A NCAC 2L .0103(e).]****)*

I, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, a Professional Engineer/Licensed Geologist *(circle one)* for (firm or company of employment), do certify that the information contained in this report is correct and accurate to the best of my knowledge.

*(Please Affix Seal and Signature)*

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(Name of company or corporation) is licensed to practice geology/engineering *(circle one or both)* in North Carolina*.* The certification number of the company or corporation is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

##### B. Executive Summary

Present a brief summary of the most pertinent information about the site and the release, using the following outline:

1. Describe the source, date of discovery, and quantity and type(s) of contaminant released;

2. Summarize initial abatement actions, including closure, soil removal, free product recovery, and provision of alternate water;

3. Describe the results of the hydrogeological investigation;

4. Summarize the results of soil, groundwater, and surface water assessment and free product measurement, indicating the nature and extent of contamination, the estimated rate of migration, and potential for impacting receptors;

5. Indicate the risk classification (or non-UST petroleum/non-petroleum UST rank) and the criteria for that determination;

6. Indicate the soil, groundwater, and surface water concentration levels to which contamination must be remediated;

7.Calculate the maximum contaminant mass in soil and groundwater to provide the baseline for cleanup goals, milestones; and

8. Indicate actions that might reduce the risk classification (or rank) and tentatively propose appropriate remedial actions for soil and groundwater contamination.

**C. Table of Contents**

Provide a table of contents, as follows:

1. List sections, indicating page numbers;

2. List figures, identifying each by number;

3. List tables; identifying each by number; and

4. List appendices, identifying each by letter.

**D. Site History and Characterization**

Present information relevant to site history and characterization, ***updating information provided in previous reports*** (e.g., LSA, 45-Day Report, or IAR), using the following outline:

1. Provide information for UST/AST owners/operators and other responsible parties.

List the names, addresses, telephone numbers, and dates of ownership/operation of all previous UST/AST owners, UST/AST operators, and other responsible parties. Present in table form in Section R (Use Reporting Table B-2, Site History, UST/AST Owner/Operator and Other Responsible Party Information, from *Guidelines*, Appendix B.).

2. Provide UST information (inclusive of all USTs, currently and historically in place at facility). For each UST, provide the following information in table form in Section R (Use Reporting Table B-1, Site History- UST/AST System and Other Release Information, from the *Guidelines*, Appendix B.):

* + Tank identification number (keyed to a site map showing the locations of all UST systems);
  + Last contents of tank;
* Previous contents of tank (if any);
* Capacity of tank in gallons;
* Construction (material and structure);
* Tank dimensions;
* Installation date;
* Description of piping and pump(s) associated with each UST;
* Status of UST (in use or not in use, closed in place, closed by removal; date of last use, date of closure); and
* Indication of a release.
* Provide a discussion (to supplement Table B-1 and the UST location map) of the spatial and historical relationships among tanks and between tanks and piping and dispensers and a brief description of all historical compliance issues and releases (indicate incident number).

3. Provide information about petroleum AST systems, petroleum spills, and other non-UST petroleum releases (inclusive of all ASTs, currently and historically in place at site and all spills at site)., as indicated:

* List, describe, and indicate location of ASTs and associated piping and pump(s) currently and historically in place at facility) and describe historical releases (indicate incident number). For each AST, present the information in table form in Section R (Use Reporting Table B-1, Site History- UST/AST System and Other Release Information, from the *Guidelines*, Appendix B.).; and
* List, describe, and indicate location and date of spills that have occurred at site). For each spill, present the information in table form in Section R (Use Reporting Table B-1, Site History- UST/AST System and Other Release Information, from the Guidelines, Appendix B.).

4. Provide a comprehensive description of the release, including date discovered, cause and source (including tank identification number and contents), and the relationship of historical UST releases, non-UST releases, and off-site releases (indicate incident number) to contamination from current release.

5. Provide a brief description of site characteristics (including land use of site and surrounding area, topography, vegetation, surface water, wells, buildings, surface cover, soil type, depth to and nature of bedrock, depth to groundwater, direction of groundwater flow, etc.).

6. Summarize initial abatement actions, assessment activities, and corrective actions performed to date and list all reports previously submitted.

7. Refer to NORR/NOV requiring preparation and submittal of the CSA Report (Appendix K).

**E. Receptor Information**

Provide information included in the LSA, 45-Day Report, or IAR and update as necessary.

**1. Water Supply Wells**

Determine and describe the location, use, and ownership of public and private water supply wells in the area within 1,500 feet of the source of the release. Compile this information using Table B-5 (from *Guidelines*, Appendix B) and indicate the well locations on the potential receptor map. Note whether well users are also served by a municipal water supply. For additional guidance, refer to the instructions for a water supply well survey in Section 2.4 of the *Guidelines for Assessment and Corrective Action for UST Releases.*

**2. Public Water Supplies**

Determine the existence and availability of public water supplies within 1,500 feet of the source area of the release. Compile this information using Table B-5 and indicate the locations of the nearest public water lines and the source(s) of the public water supply on the potential receptor map.

**3. Surface Water**

Identify all surface water bodies (e.g., ditch, pond, stream, lake, river) located within 1,500 feet of the source area of the release and indicate distance from source of release using Table B-5 and indicate locations on the potential receptor map.

**4. Wellhead Protection Areas**

Indicate whether or not the UST release source area is located within an approved wellhead protection area. Refer to Section 2.4 of the *Guidelines for Assessment and Corrective Action for UST Releases for Assessment and Corrective Action for UST Releases* for instructions on how to access the list of currently approved wellhead protection plans and generate a map of UST and wellhead protection area locations. List any identified wellhead protection area in Table B-5 by PWS ID number and PWS system name and show the wellhead protection area on the potential receptor map. To document performance of the wellhead protection area investigation append to the potential receptor map a copy of the map generated using ArcIMS Viewer to show 1) the UST location, 2) the wellhead protection area, and 3) community wells.

**5. Deep Aquifers in the Coastal Plain Physiographic Region**

Indicate if the source area of the release is located in an area in which there is recharge to an unconfined or semi-confined deeper aquifer and indicate if that aquifer is being used or may be used as a source of drinking water, referring to Section 2.4 of the *Guidelines for Assessment and Corrective Action for UST Releases*. Based on a review of scientific literature on the regional hydrogeology and well construction records and lithologic logs for deeper wells in the area, identify and describe the deep aquifers underlying the release. Include information on the depth of the deep aquifer in relation to the surficial saturated zone, the lithology and hydraulic conductivity of the strata between the surficial aquifer and the deeper aquifer, and the difference in groundwater head between the surficial aquifer and the deeper aquifer. Discuss the local and regional usage of the deep aquifer and the draw down from major pumping influences. Also, specify the distance from the source area of the release to major discharge areas, such as streams and rivers. Cite all sources and references used for this discussion.

***Note****:**This requirement only pertains to releases in the Coastal Plain physiographic region as designated on a map entitled “Geologic Map of North Carolina” published by the Department in 1985*. *This map can be obtained for a fee from the North Carolina Geologic Survey, 1612 MSC, Raleigh, NC 27699-1612* or at <https://www.nc-maps.com/>

**6. Subsurface Structures**

Describe subsurface features, including sewers, utility lines, conduits, basements, vaults, septic tanks, drainfields, etc., referring to Section 2.4 of the *Guidelines for Assessment and Corrective Action for UST Releases.* Compile this information using Table B-5 and indicate the locations on the potential receptor map. Discuss the risk of explosion due to the accumulation of vapors in confined space and the threat to public health, public safety or the environment posed by vapors in the subsurface features.

**F. Land Use**

**1. Property Owners and Occupants**

Determine the names and addresses of property owners and occupants within or contiguous to the area containing contamination and all property owners and occupants within or contiguous to the area where the contamination is expected to migrate. Compile this information using Table B-6 from the *Guidelines*, Appendix B, and indicate the property locations on the land use map.

**2. Sensitive Land Use Features**

List features sensitive to impact from the release (human exposure to contamination), including schools, daycare centers, nursing homes, hospitals, playgrounds, parks and recreation areas, churches, camps and other places of assembly, and show the zoning status of the area within 1500’ of the source of the release. Compile this information using Table B-10 from the *Guidelines*, Appendix B, and indicate the feature locations on the land use map.

**G. Soil Sampling Results**

1. Provide soil sampling information for all samples collected during the CSA and during previous investigations. Refer to table provided in Section R (using Table B-3, Summary of Soil Sampling Results); to figures, in Section Q; and to appendices, in Section S. Information should include:

* Lithological descriptions from logs for borings, excavations;
* Type of samples (from excavation, borehole, geoprobe boring, stockpiled soil, etc.);
* Sample collection procedures (grab, split spoon, hand auger, etc.);
* Location of soil samples;
* Depth of soil samples (feet below land surface);
* Time/date collected;
* Sample identification;
* Indication of phase of sampling: closure, IAA, LSA, CSA, etc.; and
* Method(s) of soil sample analysis.

2. Document quality-control measure information (Refer to tables and appendices provided in Sections R and S.), including:

* Sample handling procedures including sample preservation techniques and sample transport procedures;
* Decontamination procedures;
* Time and date samples were submitted to lab; and
* Collection of samples for quality control purposes (e.g., duplicates, field blanks, trip blanks).

3. Describe soil investigation results, including:

* Presentation of analytical results for soil samples (Refer to table provided in Section R and to appendix with laboratory analytical results provided in Section S.);
* Discussion of the results in relation to the appropriate cleanup levels, identifying the samples that,for non-UST petroleum or non-petroleum UST releases, exceed the soil-to-groundwater MSCCs or, for petroleum UST releases, exceed the lower of:

1. the residential MSCCs or
2. the soil-to-groundwater MSCCs.; and

* Discussion of effect of quality control sample results on the interpretation of soil analytical results.

**H. Groundwater Sampling Results**

1. Provide groundwater and surface water sampling information for all samples collected during the CSA and during previous investigations. Refer to table provided in Section R (Using Table B-4, Summary of Groundwater and Surface Water Sampling Results) from *Guidelines*, Appendix B; and to figures, in Section Q and to appendices, in Section S. Information should include:

* Location of water samples (e.g., of monitoring well, water supply well, stream sampling point);
* Field measurements (pH, dissolved oxygen, specific conductivity, temperature, Eh, alkalinity, TPH);
* Sample collection procedures (grab, bailer, etc.);
* Time/date collected;
* Sample identification;
* Indication of phase of sampling: closure, IAA, LSA, CSA, etc.; and
* Method(s) of water sample analysis.

2. Document quality-control measure information (Refer to tables and appendices provided in Sections R and S), including:

* Sample handling procedures including sample preservation techniques and sample transport procedures;
* Decontamination procedures;
* Time and date samples were submitted to lab; and
* Collection of samples for quality control purposes (e.g., duplicates, field blanks, trip blanks).

3. Describe groundwater or surface water investigation results, including:

* Presentation of analytical results (Refer to table(s) provided in Section R and to appendix with laboratory analytical results provided in Section S) and identify results which exceed the cleanup levels (groundwater quality standards, gross contamination levels, or surface water quality standards).
* Discussion of groundwater results in relation to the appropriate cleanup levels, identifying the samples that exceed:
* The groundwater standards or interim standards established by 15A NCAC 2L .0202;
* The gross contamination levels established by the Department (for petroleum releases); and/or
* Alternate cleanup levels which have been determined by modeling to have no potential to impact surface water above the surface water standards adopted per 15A NCAC 2B .0200 or National Criteria per EPA; groundwater above the standards in 2L 0202 in a deep aquifer used for drinking water (if release is in a recharge area); or groundwater (at a location one year’s travel time upgradient of a well) above the standards in 2L 0202 if release is in a wellhead protection area.
* Discussion of surface water results in relation to the appropriate cleanup levels, identifying the samples that exceed:
* The surface water standards adopted per 15A NCAC 2B .0200 or National Criteria per EPA.
* Discussion of the effect of quality control sample results on the interpretation of groundwater or surface water analytical results.

**I. Free Product Investigation and Recovery *(if applicable)***

Discuss the status of free product at the site, as follows:

1. If free product is, or has been, present at the site, describe its current and historical status (product distribution, thickness, recovery rate, and recovery activities). Refer to tables in Section R (Using Table B-7, Monitoring and Remediation Well Construction Information, from *Guidelines*, Appendix B; Table B-8A, Free Product Recovery Information; Table B-8B, Cumulative Volume of Free Product Recovered from Site; and Table B-9, Current and Historical Groundwater Elevations and Free Product Thickness). Also refer to map(s) showing extent of free product in Section Q.

2. Identify any on-site or off-site effluent discharges, treatment used, effluent quality, permitting actions taken, and location of such discharges and identify the disposition of recovered free product (refer to attached product disposal manifests).

3. Document the performance, total cost, and cost per gallon to date of each method of free product recovery used at site. Justify why the technology is or was used.

4. Provide conclusions and recommendations concerning historical, current, and future recovery activities, including:

* Any proposal to change the current method of free product recovery to a better or more cost-effective technology;
* A justification for continued product recovery, if planned; and
* Any determination that free product has been eliminated from the site with a recommendation to reclassify the risk posed by the release, if applicable.

**J. Hydrogeologic Investigation**

Describe the hydrogeologic investigation performed. Include all methods, procedures, and calculations used to characterize site hydrogeologic conditions. The following information should be provided and discussed.

* Groundwater flow direction,
* Hydraulic gradient (horizontal and vertical),
* Hydraulic conductivity,
* Groundwater velocity,
* Aquifer test results (see Appendix I).

**K. Regional Geology and Hydrogeology**

Provide a brief description of the regional geology and hydrogeology. Cite all references.

**L. Site Geology and Hydrogeology**

1. Describe the soil and geology encountered at the site. Use the information obtained during assessment activities (e.g., lithological descriptions made during drilling, probe surveys, tank closure, etc.). This information should correspond to the geologic cross-sections required in Section Q.

2. Based on the results of groundwater sampling (Section H) and of the hydrogeologic investigation (Section J), describe the site hydrogeology. Discuss the effects of the geologic and hydrogeologic characteristics on the migration and attenuation of contaminants.

**M. Groundwater Modeling Results (applicable for intermediate risk sites only)**

If groundwater modeling is necessary to determine if groundwater contamination poses a risk to a receptor (for example, surface water) or to determine cleanup goals for contaminated groundwater known to pose a risk to a receptor, describe the model, present and explain the modeling results, and provide documentation of the modeling (Refer to Appendix J, Documentation of groundwater modeling), including, at a minimum:

* Name, version, and developer of the model;
* Type of site for which the model is applicable;
* Critical conceptual assumptions and estimates of input values;
* Calibration process;
* Range of values used and the results of sensitivity analysis on critical data inputs; and
* Graphical representation and narrative explanation of the modeling results.

All assumptions and estimated values, including biodegradation rates, must be conservative (predict reasonable worst-case scenarios) and well documented.

**N. Discussion**

Summarize the investigations, covering the following points:

* Nature and extent of contamination;
* Maximum contaminant concentrations;
* Contaminant migration and potentially affected receptors;
* Site-specific conditions or possible actions that would result in lowering the risk classification or site priority ranking,
* Applicable cleanup levels
* Initial Contaminant Mass (Example calculation: 1. Total contaminant mass = Soil Contaminant Mass + Groundwater Contaminant Mass. 2. Mean groundwater concentration x source area calculation x depth of groundwater contamination zone x porosity = contaminant mass calculation for groundwater; 3. Source area mean concentration x source area calculation x depth of soil contamination x density of soil = contaminant mass calculation for soil), and
* Selected Proposed Remediation Technology

**O. Conclusions and Recommendations**

If corrective action will be necessary, provide a preliminary evaluation of remediation alternatives (including initial mass contaminant calculations) appropriate for the site. Discuss the remediation alternative likely to be selected.

**P. Public Notice**

If groundwater contamination in exceedance of the groundwater quality standards established in 15A NCAC 2L .0202 exists at the site, provide to the Department proof of receipt of copies of the CSA required, as a consequence, under 15A NCAC 2L .0114(a) to be sent to the local health director and t he chief administrative officer of the relevant political jurisdiction. Provide the names and addresses of the local authorities to whom copies of the CSA were sent, copies of accompanying cover letters, and certified USPS delivery receipts. \*

The CSA will not be approved until any public notice required is complete and the documentation specified above provided.

**Q. Figures**

Provide the following:

1. A topographic map illustrating the area within 1500-foot radius of the UST/AST system, or spill, showing:

* Topographic contours;
* Site location;
* Buildings;
* Adjacent streets, roads, highways (identified by street names and numbers);
* Surface water bodies;
* Groundwater flow direction (if determined); and
* North arrow and scale.

2. A site map\* and cross-sections illustrating the UST/AST system(s) or spill, drawn to scale, showing:

* Buildings and property boundaries;
* Underground utilities, such as sewer lines and other conduits; basements; and vaults;
* Water supply wells, surface water bodies;
* Location and orientation of current and former UST(s)/AST(s), pumps, piping, sumps, etc.; spills;
* Length, diameter and volume of current and former UST(s)/AST(s);
* Type of material(s) stored in UST(s)/ASTs (currently and formerly); and
* North arrow and scale.

3. Map(s)\* and geological cross-sections, drawn to scale, depicting all soil analytical results obtained to date, to include:

* Description of soil and bedrock lithology (as determined by investigation to date);
* Location and orientation of UST(s)/AST(s), pumps, piping, sumps, etc.(current and former); spills;
* Soil sample identification (unique letter and/or numerical code), location, and depth;
* Soil sample analytical results;
* Date soil sample collected;
* Final limits of each stage of excavation for each excavation on site; and
* Two geological cross-sections, drawn across the contaminated area and intersecting at right angles, showing the vertical distribution of the contaminants in the unsaturated zone. (Indicate vertical and horizontal scale, orientation of each section, location of water table, soil types and lithology, all borings and sample locations represented by the sections, and soil analytical results for each represented sample, and show sections as labeled lines on the map.)

4. Map(s)\* depicting groundwater elevations, to include:

* Groundwater elevations (relative to MSL);
* Groundwater elevation data points (identified by monitoring well);
* Date of measurement (each map should represent a single water level measurement event);
* Potentiometric contour lines; and
* Groundwater flow direction.

5. Map\*, drawn to scale, depicting the groundwater and surface water analytical results,\*\* to include:

* Location and orientation of UST(s)/AST (s), pumps, piping, sumps, etc. (current and former); spills;
* Groundwater sample identification (unique letter and/or numerical code referencing monitoring or water supply well) and location;
* Date of sampling;
* Surface water sample identification (unique letter and/or numerical code) and location; and
* Groundwater and surface water sample analytical results.

6. Individual groundwater contaminant iso-concentration contour maps\* for every contaminant present in concentrations which exceed the 2L standard limits,\*\* including:

* Contaminant concentrations (in µg/ml) with concentrations in exceedance of MSCCs indicated);
* Contaminant concentration data points (identified by monitoring well);
* Date of measurement (each map should represent a single sampling event;
* Iso-concentration contour lines (solid, if determined from adequate data points; dotted, if estimated);
* An iso-concentration contour line representing the 2L standard limit and, if applicable, the GCL for the contaminant; and
* Two geological cross-sections, one drawn along the long axis of the plume and the second, across it at right angles, showing the vertical distribution of the contaminants in the saturated zone. (Indicate vertical and horizontal scale, orientation of each section; location of water table; and all monitoring wells represented by the sections, and show sections as labeled lines on the map.)

7. A free product map\* depicting thickness and extent of free product and date of measurement.

8. A potential receptor map that clearly identifies water supply wells (municipal or public/private wells, etc.) and other potential receptors (surface water bodies, basements, utilities, wellhead protection areas, etc.) within 1500’ of the source of the release.

9. A land use map that identifies the following items within 1500’ of the source of the release:

* Features sensitive to impact from the release (schools, daycare centers, nursing homes, hospitals, playgrounds, parks and recreation areas, churches, camps and other places of assembly);
* Properties within or contiguous to the area containing contamination or within and contiguous to the area where the contamination is expected to migrate; and
* Zoning status.

***\*Note:*** *Use a single base map to prepare site plans using a map scale of 1 in. = 40 ft.; use a smaller scale for large sites. Maps and figures should include conventional symbols, notations, labeling, legends, scales, and north arrows and should conform to accepted practices of map presentation described in the USGS Geological Survey publication "Topographic Map Symbols”,* [http://store.usgs.gov](http://store.usgs.gov/). *Scale should be expressed as a graphic scale and a verbal statement (e.g., 1 in.= 40 ft) or ratio. Refer to* <http://geokov.com/Education/map-scale.aspx>.

**\*\*** *If applicable*

**R. Tables**

Provide the following:

1. Site History (Complete Tables B-1 and B-2 from *Guidelines*, Appendix B);

2. Public and Private Water Supply Well and Other Receptor Information (Complete Table B-5 from *Guidelines*, Appendix B);

3. Field Screening Results;

4. Summary of Soil Sampling Results (Complete Table B-3 from *Guidelines*, Appendix B);

5. Summary of Groundwater and Surface Water Sampling Results (Complete Table B-4 from *Guidelines*, Appendix B)\*;

6. Monitoring and Remediation Well Construction Information (Complete Table B-7 from *Guidelines*, Appendix B)\*;

7. Free Product Recovery Information (Complete Table B-8A from *Guidelines*, Appendix B)\*;

8. Cumulative Volume of Free Product Recovered from Site (Complete Table B-8B from *Guidelines*, Appendix B)\*;

9. Current and Historical Groundwater Elevations and Free Product Thickness (Complete Table B-9 from *Guidelines*, Appendix B)\*; and

1. Land Use (Complete Table B-10 from *Guidelines*, Appendix B)

*\* If applicable*

**S. Appendices**

Provide the following:

Appendix A Site Specific Health and Safety Plan (HASP)

Appendix B Field measurements (pH, dissolved oxygen, specific conductivity, temperature, Eh, alkalinity in groundwater; TPH in soil or groundwater; etc.)

Appendix C Standard procedures (sampling, field equipment decontamination, field screening, etc.)

Appendix D Soil, water, free product, and sludge disposal manifests and permits (soil treatment, wastewater treatment, etc. (copies)\*

Appendix E Complete chain-of-custody records

Appendix F Copy of all laboratory analytical records

Appendix G Geologic logs for borings (related to CSA investigation only)

Appendix H Monitoring Well Construction Forms (for all wells constructed to date)

Appendix I Aquifer test data and calculations

Appendix J Documentation of groundwater modeling process and results\*

Appendix K Copies of the NORR, NOV, etc. requiring the CSA

Appendix L Names and addresses of the local authorities to whom copies of the CSA were sent, copies of cover letters which accompanied the CSA reports, and certified USPS delivery receipts \*

*\* If applicable*

### Soil Assessment Report

*(For low-risk petroleum UST releases only)*

Minimum elements of the report:

**A. Site Information**

1. Site Identification

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Date of Report: |  | | | | Site Risk: | |  |
| Facility I.D.: |  | | UST Incident Number (if known): | | | |  |
| Site Name: |  | | | | | | |
| Street Address: |  | | | | | | |
| City/Town: |  | | Zip Code: |  | County: | |  |
| Description of Geographical Data Point (e.g., diesel fill port): | | | |  | | | |
| Location Method (GPS, topographical map, other): | | | |  | | | |
| Latitude (***decimal degrees***): | |  | Longitude (***decimal degrees***): | | |  | |

2. Information about Contacts Associated with the Release *(Addresses must include street, city, state, zip code and mailing address, if different)*

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UST/AST Owner: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| UST/AST Operator: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Property Owner: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Property Occupant: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Consultant/Contractor: | | |  | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Analytical Laboratory: | | |  | | State Certification No: | | | | |  |
| Address: |  | | | | | | Tel: | |  | |

3. Information about Release

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date Discovered: |  | | | |
| Estimated Quantity of Release: | |  | | |
| Cause of Release: |  | | | |
| Source of Release (e.g., Dispenser/Piping/UST): | | |  | |
| Sizes and Contents of Tanks or Other Containment from which the Release Occurred: | | | |  |

4. Certification (***The title page must display the seal and signature of the certifying P.E. or L.G. and the name and certification number of the company or corporation [See 15A NCAC 2L .0103(e).]****)*

I, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, a Professional Engineer/Licensed Geologist *(circle one)* for (firm or company of employment), do certify that the information contained in this report is correct and accurate to the best of my knowledge.

*(Please Affix Seal and Signature)*

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(Name of company or corporation) is licensed to practice geology/engineering *(circle one or both)* in North Carolina*.* The certification number of the company or corporation is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**B. Executive Summary**

Present a brief summary of the most pertinent information about the site and the release and indicate the recommended remedy for contamination, using the following outline:

1. Describe the source, date of discovery, and quantity and type(s) of contaminant released;

2. Summarize initial abatement actions, including closure, soil removal, free product recovery, and provision of alternate water;

3. Describe the results of the hydrogeological investigation;

4. Summarize the results of soil, groundwater, and surface water assessment and free product measurement, indicating the nature and extent of contamination, the estimated rate of migration, and potential for impacting receptors;

5. Indicate the risk classification and the criteria for that determination;

6. Indicate the concentration levels to which soil contamination must be remediated;

7.Calculate the maximum contaminant mass in soil and groundwater to provide the baseline for cleanup goals, milestones and

8. Present the selected remedy for soil contamination and discuss the basis for selection, schedule for implementation, remediation progress milestones, and cost.

**C. Table of Contents**

Provide a table of contents, as follows:

1. List sections, indicating page numbers;

2. List figures, identifying each by number;

3. List tables; identifying each by number; and

4. List appendices, identifying each by letter

**D. Site History and Characterization**

Present information relevant to site history and characterization, ***updating information provided in IAA and LSA reports***, using the following outline:

1. Provide information for UST/AST owners/operators and other responsible parties.

* Refer to table (Use Table B-2, Site History, UST/AST Owner/Operator and Other Responsible Party Information, from the *Guidelines*, Appendix B.)

2. Provide UST information (inclusive of all USTs, currently and historically in place at facility).

* + Refer to table (Use Reporting Table B-1, Site History- UST/AST System and Other Release Information, from the *Guidelines*, Appendix B) and to site map;
* Briefly discuss the spatial and historical relationships among tanks and between tanks and piping and dispensers, describe all historical compliance issues and releases (indicate incident number), and indicate from which UST system(s) the currently investigated release originated.

3. Provide information about petroleum AST systems, petroleum spills, and other petroleum non-UST releases.

* Refer to table (Use Reporting Table B-1, Site History- UST/AST System and Other Release Information, from the *Guidelines*, Appendix B.) and to site map;
* List, describe, and indicate location (refer to location on site map) of spills which have occurred at site.

4. Provide a comprehensive description of the release, including date discovered, cause and source (including tank identification number and contents), and the relationship of historical UST releases, non-UST releases, and off-site releases (indicate incident number) to contamination from current release.

5. Provide a brief description of site characteristics (including land use of site and surrounding area, topography, vegetation, surface water, wells, buildings, surface cover, soil type, depth to and nature of bedrock, depth to groundwater, direction of groundwater flow, etc.).

6. Provide information on owners and occupants of property within or adjacent to area containing contamination or the area where contamination is expected to migrate and describe land use.

* Refer to tables (Use Table B-6, Property Owners/ Occupants; and Table B-10, Land Use) and refer to land use map.

7. Present information on receptors/potential receptors.

* Refer to table (Use Table B-5, Public and Private Water Supply Well and other Receptor Information) and to potential receptor map.

8. List all report previously submitted.

9. Summarize initial abatement and corrective actions performed to date, including excavation of contaminated soil and free product removal.

**E. Soil Sampling Results**

1. Provide soil sampling information for all samples collected during the SAR and during all previous investigations (Site Check, UST Closure, IAA, LSA). Complete and refer to the table provided in Section K (using Table B-3, Summary of Soil Sampling Results); the figures, in Section J; and the appendices, in Section L. Soil sampling information should include:

* Lithological descriptions from logs for borings, excavations;
* Type of samples (from excavation, borehole, geoprobe boring, stockpiled soil, etc.);
* Sample collection procedures (grab, split spoon, hand auger, etc.);
* Location of soil samples;
* Depth of soil samples (feet below land surface);
* Time/date collected;
* Sample identification;
* Indication of phase of sampling: closure, IAA, LSA, SAR, etc.; and
* Method(s) of soil sample analysis.

2. Document quality-control measure information (Complete and refer to tables and appendices provided in Sections K and L.), including:

* Sample handling procedures including sample preservation techniques and sample transport procedures;
* Decontamination procedures;
* Time and date samples were submitted to lab; and
* Collection of samples for quality control purposes (e.g., duplicates, field blanks, trip blanks).

3. Describe soil investigation results, including:

* Presentation of analytical results for soil samples (Complete and refer to table provided in Section K and to appendix with laboratory analytical results provided in Section L.);
* Discussion of the results in relation to the appropriate cleanup levels, identifying the samples that exceed the:

1. the residential MSCCs or
2. the industrial/commercial MSCCs.; and
3. the soil-to-groundwater MSCCs (to determine the need for public notification on site closure).

4. Discuss the effect of quality control sample results on the interpretation of soil analytical results.

**F. Summary of Site Assessment Information**

1. Briefly summarize groundwater, surface water, and free product assessment information provided to date, as follows:

* Refer to tables in Section K (Use Table B-4, Summary of Groundwater and Surface Water Sampling Results); Table B-9, Current and Historical Groundwater Elevations and FP Thickness) and to map(s) showing groundwater elevation and flow; Confirm that no (or less than 0.01 foot) free product exists; and
* Confirm that groundwater contamination is not present in excess of the GCLs or other alternate standards approved for the site and indicate that no further remediation of groundwater is required at the site.

2. Summarize soil assessment information presented in the SAR and previous reports, as follows:

* Refer to tables in Section K (Use Table B-3, Summary of Soil Sampling Results) and to maps and geological cross-sections depicting soil analytical results and the horizontal and vertical extent of soil contamination;
* Describe the horizontal and vertical extent of contaminants in soil exceeding applicable cleanup levels and estimate the volume of soil that will require remediation.

3. Describe the geology and hydrogeology of the region and the site.

* Describe soil and bedrock encountered at the site (Refer to geologic cross sections of map illustrating soil contamination and to geologic logs for borings.);
* Discuss site hydrogeology (Include the following information: depth to groundwater, groundwater flow direction (estimated or calculated), and hydraulic gradient (vertical and horizontal), if determined.).

4. Summarize and evaluate assessment information. *Note that the goal of soil assessment at the SAR stage is to delineate soil contamination vertically and horizontally in the unsaturated zone from the source of the release to limits equivalent to the residential or industrial/commercial maximum soil contaminant concentrations, whichever are applicable*:

* Describe extent of contamination;
* Describe maximum contaminant concentration levels;
* Indicate the applicable cleanup levels for soil (and the basis for determination).

**G. Objectives of Corrective Action at the Site**

1. Indicate the NORR requiring preparation and submittal of the SAR and any NOVs and enforcement documents related to SAR submittal (Refer to Appendix D.);

2. State purpose and objectives of the SAR (e.g., to assess and delineate contamination in the unsaturated zone and to propose appropriate remedial action for that soil contamination); and

3. State the cleanup goals of the SAR (Refer to previous Section F, item 4).

**H. Evaluation of Remedial Actions**

1. Present and comprehensively evaluate remedial options;

a. Evaluate excavation as a remedial option for soil (mandatory);

b. In addition to the mandatory evaluation of excavation, evaluate at least one viable option for remediating soil contamination, which can consist of any single technology or any combination of a technology (or technologies) with mechanisms and processes that will achieve full cleanup of contamination, with the stipulation that excavation must be included if determined to be viable when combined with other actions; and

c. Insure that the scope of each option is inclusive of all technologies and actions to be utilized, concurrently or sequentially, to clean up all types of contamination at the site.

d. The responsible party must evaluate each option separately; the evaluation of each option must include the following:

* + 1. Consideration of the nature of the contamination at the site, including:
* Horizontal and vertical extent of soil contamination in unsaturated zone
* Accessibility of contamination;
* Estimated volume of contaminated soil to be treated.
  1. Description of each remedial technology included within a single remedial option:
* Presentation of system design and specifications (for each technology, including SVE, AS), including the following:
* System design and process;
* Radius of influence of system and estimated rates of contaminant removal;
* Anticipated flow rates and pressures for soil vapor extraction/air sparging;
* Anticipated effluent concentration after treatment;
* Determination of permits necessary for implementation of the remedial option and assessment of feasibility for permit approval; and
* Figures and tables to illustrate system design and present specifications. (Refer to Section J and K.)
* Presentation of plan for excavation, including:
* Excavation specifications;
* Estimated volume of soil to be treated/disposed of:
* Waste treatment/disposal plan;
* Sampling/analysis of contaminated soil prior to treatment/disposal;
* Name, and address of and distance to treatment/disposal facility;
* Determination of permits necessary for implementation of the excavation option and assessment of feasibility for permit approval; and
* Figures and tables to illustrate excavation specifications. (Refer to Section J and K.)
  1. Discussion of feasibility and effectiveness of each remedial technology, based on:
* Pilot test results;
* Soil monitoring results;
* Other relevant parameters;
* Limitations of each remedial technology (including access issues, technological feasibility, etc.) and proposed measures for dealing with limitations;
* Completed bids.
  1. Remedial system operation and maintenance plan (with schedule and discussion of measures to reduce operation and maintenance activities /costs, such as use of automated controls and remote telemetry).
  2. Monitoring plan for soil (with proposed sampling locations, analytical methods, sampling frequency, and reporting frequency).
  3. Comprehensive, well-substantiated schedule describing, in detail, the progression of all activities, from the date of SAR approval, through implementation of remedial action to the date of attainment of cleanup goals. The schedule for each remedial option should include, but not be limited to, the performance or occurrence of the following actions and processes:
* soil excavation,
* treatment system installation and activation,
* operation and maintenance,
* soil monitoring,
* **cleanup progress** **milestones** (dates on which progressively decreasing cleanup levels for soil contamination are to be reached),
* project completion.
  1. Detailed cost estimate for full performance of the remedial option, from approval to attainment of cleanup goals, including the costs proposed as low bid for each remedial system, costs for labor, soil monitoring, operation and maintenance, periodic reporting, waste disposal, etc.

2. Select the best remedial option, discuss the basis for selection of the remedial option (including initial mass contaminant calculations), and indicate why it was determined to be the most effective and cost efficient option for remediating soil contamination at the site. Provide a copy(s) of the approved permit(s) necessary for implementation of the selected remedial option.

**I. Public Notice**

If public notice was required under 15A NCAC 2L .0114(a) as a consequence of the current existence of groundwater contamination in exceedance of the groundwater quality standards established in 15A NCAC 2L .0202, provide to the Department proof that the public notice is complete. Refer to Appendix H and provide therein the names and addresses of the local authorities to whom copies of the SAR were sent, copies of accompanying cover letters, and certified USPS delivery receipts.

If public notice was required under 15A NCAC 2L .0409(a) for any remedial action alternative required and selected, state why it was required. Provide proof that the public notice is complete. Refer to Appendix H and provide therein the following: a list of names and addresses of the local authorities and property owners/occupants to whom the public notice was sent (and reference property owners/occupants table provided using Table B-6), an example copy of the public notice, certified USPS delivery receipts from each addressee (or documentation of refusal by the addressee to accept delivery of the notice), and a copy of any publicly-posted notice.

***The SAR will not be approved until any public notice required is complete and the documentation specified above provided.***

**J. Figures**

Provide the following:

1. A topographic map illustrating the area within 1500-foot radius of the source of the release, showing:

* Topographic contours;
* Site location;
* Buildings;
* Adjacent streets, roads, highways (identified by street names and numbers);
* Surface water bodies;
* Groundwater flow direction (if determined); and
* North arrow and scale.

2. A site map\* and cross-sections illustrating the release site (UST system(s), AST systems(s), location of spills, etc.), drawn to scale, showing:

* Buildings and property boundaries;
* Underground utilities, such as sewer lines and other conduits; basements; and vaults;
* Water supply wells, surface water bodies;
* Location and orientation of current and former UST(s), AST(s), pumps, product lines, sumps, etc.;
* Length, diameter and volume of current and former UST(s), AST(s);
* Type of material(s) stored in UST(s) (currently and formerly), AST(s) (currently and formerly), or spilled; and
* North arrow and scale.

3. Map(s)\* and geological cross-sections, drawn to scale, depicting all soil analytical results obtained to date, to include:

* Description of soil and bedrock lithology (as determined by investigation to date);
* Location and orientation of UST(s), AST(s), pumps, piping, sumps, etc. (current and former); spills;
* Soil sample identification (unique letter and/or numerical code), location, and depth;
* Soil sample analytical results;
* Date soil sample collected;
* Final limits of each stage of excavation for each excavation on site; and
* Two geological cross-sections, drawn across the contaminated area and intersecting at right angles, showing the vertical distribution of the contaminants in the unsaturated zone. (Indicate vertical and horizontal scale, orientation of each section, location of water table, soil types and lithology, all borings and sample locations represented by the sections, and soil analytical results for each represented sample, and show sections as labeled lines on the map.)

4. Map(s)\* depicting groundwater elevations, to include:

* Groundwater elevations (relative to MSL);
* Groundwater elevation data points (identified by monitoring well);
* Date of measurement (each map should represent a single water level measurement event);
* Potentiometric contour lines; and
* Groundwater flow direction.

5. A potential receptor map that clearly identifies water supply wells (municipal or public/private wells, etc.) and other potential receptors (surface water bodies, basements, utilities, wellhead protection areas, etc.) within 1500’ of the source of the release.

6. A land use map that identifies the following items within 1500’ of the source of the release:

* Features sensitive to impact from the release (schools, daycare centers, nursing homes, hospitals, playgrounds, parks and recreation areas, churches, camps and other places of assembly):
* Properties within or contiguous to the area containing contamination or within and contiguous to the area where the contamination is expected to migrate; and
* Zoning status.

7. A map\* and cross-sections, to be used in conjunction with soil contamination map/cross-sections in item #3, illustrating 3-dimensional extent of proposed excavation area to scale.\*\*

8. Maps\* and cross-sections, to be used in conjunction with soil contamination map/cross-sections in item #3, illustrating, to scale, each proposed remedial technology for soil contamination (present a detailed plan of each system design and layout, which includes all major components of the system).\*\*

***\*Note:*** *Use a single base map to prepare site plans using a map scale of 1 in. = 40 ft.; use a smaller scale for large sites. Maps and figures should include conventional symbols, notations, labeling, legends, scales, and north arrows and should conform to accepted practices of map presentation described in the USGS Geological Survey publication "Topographic Map Symbols”,* [http://store.usgs.gov](http://store.usgs.gov/). *Scale should be expressed as a graphic scale and a verbal statement (e.g., 1 in.= 40 ft) or ratio. Refer to* <http://geokov.com/Education/map-scale.aspx>.

***\*\*****If applicable*

**K. Tables**

Provide the following:

1. Site History (Complete Tables B-1 and B-2 from *Guidelines*, Appendix B);

2. Public and Private Water Supply Well and Other Receptor Information (Complete Table B-5 from *Guidelines*, Appendix B);

3. Field Screening Results;

4. Summary of Soil Sampling Results (Complete Table B-3 from *Guidelines*, Appendix B);

5. Summary of Groundwater and Surface Water Sampling Results (Complete Table B-4 from *Guidelines*, Appendix B)\*;

6. Current and Historical Groundwater Elevations and Free Product Thickness (Complete Table B-9 from *Guidelines*, Appendix B)\*;

7. Land Use (Complete Table B-10 from *Guidelines*, Appendix B);

8. Remediation Schedules and Cleanup Progress Milestones for Each Evaluated Remedial Option;

9. Cost Estimate for Each Evaluated Remedial Option.

*\* If applicable*

Provide additional tables as necessary to compile information critical to evaluating in detail each proposed remedial technology or procedure (eg., SVE pilot test data) included in each remedial option and to present schedule and costs for each evaluated remedial option.

**L. Appendices**

Provide the following:

Appendix A Site Specific Health and Safety Plan (HASP)

Appendix B Copies of permits (soil treatment, etc.)\*

Appendix C Geologic logs for borings (related to SAR investigation only)

Appendix D Copies of the NORR, NOV, etc. requiring the SAR

Appendix E Cost estimate documentation for each remediation technology evaluated, including bid specification, invitations to bid, and bids received

Appendix F Specifications for remedial system design and layout, with calculations, for each remediation technology evaluated

Appendix G Pilot test data/calculations

Appendix H Names and addresses of the local authorities to whom copies of the SAR were sent, copies of cover letters which accompanied the SAR copies, and certified USPS delivery receipts \*

\* If applicable

### Corrective Action Plan

1. **Minimum elements of the report:**
2. Site Identification

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Date of Report: |  | | | | Site Risk: | |  |
| Facility I.D.: |  | | UST Incident Number (if known): | | | |  |
| Site Name: |  | | | | | | |
| Street Address: |  | | | | | | |
| City/Town: |  | | Zip Code: |  | County: | |  |
| Description of Geographical Data Point (e.g., diesel fill port): | | | |  | | | |
| Location Method (GPS, topographical map, other): | | | |  | | | |
| Latitude (***decimal degrees***): | |  | Longitude (***decimal degrees***): | | |  | |

2. Information about Contacts Associated with the Release *(Addresses must include street, city, state, zip code and mailing address, if different)*

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UST/AST Owner: | |  | Email: | |  | | | | |
| Address: |  | | | | | Tel: |  | | |
| UST/AST Operator: | |  | Email: | |  | | | | |
| Address: |  | | | | | Tel: |  | | |
| Property Owner: | |  | Email: | |  | | | | |
| Address: |  | | | | | Tel: |  | | |
| Property Occupant: | |  | Email: | |  | | | | |
| Address: |  | | | | | Tel: |  | | |
| Consultant/Contractor: | |  | Email: | |  | | | | |
| Address: |  | | | | | Tel: |  | | |
| Analytical Laboratory: | |  | | State Certification No: | | | | |  |
| Address: |  | | | | | Tel: | |  | |

3. Information about Release

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date Discovered: |  | | | |
| Estimated Quantity of Release: | |  | | |
| Cause of Release: |  | | | |
| Source of Release (e.g., Dispenser/Piping/UST): | | |  | |
| Sizes and Contents of Tanks or Other Containment from which the Release Occurred: | | | |  |

4. Certification (***The title page must display the seal and signature of the certifying P.E. or L.G. and the name and certification number of the company or corporation [See 15A NCAC 2L .0103(e).]****)*

I, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, a Professional Engineer/Licensed Geologist *(circle one)* for (firm or company of employment), do certify that the information contained in this report is correct and accurate to the best of my knowledge.

*(Please Affix Seal and Signature)*

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(Name of company or corporation) is licensed to practice geology/engineering *(circle one or both)* in North Carolina*.* The certification number of the company or corporation is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

##### B. Executive Summary

Present a brief summary of the most pertinent information about the site and the release and indicate the recommended remedy for contamination, using the following outline:

1. Describe the source, date of discovery, and quantity and type(s) of contaminant released;

2. Summarize initial abatement actions, including closure, soil removal, free product recovery, and provision of alternate water;

3. Describe the results of the hydrogeological investigation;

4. Summarize the results of soil, groundwater, and surface water assessment and free product measurement, indicating the nature and extent of contamination, the estimated rate of migration, and potential for impacting receptors;

5. Indicate the risk classification (or non-UST petroleum/non-petroleum UST rank) and the criteria for that determination;

6. Indicate the soil, groundwater, and surface water concentration levels to which contamination must be remediated; and

7. Present the selected remedy for soil and groundwater contamination and/or actions to reduce the risk classification (or rank) and briefly state the basis for selection, schedule for implementation, remediation progress milestones, and cost.

##### C. Table of Contents

Provide a table of contents, as follows:

1. List sections, indicating page numbers;

2. List figures, identifying each by number;

3. List tables; identifying each by number; and

4. List appendices, identifying each by letter.

**D. Site History and Characterization**

Present information relevant to site history and characterization, ***updating information provided in CSA***, using the following outline:

1. Provide information for UST/AST owners/operators and other responsible parties.

List the names, addresses, telephone numbers, and dates of ownership/operation of all previous UST/AST owners, UST/AST operators, and other responsible parties. Present in table form in Section J (Use Reporting Table B-2, Site History, UST/AST Owner/Operator and Other Responsible Party Information, from *Guidelines*, Appendix B.).

2. Provide UST information (inclusive of all USTs, currently and historically in place at facility). For each UST, provide the following information in table form in Section J (Use Reporting Table B-1, Site History- UST/AST System and Other Release Information, from the *Guidelines*, Appendix B.):

* + Tank identification number (keyed to a site map showing the locations of all UST systems);
  + Last contents of tank;
* Previous contents of tank (if any);
* Capacity of tank in gallons;
* Construction (material and structure);
* Tank dimensions;
* Installation date;
* Description of piping and pump(s) associated with each UST;
* Status of UST (in use or not in use, closed in place, closed by removal; date of last use, date of closure); and
* Indication of a release.

1. Provide a discussion (to supplement Table B-1 and the UST location map) of the spatial and historical relationships among tanks and between tanks and piping and dispensers and a brief description of all historical compliance issues and releases (indicate incident number).

4. Provide information about petroleum AST systems, petroleum spills, and other non-UST petroleum releases (inclusive of all ASTs, currently and historically in place at site and all spills at site)., as indicated:

* List, describe, and indicate location of ASTs and associated piping and pump(s) currently and historically in place at facility) and describe historical releases (indicate incident number). For each AST, present the information in table form in Section J (Use Reporting Table B-1, Site History- UST/AST System and Other Release Information, from the *Guidelines*, Appendix B.).; and
* List, describe, and indicate location and date of spills that have occurred at site). For each spill, present the information in table form in Section J (Use Reporting Table B-1, Site History- UST/AST System and Other Release Information, from the Guidelines, Appendix B.).

4. Provide a comprehensive description of the release, including date discovered, cause and source (including tank identification number and contents), and the relationship of historical UST releases, non-UST releases, and off-site releases (indicate incident number) to contamination from current release.

5. Provide a brief description of site characteristics (including land use of site and surrounding area, topography, vegetation, surface water, wells, buildings, surface cover, soil type, depth to and nature of bedrock, depth to groundwater, direction of groundwater flow, etc.).

6. Provide information on owners and occupants of property within or adjacent to area containing contamination or the area where contamination is expected to migrate and describe land use.

* Refer to tables (Use Table B-6, Property Owners/ Occupants; and Table B-10, Land Use) and to land use map.

7. Present information on receptors/potential receptors.

* Refer to table (Use Table B-5, Public and Private Water Supply Well and other Receptor Information) and to potential receptor map.

8. List all report previously submitted.

9. Summarize initial abatement and corrective actions performed to date, including excavation of contaminated soil and free product removal (Refer to free product recovery information tables; use Table B-8Aand Table B-8B).

10. Refer to NORR/NOV requiring preparation and submittal of the CAP (Appendix D).

**E. Summary of Site Assessment Information**

1. Summarize soil, groundwater, surface water, and free product assessment information presented in the CSA Report (and updated in any Pre-CAP Monitoring Reports or Free Product Recovery Reports submitted after the CSA report).

* Refer to tables (Use Table B-3, Summary of Soil Sampling Results; Table B-4, Summary of Groundwater and Surface Water Sampling Results); Table B-9, Current and Historical Groundwater Elevations and FP Thickness) and to map(s) showing groundwater elevation and flow; maps and geological cross-sections depicting soil and groundwater analytical results and the horizontal and vertical extent of contamination, and map(s) depicting free product thickness and extent.

2. Describe the geology and hydrogeology of the region and the site.

* Describe soil and bedrock encountered at the site. (Refer to geologic cross sections of map illustrating soil contamination and to geologic logs for borings.)
* Discuss site hydrogeology, as determined from groundwater monitoring and from the hydrogeological investigation reported in the CSA. (Include the following information: groundwater flow direction, hydraulic gradient (vertical and horizontal), hydraulic conductivity, and groundwater velocity.)
* Describe the relationship of the geological and hydrogeological characteristics of the site to the potential migration or natural attenuation of contaminants.

3. Examine and evaluate assessment information.

* Describe extent of contamination.
* Describe maximum contaminant concentration levels.
* Indicate the applicable cleanup levels for soil, groundwater, surface water, and free product (and the basis for their determination).
* Indicate potential for contaminant migration and for impact of receptors.
* Describe any action that could result in lowering the risk classification (or rank).

**F. Objectives of Corrective Action at the Site**

1. Indicate the NORR requiring preparation and submittal of the CAP and any NOVs and enforcement documents related to CAP submittal (Refer to Appendix D.);

2. State purpose and objectives of the CAP (e.g., free product recovery, containment or retardation of plume migration, reduction of contaminant concentrations, protection of nearby water supplies, etc.); and

3. State the cleanup goals of the CAP (Refer to Section E, item 3).

**G. Comprehensive Evaluation of Remedial Actions**

1. Present and comprehensively evaluate remedial options.

1. **Evaluate risk reduction mechanisms** (e.g. connecting water supply well users to alternate water sources); as the sole remedial process for soil and/or groundwater. *(Only applicable to petroleum UST releases)*
2. **Evaluate excavation** as the sole remedial process for soil contamination.
3. **Evaluate natural attenuation** as the sole remedial process for groundwater contamination.
4. **Evaluate a minimum of two viable technologically-based remedial options** for soil and groundwater *(in addition to the stand-alone options in items a-c)***,** each option consisting of a single technology or any combination of a technology with another technology, risk reduction mechanism, excavation, or natural attenuation, with the following stipulations:
5. The scope of each option must be inclusive all technologies, mechanisms, and processes to be utilized, concurrently or sequentially, to achieve remediation of all types of contamination at the site to the cleanup goals required for site closure;
6. Natural attenuation, risk reduction mechanism, and excavation must be incorporated into the remedial options when determined to be viable when combined with remedial technologies.
7. **For each evaluation required in items a-d**, include the following, as applicable:
8. Consideration of the nature of the contamination at the site, inclusive of:
   1. Horizontal and vertical extent of soil contamination in unsaturated zone, thickness and extent of free product, and horizontal and vertical extent of individual contaminants dissolved in groundwater;
   2. Accessibility of contamination; and
   3. Estimated volume of contaminated soil or groundwater to be treated.
9. Description of each remedial technology, mechanism, or process included within an option, including:
10. Presentation of system design and specifications, inclusive of

* System design and process;
* Radius of influence of system and estimated rates of contaminant removal;
* Anticipated flow rates and pressures for soil vapor extraction, for groundwater recovery (i.e., both after stripper and after carbon), air sparging, and groundwater injection;
* Anticipated effluent concentration after each unit of treatment;
* Radius of influence of system and estimated rates of contaminant removal;
* Plan for waste disposal;
* Determination of permits necessary for implementation of the remedial option and assessment of feasibility for permit approval;
* Figures and tables to illustrate system design and present specifications (Refer to Sections I, J, and K.).

1. Description of the process of natural attenuation of groundwater contamination, *if proposed as part of a technologically-based remedial option*, to include:

* Presentation of the parameters selected to monitor the progress of natural attenuation, with an explanation of the basis for selection; and
* Schedule of the contaminant degradation process based on modeling.

1. Discussion of feasibility and effectiveness of each remedial technology, mechanism, or process included within a remedial option, based on:
2. Pilot test results;
3. Aquifer test results and hydrogeological information;
4. Water supply well user information;
5. Soil and groundwater monitoring results;
6. Free product thickness;
7. Natural attenuation parameter sampling results;
8. Groundwater modeling results,
9. Other relevant parameters;
10. Limitations of each remedial technology, mechanism, or process (including access issues, technological feasibility, etc.) and proposed measures for dealing with limitations;
11. Completed bids (for technologies, extension of municipal lines, etc.).
12. Remedial system operation and maintenance plan for each remedial option (with schedule and discussion of measures to reduce operation and maintenance activities /costs, such as use of automated controls and remote telemetry).
13. Waste treatment/disposal plan for each remedial option (for contaminated soil, contaminated groundwater, free product, used filters, etc.):
14. Estimated volume to be treated/disposed of,
15. Treatment/disposal method,
16. Name and address of treatment/disposal facility,
17. Analytical results for any pre-treatment/disposal samples, and
18. Copies of approved permits necessary for implementation of the remedial option.
19. Monitoring plan for soil, groundwater, and free product for each remedial option (with proposed sampling locations, analytical methods, sampling frequency, and reporting frequency).
20. Comprehensive, well-substantiated schedule for each remedial option describing, in detail, the progression of all activities, from the date of CAP approval, through implementation of remedial action to the date of attainment of cleanup goals. The schedule for each remedial option should include, but not be limited to, the performance or occurrence of the following actions and processes:
21. risk reduction mechanism implementation,
22. soil excavation,
23. treatment system installation and activation,
24. operation and maintenance,
25. natural attenuation,
26. monitoring,
27. **cleanup progress milestones** (dates, of no greater than annual frequency, on which progressively decreasing cleanup levels for soil and groundwater contamination are to be reached),
28. project completion.
29. Detailed cost estimate for full performance of each remedial option, from approval to attainment of cleanup goals, including the costs proposed as low bid for each remedial system, costs for labor, soil and groundwater monitoring, operation and maintenance, periodic reporting, waste disposal, etc.

2. Select the best remedial option, discuss the basis for selection of the remedial option, and indicate why it was determined to be the most effective and cost efficient option for remediating contamination at the site.

Provide a copy(s) of the approved permit(s) necessary for implementation of the selected remedial option.

##### H. Public Notice

If public notice was required under 15A NCAC 2L .0114(b) or .0409(a) for the remedial action alternative selected, state why it was required. Provide proof that the public notice is complete. Refer to Appendix H and provide therein the following: a list of names and addresses of the local authorities and property owners/occupants to whom the public notice was sent (and reference property owners/occupants table provided using Table B-6), an example copy of the public notice, certified USPS delivery receipts from each addressee (or documentation of refusal by the addressee to accept delivery of the notice), and a copy of any publicly-posted notice. ***The CAP will not be approved until any public notice required is complete and the documentation specified above provided.***

##### I. Figures

Provide the following:

1. A topographic map illustrating the area within 1500-foot radius of the UST/AST system(s), or spill, showing:

* Topographic contours;
* Site location;
* Buildings;
* Adjacent streets, roads, highways (identified by street names and numbers);
* Surface water bodies;
* Groundwater flow direction (if determined); and
* North arrow and scale.

2. A site map\* and cross-sections illustrating the UST/AST system(s), or spill, drawn to scale, showing:

* Buildings and property boundaries;
* Underground utilities, such as sewer lines and other conduits; basements; and vaults;
* Water supply wells, surface water bodies;
* Location and orientation of current and former UST(s), pumps, product lines, sumps, etc.;
* Length, diameter and volume of current and former UST(s);
* Type of material(s) stored in UST(s) (currently and formerly); and
* North arrow and scale.

3. Map(s)\* and geological cross-sections, drawn to scale, depicting all soil analytical results obtained to date, to include:

* Description of soil and bedrock lithology (as determined by investigation to date);
* Location and orientation of UST(s)/AST(s), pumps, piping, sumps, etc.(current and former);spills;
* Soil sample identification (unique letter and/or numerical code), location, and depth;
* Soil sample analytical results;
* Date soil sample collected;
* Final limits of each stage of excavation for each excavation on site; and
* Two geological cross-sections, drawn across the contaminated area and intersecting at right angles, showing the vertical distribution of the contaminants in the unsaturated zone. (Indicate vertical and horizontal scale, orientation of each section, location of water table, soil types and lithology, all borings and sample locations represented by the sections, and soil analytical results for each represented sample, and show sections as labeled lines on the map.)

4. Map(s)\* depicting groundwater elevations, to include:

* Groundwater elevations (relative to MSL);
* Groundwater elevation data points (identified by monitoring well);
* Date of measurement (each map should represent a single water level measurement event);
* Potentiometric contour lines; and
* Groundwater flow direction.

5. Map\*, drawn to scale, depicting the groundwater and surface water analytical results,\*\* to include:

* Location and orientation of UST(s)/AST (s), pumps, piping, sumps, etc. (current and former); spills;
* Groundwater sample identification (unique letter and/or numerical code referencing monitoring or water supply well) and location;
* Date of sampling;
* Surface water sample identification (unique letter and/or numerical code) and location; and
* Groundwater and surface water sample analytical results.

6. Individual groundwater contaminant iso-concentration contour maps\* for every contaminant present in concentrations which exceed the 2L standard limits,\*\* including:

* Contaminant concentrations (in µg/ml) with concentrations in exceedance of MSCCs indicated);
* Contaminant concentration data points (identified by monitoring well);
* Date of measurement (each map should represent a single sampling event;
* Iso-concentration contour lines (solid, if determined from adequate data points; dotted, if estimated);
* An iso-concentration contour line representing the 2L standard limit and, if applicable, the GCL for the contaminant; and
* Two geological cross-sections, one drawn along the long axis of the plume and the second, across it at right angles, showing the vertical distribution of the contaminants in the saturated zone. (Indicate vertical and horizontal scale, orientation of each section; location of water table; and all monitoring wells represented by the sections, and show sections as labeled lines on the map.)

7. A free product map\* depicting thickness and extent of free product and date of measurement.

8. A potential receptor map that clearly identifies water supply wells (municipal or public/private wells, etc.) and other potential receptors (surface water bodies, basements, utilities, wellhead protection areas, etc.) within 1500’ of the source of the release.

9. A land use map that identifies the following items within 1500’ of the source of the release:

* Features sensitive to impact from the release (schools, daycare centers, nursing homes, hospitals, playgrounds, parks and recreation areas, churches, camps and other places of assembly);
* Properties within or contiguous to the area containing contamination or within and contiguous to the area where the contamination is expected to migrate; and
* Zoning status.

10. A map\* and cross-sections, to be used in conjunction with soil contamination map/cross-sections in item #3, illustrating 3-dimensional extent of proposed excavation area to scale.\*\*

11. Maps\* and cross-sections, to be used in conjunction with soil contamination map/cross-sections in item #3, illustrating, to scale, each proposed remedial technology for soil contamination (present a detailed plan of each system design and layout, which includes all major components of the system).\*\*

12. Maps\* and cross-sections, to be used in conjunction with groundwater elevation map, groundwater contamination map/cross-sections, groundwater isoconcentration maps/cross-sections in items #4-6, illustrating, to scale, each proposed remedial technology for groundwater contamination and/or free product recovery (present a detailed plan of each system design and layout, which includes all major components of the system).\*\*

***\*Note:*** *Use a single base map to prepare site plans using a map scale of 1 in. = 40 ft.; use a smaller scale for large sites. Maps and figures should include conventional symbols, notations, labeling, legends, scales, and north arrows and should conform to accepted practices of map presentation described in the USGS Geological Survey publication "Topographic Map Symbols”,* [http://store.usgs.gov](http://store.usgs.gov/). *Scale should be expressed as a graphic scale and a verbal statement (e.g., 1 in.= 40 ft) or ratio. Refer to* <http://geokov.com/Education/map-scale.aspx>.

\*\* *If applicable*

##### J. Tables

Provide the following:

1. Site History (Complete Tables B-1 and B-2 from *Guidelines*, Appendix B);

2. Public and Private Water Supply Well and Other Receptor Information (Complete Table B-5 from *Guidelines*, Appendix B);

3. Field Screening Results;

4. Summary of Soil Sampling Results (Complete Table B-3 from *Guidelines*, Appendix B);

5. Summary of Groundwater and Surface Water Sampling Results (Complete Table B-4 from *Guidelines*, Appendix B)\*;

6. Monitoring and Remediation Well Construction Information (Complete Table B-7 from *Guidelines*, Appendix B)\*;

7. Free Product Recovery Information (Complete Table B-8A from *Guidelines*, Appendix B)\*;

8. Cumulative Volume of Free Product Recovered from Site (Complete Table B-8B from *Guidelines*, Appendix B)\*;

9. Current and Historical Groundwater Elevations and Free Product Thickness (Complete Table B-9 from *Guidelines*, Appendix B)\*;

10. Land Use (Complete Table B-10 from *Guidelines*, Appendix B);

11. Remediation Schedules and Cleanup Progress Milestones for Each Evaluated Remedial Option;

12. Cost Estimate for Each Evaluated Remedial Option.

*\* If applicable*

***Provide additional tables as necessary to compile information critical to evaluating in detail each proposed remedial technology or procedure (e.g., SVE pilot test data, water supply users to be connected to municipal water supply) included in each remedial option and to present schedule and costs for each evaluated remedial option.***

##### K. Appendices

Provide the following:

Appendix A Site Specific Health and Safety Plan (HASP)

Appendix B Copies of permits (soil treatment, wastewater treatment, etc.)\*

Appendix C Geologic logs for borings (related to CAP investigation only)\*

Appendix D Copies of the NORR, NOV, etc. requiring the CAP

Appendix E Cost estimate documentation for each remediation technology evaluated, including bid specification, invitations to bid, and bids received

Appendix F Specifications for remedial system design and layout, with calculations, for each remediation technology evaluated

Appendix G Pilot test data/calculations

Appendix H List of local authorities and property owners/occupants to whom public notice of corrective action was sent, an example copy of the public notice, and certified USPS delivery receipts from each party (and a copy of any publicly posted notice

*\* If applicable*

### Multi-Part Corrective Action Plan

#### A. Feasibility Study

*This template outlines the typical information**that should be provided in a Feasibility Study submitted in lieu of a full Corrective Action Plan (CAP) at an eligible site operating under the current Reasonable Rate Document to maintain access to the Commercial Leaking Petroleum Underground Storage Tank Trust Fund (Trust Fund).*

*The objective of the standalone Feasibility Study (CA Study) portion of this multi-part CAP process at Trust Fund-eligible sites is to provide a robust evaluation of the remedial strategy that was provided in the ‘Conclusion and Recommendations’ section of the preceding Comprehensive Site Assessment (CSA) Report. It should include a very brief summary of any previous abatement efforts (for example, soil excavations or free product recovery events, etc.) and site conditions, along with a more thorough description of any work performed since the completion of the CSA that may help verify the applicability of the recommended remedial alternative.*

*The core of the CA Study is built using the results of pilot studies and ‘rough’ cost estimates (within about ±15% of the actual designed and bid costs) to verify and validate the effectiveness and cost efficiency of a proposed strategy or remedial technology. As described in the June 1, 2016 UST Section Memo entitled “*[North Carolina Petroleum UST Release Corrective Action Phase Project Management: A Calibrated Risk-Based Corrective Action Decision & Implementation Guide](https://files.nc.gov/ncdeq/Waste%20Management/DWM/UST/Corrective%20Action/Corrective%20Action%20Selection_6_1_16.docx)*” the evaluated strategy should incorporate no more than two to three years of active remediation to stabilize the contaminant plume and protect nearby at-risk receptors, while also addressing the bulk of the secondary source and/or high dissolved-phase contamination plumes such that monitored natural attenuation (MNA) may be projected to achieve risk-based closure standards for a site reclassified as ‘low’ risk within approximately ten years following the completion of active remediation. [Note: For some sites with existing impacted receptors within the plume footprint, additional measures may be required beyond that typically applicable at most other sites.] The CA Study should be used to further document those needs where the remedial strategy must vary from the June 2016 guidance.*

1. Site Information
2. Site Identification

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Date of Report: |  | | | | Site Risk/Ranking: | | |  |
| Facility I.D.: |  | | UST Incident Number (if known): | | | | |  |
| Site Name: |  | | | | | | | |
| Street Address: |  | | | | | | | |
| City/Town: |  | | Zip Code: |  | | County: | |  |
| Description of Geographical Data Point (e.g., diesel fill port): | | | |  | | | | |
| Location Method (GPS, topographical map, online map, other): | | | |  | | | | |
| Latitude (***decimal degrees***): | |  | Longitude (***decimal degrees***): | | | |  | |

1. Information about Contacts Associated with the Leaking UST System *(Addresses must include street, city, state, zip code and mailing address, if different.)*

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UST/AST Owner: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| UST/AST Operator: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Property Owner: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Property Occupant: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Consultant/Contractor: | | |  | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Analytical Laboratory: | | |  | | State Certification No: | | | | |  |
| Address: |  | | | | | | Tel: | |  | |

1. Information about Release

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date Discovered: |  | | | |
| Estimated Quantity of Release: | |  | | |
| Cause of Release: |  | | | |
| Source of Release (e.g., Dispenser/Piping/UST): | | |  | |
| Sizes and Contents of Tanks or Other Containment from which the Release Occurred: | | | |  |

1. Executive Summary

Summarize the most pertinent information about the site and the release and indicate the recommended remedy for contamination, using the following outline:

1. Briefly summarize key information about -
   1. The release (such as the source(s), date of discovery, quantity, and type(s) of contaminant released;
   2. Prior remedial actions, including initial abatement, system closure, soil removal, free product recovery, and provision of alternate water;
2. Briefly summarize the conceptual site model based on any previous hydrogeological investigation(s), including key information about:
   1. Soil, groundwater, surface water impacts, and any measured free product (if applicable),
   2. The nature and known extent of contamination, and estimated rate and direction of contaminant migration
   3. The risk classification and ranking and the criteria driving that classification, and likelihood that nearby receptors will be impacted;
3. Briefly summarize the proposed remedial strategy and the basis for this selection, describing in general terms:
   1. The proposed means of accommodating site risk to reduce the risk classification over time,
   2. The target cleanup levels for soil and/or groundwater based on that projected site risk,
   3. The projected timeline for implementation of the remedial strategy, including the schedule for active remediation (typically ~2-3 years), monitored natural attenuation (typically <10 years),
   4. The methods that will be used to evaluate the effectiveness and efficiency of the strategy over time, and
   5. A general estimate of the anticipated cost for implementation and operation of the strategy over the projected lifetime of the site.
4. **Table of Contents**

Provide a table of contents, as follows:

1. List sections, indicating page numbers;
2. List figures, identifying each by number;
3. List tables; identifying each by number; and
4. List appendices, identifying each by letter
5. Update of Site History and Characterization

Any site characterization information provided in the CSA (or any other report) that has been found to be erroneous or otherwise requires updating should be included here. This includes information that would be provided in Sections D through F from the CSA template from the *Guidelines* (Template #6,) covering the site history and characterization, receptor information, and land use. Updates should follow the outlines provided in those sections and include the relevant tables referenced in the CSA template. At a minimum, the receptor survey and land use information must be resurveyed if the existing data have not been updated within the last five years. *Please note: Any deficiencies from the CSA (or other reports) that are not corrected in this section could result in the rejection of the CA Study as incomplete and denial of any claimed costs associated with the Corrective Action Plan presented within this report.*

1. Update of Site Assessment Information

Any plume assessment information provided in the CSA (or any other report) that has been found to be erroneous or otherwise requires updating should be included here. This includes information that would be provided in Sections G through M from the CSA template from the *Guidelines* (Template #6,) covering soil or groundwater assessment, free product assessment and recovery, hydrogeological testing, regional or site-specific geology and hydrogeology, and groundwater plume modeling. Updates should follow the outlines provided in those sections and include the relevant tables referenced in the CSA template. *Please note: Any deficiencies from the CSA (or other reports) that are not corrected in this section could result in the rejection of the CA Study as incomplete and denial of any claimed costs associated with the Corrective Action Plan presented within this report.*

1. Objectives for Corrective Action at the Site

1. Refer to the Notice of Regulatory Requirements (NORR) directing the preparation and submittal of the CAP and any Notices of Violation (NOV) and/or enforcement documents related to CAP submittal, including the date the Notices were made (include copies within Appendix D.);

2. State the purpose and objectives of the CAP (e.g., free product recovery, containment or retardation of plume migration, reduction of contaminant concentrations, protection of nearby water supplies, etc); and

3. Examine and evaluate the cleanup goals of the CAP:

* Discuss the extent of contamination, based upon the findings of prior site assessment activities.
* Indicate the maximum contaminant concentration levels.
* Discuss the potential for contaminant migration and the likelihood of impact to any receptors.
* Describe steps that could result in the removal, replacement, or confirmed protection of any receptors, allowing for lowering or the risk classification and/or rank.
* Discuss the applicable active cleanup levels for soil, groundwater, surface water, and free product (and the basis for their determination) that will provide for plume stability and the protection of at-risk receptors, including references to any proposed modeling techniques.
* Discuss the applicable natural attenuation target levels for soil and groundwater that are predicted to all the site to reach risk-based cleanup levels over time (and the basis for their determination).

1. Comprehensive Evaluation of Remedial Actions

1. Present and comprehensively evaluate the proposed remedial strategy. Discuss the basis for selection of the remedial option, and indicate why it was determined to be the most effective and cost efficient option for remediating contamination at the site.

1. **In validating the selected remedial strategy, discuss the following, as applicable:**
2. Consideration of the nature and source of the contamination, the geology and hydrogeology, and the land use and surface structures present at the site, to include:
   1. Pilot test results;
   2. Aquifer test results;
   3. Other geological/hydrogeological information (geophysical logs, hydrogeologic profiles, etc.);
   4. Horizontal and vertical extent of soil contamination in unsaturated zone;
   5. Thickness and extent of free product;
   6. Horizontal and vertical extent of individual contaminants dissolved in groundwater;
   7. Natural attenuation parameter sampling results;
   8. Mobility or stability of free product and/or the dissolved-phase groundwater plume;
   9. Water supply well user information;
   10. Likelihood of impact to, and replacement/protection alternatives for, all at-risk receptors;
   11. Accessibility of contamination in the unsaturated zone and/or groundwater; and
   12. Estimated volume of contamination / total contaminant mass in soil and/or groundwater to be removed/treated to achieve plume stability and/or risk reduction, or equivalent;
   13. Other groundwater modeling results; and
   14. Any other relevant parameters.
3. Description of the active remedial technology, mechanism, or process. Present the proposed active remediation system design concept based on pilot study and aquifer testing data, to include (as applicable):
   1. Predicted system process cycle;
   2. Proposed system layout/footprint onsite;
   3. Radius of influence for system components, excavation footprint, or location of engineered controls;
   4. Anticipated recovery volumes/rates and pressures/vacuum for soil vapor extraction, dual phase extraction, or groundwater recovery,
   5. Anticipated injection volumes/rate, concentrations, and pressures for air sparging or other injection processes;
   6. Anticipated effluent/emission concentration after each unit of treatment;
   7. Estimated rates of contaminant removal or augmented in situ remediation above natural attenuation;
   8. Estimated schedule for selected technology to achieve plume stability and/or risk reduction (with a target of two (2) years of active operation);
   9. Anticipated milestones for evaluating system operation effectiveness and efficiency over time;
   10. Plan for waste disposal/discharge/exhaust;
   11. Determination of permits necessary for implementation of the remedial option and assessment of feasibility/schedule for permit approval;
   12. Other limitations of the remedial technology, mechanism, or process (including access issues, technological feasibility, etc.) and proposed measures for dealing with limitations;
   13. Figures and tables for pilot study results and to illustrate system plan (Refer to Sections I, J, and K.).
4. Description of the process of natural attenuation. Present the proposed monitored natural attenuation schedule following risk reduction through active remediation, to include (as applicable):
   1. Predicted residual contaminant volume/mass following completion of active remediation;
   2. Predicted natural attenuation risk-based cleanup goals based on site risk reclassification following completion of active remediation; and
   3. Anticipated schedule of the residual contaminant degradation process to achieve risk-based cleanup within ten (10) years of completing active remediation.
5. **For the selected remedial strategy,** explain the proposed plan in further detail, to include:
6. Remedial system operation and maintenance plan (with schedule and discussion of measures to reduce operation and maintenance activities /costs, such as use of automated controls and remote telemetry).
7. Waste treatment/disposal plan (for soil and/or groundwater, free product, used filters, etc.):
8. Estimated volume to be treated/discharged/disposed of,
9. Treatment/discharge/disposal method,
10. Name and address of treatment/disposal facility,
11. Analytical methodology required for any pre-treatment/discharge/disposal samples, and
12. Examples of permit requirements necessary for implementation of the remedial option.
13. Monitoring plan for soil, groundwater, and free product for both the active remediation and natural attenuation cycles (with proposed sampling locations, analytical methods, sampling frequency, and reporting frequency, with predicted changes over time as the contaminant plume is remediated).
14. Comprehensive, well-substantiated proposed schedule describing the anticipated progression from the date of approval for the CA Study, through the remedial system Design and Specification, Record of Decision, installation/implementation of remedial action, transition to monitored natural attenuation, and final attainment of cleanup goals. The schedule should include, but not be limited to, the performance or occurrence of the following actions and processes:
15. risk reduction mechanism implementation (e.g. connecting water supply well users to alternate water sources, modeling plume stability, etc.);
16. soil excavation,
17. treatment system installation and activation,
18. operation and maintenance (~ 2 years, typ.),
19. **active remediation progress milestones** (typically a quarterly schedule for evaluating the efficiency and effectiveness of the remedial strategy through monitoring contaminant mass throughput or in situ cleanup in excess of anticipated natural attenuation processes, etc.),
20. natural attenuation (up to 10 years),
21. **monitored natural attenuation progress milestones** (a quarterly, semiannual, annual, or variable schedule for evaluating the efficiency and effectiveness of natural attenuation to achieve the applicable risk-based cleanup goals for soil and groundwater at this site),
22. risk-based closure mechanisms (institutional or engineering controls, including any projected future monitoring of the maintenance of those controls over time), and
23. project completion.
24. Rough cost estimate for implementation of the proposed active remedial option and monitored natural attenuation cycles, from Record of Decision approval to attainment of cleanup goals, including the costs to purchase any active remedial option, costs for implementation/installation, soil and groundwater monitoring, operation and maintenance, periodic reporting, waste disposal, etc.
25. Public Notice

If public notice is required under 15A NCAC 2L .0114(b) or .0409(a) for the remedial action alternative selected, provide a plan to ensure that the public notice will be properly completed and records of the notice maintained. Refer to Appendix H and provide therein the following: a list of names and addresses of the local authorities and property owners/occupants to whom the public notice will be sent (and reference property owners/occupants table provided using Table B-6, if applicable), an example copy of the proposed public notice, and a copy of any notice that will be posted publicly and the proposed mechanism for that public posting. ***The final CAP Record of Decision (CA Decision) will not be approved until any and all required public notice is complete, and documentary proof is provided, as described above.***

1. Statements and Certification

**The following statements must be included at the closing of the document text, and must display the seal and signature of the certifying P.E. or L.G. in addition to the name and certification number of the company or corporation [See 15A NCAC 2L .0103(e).]**

|  |  |  |  |
| --- | --- | --- | --- |
| **1** | **Enter the date the Corrective Action Plan was due.** Click or tap to enter a date. **Will this Corrective Action Plan Feasibility Study be submitted after the established due date?** | **YES** | **NO** |
| **2** | **Was any recommended information from the above template missing from this report?** | **YES** | **NO** |
| (IF the answer to question #1 or# 2 is “YES”, please replace this note with additional information in this cell to explain what was missing and why.) | | | |
| **3** | **Are there any known or suspected factors that could prohibit risk reclassification and the use of monitored natural attenuation to risk-based cleanup standards following the completion of two years of active remediation under the proposed strategy?** | **YES** | **NO** |
| (IF the answer to question #3 is “YES”, please replace this note with a short description of the possible reason(s), and outline proposed remedies. Greater detail should be provided in the report text above.) | | | |
| **4** | **Does any potential continuing source for the known contamination onsite remain (e.g., an existing, operating system onsite where a leaking component directly responsible for the discovered release has not been found and repaired/replaced, etc.)?** | **YES** | **NO** |
| **5** | **Does any known or suspected source zone soil contamination or free product remain outside of the assessed area that could inhibit the effectiveness of the proposed strategy?** | **YES** | **NO** |
| **6** | **Since release discovery, has there been any unexpected increase in contaminant mass sufficient to suggest a potential new release from a separate onsite or offsite source?** | **YES** | **NO** |
| (IF the answer to any question from #4 - #6 is “YES”, replace this note with a short description of any recommended actions to address, assess, or clean up any other known, suspected, or potential source. Greater detail should be provided in the report text above.) | | | |
| **7** | **Certification:**  I, [Name of Licensed Professional], a [Select License Type] for [Name of Firm or Company of Employment], do certify that the information contained in this report is correct and accurate to the best of my knowledge.  *(Affix Seal and Signature)*  [Name of Firm or Company of Employment] is licensed to practice [Select Corporate Licensure] in North Carolina*.* The certification number of the company or corporation is [Certification Number]. | | |

##### Figures

Provide the following:

1. A topographic map illustrating the area within 1500-foot radius of the UST system, showing:

* Topographic contours;
* Site location;
* Buildings;
* Adjacent streets, roads, highways (identified by street names and numbers);
* Surface water bodies;
* Groundwater flow direction(s); and
* North arrow and scale.

2. A site map\* and cross-sections illustrating the UST/AST system(s) and any spills, drawn to scale, showing:

* Buildings and property boundaries;
* Streets, roads, highways;
* Underground utilities, such as sewer lines and other conduits; basements; and vaults;
* Water supply wells, surface water bodies;
* Location and orientation of current and former UST(s), pumps, product lines, sumps, etc.;
* Length, diameter and volume of current and former UST(s);
* Type of material(s) stored in UST(s) (currently and formerly); and
* North arrow and scale.

3. Map(s)\* and geological cross-sections, drawn to scale, depicting all soil analytical results obtained to date, to include:

* Description of soil and bedrock lithology (as determined by investigation to date);
* Location and orientation of any current or former UST(s), AST(s), pumps, piping, sumps, etc., and any known spills;
* Soil sample identification (unique letter and/or numerical code), location, depth, and date collected;
* Soil sample analytical results;
* Final limits of each stage of excavation for each excavation on site (if applicable); and
* Two geological cross-sections, drawn across the contaminated area and intersecting at right angles, showing the vertical distribution of the contaminants in the unsaturated zone. (Indicate vertical and horizontal scale, orientation of each section, location of water table, soil types and lithology, all borings and sample locations represented by the sections, and soil analytical results for each represented sample, and show sections as labeled lines on the map.)

4. Map(s)\* depicting groundwater elevations, to include:

* Groundwater elevations (relative to MSL and corrected for presence of free product);
* Groundwater elevation data points (identified by monitoring well);
* Date of measurement (each map should represent a single water level measurement event);
* Potentiometric contour lines; and
* Groundwater flow direction.

5. Map\*, drawn to scale, depicting the groundwater and surface water analytical results,\*\* to include:

* Location and orientation of any current or former UST(s), AST(s), pumps, piping, sumps, etc., and any known spills;
* Groundwater sample identification (unique letter and/or numerical code referencing monitoring or water supply well), location, and date of sampling;
* Surface water sample identification (unique letter and/or numerical code), location, and date of sampling; and
* Groundwater and surface water sample analytical results.

6. Individual groundwater contaminant isoconcentration contour maps\* for every contaminant present in concentrations which exceed the 2L standard limits,\*\* including:

* Contaminant concentrations (in µg/L) with concentrations in exceedance of MSCCs indicated);
* Contaminant concentration data points (identified by monitoring well);
* Date of measurement (each map should represent a single sampling event;
* Isoconcentration contour lines (solid, if determined from adequate data points; dotted, if estimated);
* A bold isoconcentration contour line representing the 2L standard limit, or CAP cleanup goal, if different, for the contaminant;
* A general plan depicting the footprint of any groundwater remediation system installed on site; and
* Two geological cross-sections, one drawn along the long axis of the plume and the second, across it at right angles, showing the vertical distribution of the contaminants in the saturated zone. (Indicate vertical and horizontal scale, orientation of each section; location of water table; and all monitoring wells represented by the sections, and show sections as labeled lines on the map.)

7. A free product map\* depicting thickness and extent of free product and date of measurement, with a general plan of the footprint of any free product recovery system installed on site\*\*.

8. A potential receptor map that clearly identifies water supply wells (municipal or public/private wells, etc.) and other potential receptors (surface water bodies, basements, utilities, wellhead protection areas, etc.) within 1500’ of the source of the release.

9. A land use map that identifies the following items within 1500’ of the source of the release:

* Features sensitive to impact from the release (schools, daycare centers, nursing homes, hospitals, playgrounds, parks and recreation areas, churches, camps and other places of assembly);
* Properties within or contiguous to the area containing contamination or within and contiguous to the area where the contamination is expected to migrate; and
* Zoning status.

10. A map\* and cross-sections, to be used in conjunction with soil contamination map/cross-sections in item #3, illustrating 3-dimensional extent of proposed excavation area to scale.\*\*

11. Maps\* and cross-sections, to be used in conjunction with soil contamination map/cross-sections in item #3, illustrating, to scale, the proposed remedial technology for soil contamination (present the anticipated system design and layout, to include all major components of the system).\*\*

12. Maps\* and cross-sections, to be used in conjunction with groundwater elevation map, groundwater contamination map/cross-sections, groundwater isoconcentration maps/cross-sections in items #4-6, illustrating, to scale, the proposed remedial technology for groundwater contamination and/or free product recovery (present the anticipated system design and layout, to include all major components of the system).\*\*

***\*Note:*** *Use a single base map to prepare site plans using a map scale of 1 in. = 40 ft.; use a smaller scale for large sites. Maps and figures should include conventional symbols, notations, labeling, legends, scales, and north arrows and should conform to accepted practices of map presentation described in the USGS Geological Survey publication "Topographic Map Symbols”,* [http://store.usgs.gov](http://store.usgs.gov/). *Scale should be expressed as a graphic scale and a verbal statement (e.g., 1 in.= 40 ft) or ratio. Refer to* <http://geokov.com/Education/map-scale.aspx>.

\*\* *If applicable*

##### Tables

Provide the following:

1. Site History (Complete Tables B-1 and B-2 from *Guidelines*, Appendix B);

2. Public and Private Water Supply Well and Other Receptor Information (Complete Table B-5 from *Guidelines*, Appendix B)\*;

3. Field Screening Results\*;

4. Summary of Soil Sampling Results (Complete Table B-3 from *Guidelines*, Appendix B)\*;

5. Summary of Groundwater and Surface Water Sampling Results (Complete Table B-4 from *Guidelines*, Appendix B)\*;

6. Monitoring, Pilot, and Remediation Well Construction Information (Complete Table B-7 from *Guidelines*, Appendix B)\*;

7. Free Product Recovery Information (Complete Table B-8A from *Guidelines*, Appendix B)\*;

8. Cumulative Volume of Free Product Recovered from Site (Complete Table B-8B from *Guidelines*, Appendix B)\*;

9. Current and Historical Groundwater Elevations and Free Product Thickness (Complete Table B-9 from *Guidelines*, Appendix B)\*;

10. Land Use (Complete Table B-10 from *Guidelines*, Appendix B);

11. Remediation Schedules and Cleanup Progress Milestones for the Active Remedial Option and Monitored Natural Attenuation Phase;

12. Cost Estimates for the Active Remedial Option and Monitored Natural Attenuation Phase.

*\* If applicable*

***Provide additional tables as necessary to compile information critical to evaluating the proposed remedial technology or procedure (e.g., SVE pilot test data, water supply users to be connected to municipal water supply, etc.) and to validate the proposed schedules and costs for the active remedial option and monitored natural attenuation phase.***

##### Appendices

Provide the following:

Appendix A Site Specific Health and Safety Plan (HASP)

Appendix B Copies of permits (soil treatment, wastewater treatment, etc.)\*

Appendix C Geologic logs for borings (related to CAP investigation / pilot studies only)\*

Appendix D Copies of the NORR, NOV, etc. requiring the CAP

Appendix E Rough cost estimate information for the selected remediation technology, including any rough bids received or existing bids for approximately equivalent systems at other sites.

Appendix F General plan for remedial system design and layout, based on pilot study calculations to verify the location and orientation of the proposed system footprint.

Appendix G Logs and calculations documenting the actual pilot test data and results

Appendix H List of local authorities and property owners/occupants to whom public notice of corrective action is to be sent, an example copy of the public notice and a copy of any notice to be publicly posted (if different).

*\* If applicable*

*Provide additional appendices as needed to better validate the proposed remedial strategy.*

#### B. Corrective Action Design

*This template outlines the typical information**to be provided in a Corrective Action (CA) Design submitted in lieu of a full Corrective Action Plan (CAP) at an eligible site operating under the current Reasonable Rate Document (RRD) to maintain access to the Commercial Leaking Petroleum Underground Storage Tank Trust Fund (Trust Fund).*

*The objective of the standalone CA Design portion of this multi-part CAP process at Trust Fund-eligible sites is to provide a formal design for the remedial strategy in the preceding CA Study, as approved by the Department. Please note that any CA Design incorporating engineering practices must be sealed by the professional engineer who developed the remediation system design.*

*The CA Design should include a full remedial system design specification, incorporating pilot test results from the CA Study and all necessary calculations and design drawings, as well as formal individual bid request responses for the fabrication of a turnkey system and installation of that system (and any other standalone Trust Fund RRD task within the scope of system implementation, such as the installation of an infiltration gallery, etc.), and an estimated schedule for fabrication and installation. Remedial strategies that include relocated or rented systems should include any existing design specifications and supplemental designs and/or bids for the additional efforts associated with incorporating the existing system into the remedial strategy for the site (e.g., modifications, enhancements, transit, etc.). For further information on the CA Design task, see the Trust Fund RRD guidance available at:* <https://deq.nc.gov/about/divisions/waste-management/ust/trust-fund/reasonable-rate-documents> *.*

1. Site Information
2. Site Identification

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Date of Report: |  | | | | Site Risk/Ranking: | | |  |
| Facility I.D.: |  | | UST Incident Number (if known): | | | | |  |
| Site Name: |  | | | | | | | |
| Street Address: |  | | | | | | | |
| City/Town: |  | | Zip Code: |  | | County: | |  |
| Description of Geographical Data Point (e.g., diesel fill port): | | | |  | | | | |
| Location Method (GPS, topographical map, online map, other): | | | |  | | | | |
| Latitude (***decimal degrees***): | |  | Longitude (***decimal degrees***): | | | |  | |

1. Information about Contacts Associated with the Leaking UST System (Addresses must include street, city, state, zip code and mailing address, if different.)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UST/AST Owner: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| UST/AST Operator: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Property Owner: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Property Occupant: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Consultant/Contractor: | | |  | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Analytical Laboratory: | | |  | | State Certification No: | | | | |  |
| Address: |  | | | | | | Tel: | |  | |

1. Information about Release

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date Discovered: |  | | | |
| Estimated Quantity of Release: | |  | | |
| Cause of Release: |  | | | |
| Source of Release (e.g., Dispenser/Piping/UST): | | |  | |
| Sizes and Contents of Tanks or Other Containment from which the Release Occurred: | | | |  |

1. Executive Summary

Summarize the most pertinent information about the site and the release and indicate the recommended remedy for contamination, using the following outline:

1. Briefly summarize key information about -
   1. The release (such as the source(s), date of discovery, quantity, and type(s) of contaminant released);
   2. Prior remedial actions, including initial abatement, system closure, soil removal, free product recovery, and provision of alternate water;
2. Briefly summarize the conceptual site model based on any previous hydrogeological investigation(s), including key information about:
   1. Soil, groundwater, surface water impacts, and any measured free product (if applicable),
   2. The nature and known extent of contamination, and estimated rate and direction of contaminant migration
   3. The risk classification and ranking and the criteria driving that classification, and likelihood that nearby receptors will be impacted;
3. Briefly summarize the proposed remedial strategy and the basis for this selection, describing in general terms:
   1. The proposed means of accommodating site risk to reduce the risk classification over time,
   2. The target cleanup levels for soil and/or groundwater based on that projected site risk,
   3. The projected timeline for implementation of the remedial strategy, including the schedule for active remediation (typically ~2-3 years), monitored natural attenuation (typically <10 years),
   4. The methods that will be used to evaluate the effectiveness and efficiency of the strategy over time, and
   5. A general estimate of the anticipated cost for implementation and operation of the strategy over the projected lifetime of the site.
4. Briefly summarize the proposed remediation system design, describing in general terms:
   1. Projected operating capacities of the primary remedial system components, as applicable (such as recovery or injection volumes and rates, areas of influence or remediation zones, etc.),
   2. The proposed orientation of the system with respect to the site (e.g., projected system structure placement, general trenching orientation, general location of remediation points/wells, discharge outfalls, general excavation footprint orientation, etc.),
   3. General name and location for vendors contacted for bids related to fabrication and/or installation (and any other applicable task) and the total costs represented in the winning bids, and
   4. Estimated schedule for fabrication and installation or injection once the CAP has been approved in full.
5. **Table of Contents**

Provide a table of contents, as follows:

1. List sections, indicating page numbers;
2. List figures, identifying each by number;
3. List tables; identifying each by number; and
4. List appendices, identifying each by letter
5. Update of Site History and Characterization

Any site characterization information provided in the CSA, CA Study, or any other report that has been found to be erroneous or otherwise requires updating should be included here. This includes information that would be provided in Sections D through F from the CSA template from the *Guidelines* (Template #6,) covering the site history and characterization, receptor information, and land use. Updates should follow the outlines provided in those sections and include the relevant tables referenced in the CSA template. At a minimum, the receptor survey and land use information must be resurveyed if the existing data have not been updated within the last five years. *Please note: Any deficiencies from the CSA, CA Study, or any other report that are not corrected in this section could result in the rejection of the CA Design as incomplete and denial of any claimed costs associated with the Corrective Action Plan presented within this report.*

1. Update of Site Assessment Information

Any plume assessment information provided in the CSA, CA Study, or any other report that has been found to be erroneous or otherwise requires updating should be included here. This includes information that would be provided in Sections G through M from the CSA template from the *Guidelines* (Template #6,) covering soil or groundwater assessment, free product assessment and recovery, hydrogeological testing, regional or site-specific geology and hydrogeology, and groundwater plume modeling. This also includes updating or otherwise describing any information provided within the earlier CA Study that is found to no longer be accurate or representative, in whole or in part, related to any aspect of the proposed remedial strategy, including any changes that could affect site risk or available remedial strategies (such as plans for site redevelopment, installation of public water in the area, etc.) Updates should follow the outlines provided in the applicable CSA or CA Study sections and include the relevant tables referenced in the CSA or CA Study templates. *Please note: Any deficiencies from the CSA, CA Study, or any other report that are not corrected in this section could result in the rejection of the CA Design as incomplete and denial of any claimed costs associated with the Corrective Action Plan presented within this report.*

1. Objectives for Corrective Action at the Site

1. Refer to the Notice of Regulatory Requirements (NORR) directing the preparation and submittal of the CAP and any Notices of Violation (NOV) and/or enforcement documents related to CAP submittal, including the date the Notices were made (include copies within Appendix D.);

2. State the purpose and objectives of the CAP (e.g., free product recovery, containment or retardation of plume migration, reduction of contaminant concentrations, protection of nearby water supplies, etc); and

3. Examine and evaluate the cleanup goals of the CAP:

* Discuss the extent of contamination.
* Indicate the maximum contaminant concentration levels.
* Discuss the potential for contaminant migration and the likelihood of impact to any receptors.
* Describe steps that could result in the removal, replacement, or confirmed protection of any receptors, allowing for lowering or the risk classification and/or rank.
* Discuss the applicable active cleanup levels for soil, groundwater, surface water, and free product (and the basis for their determination) that will provide for plume stability and the protection of at-risk receptors.
* Discuss the applicable natural attenuation target levels for soil and groundwater that are predicted to all the site to reach risk-based cleanup levels over time (and the basis for their determination).

1. Remedial Action Implementation

1. Present any information related to the remediation system design for the approved remedial strategy from the CA Study. Discuss the basis for selection of the specific design, the bid responses from vendors and/or service providers for fabrication and installation (and any other applicable task) and indicate why this design and the selected winning bidders were determined to represent the most effective and cost efficient option for remediating contamination at the site.

1. **Describe the remedial system design and specification in detail**, discussing the following, with reference to the attached engineered design and/or manufacturer literature (as applicable):
2. Discuss details about the primary system components, to include:
   1. Make and model for primary mechanical system components (blowers, compressors, etc.);
   2. Anticipated operating loads (volumes, flow rates, pressures, vacuum, etc.) for the primary system components, in comparison with the recommended operation range for the component;
   3. System component lifetime/replacement cycles;
   4. Manufacturer and trade name for chemical injectates (chemical oxidizers, electron acceptors, bioaugmentation slurries, etc.);
   5. Injectate mixing and delivery system design, and any special management procedures associated with the selected chemistry;
   6. Total cost for the fabricated system/injectate supply;
   7. A description of the winning vendor (including qualifications); and
   8. Any other items related to the fabrication of a remedial system or purchase and handling of a chemical injectate.
3. Discuss the system installation strategy, to include:
   1. Formal proposed system layout/footprint onsite, including system structures, pipe trenching, and discharge outfalls, with references to the actual design specifications, where applicable;
   2. Orientation of remediation points/wells (including radius of influence and construction specifications), excavation footprint (including any required shoring or benching), and/or location and construction details for engineered controls;
   3. Chemical injection mixing and delivery system operations, including injection point advancement, point design, injection network orientation, and delivery procedures;
   4. Total cost for the system installation or chemical injection process;
   5. A description of the winning vendor/service provider (including qualifications);
   6. A description of the proposed installation schedule (including details related to staffing and the installation timeline); and
   7. Any other items related to the installation of a remedial system or chemical injection process.
4. **Describe the remediation schedule in detail for both the active remediation and monitored natural attenuation cycles,** discussing the following, with reference to the attached engineered design and/or manufacturer literature (as applicable):
5. Discuss the predicted system operation and maintenance requirements, to include:
   1. Proposed schedule for selected technology to achieve plume stability and/or risk reduction (with a target of two (2) years of active operation);
   2. Proposed active remediation progress milestones (typically a quarterly schedule for evaluating the efficiency and effectiveness of the remedial strategy through monitoring contaminant mass throughput or in situ cleanup in excess of anticipated natural attenuation processes, etc.);
   3. Event frequency and estimated costs for labor and materials related to the maintenance of the remedial system (based upon the specific maintenance schedule for key components within the selected design and/or site-specific conditions) over the estimated active remediation cycle;
   4. Estimated utility/other operating costs related to system operation over the estimated active remediation cycle;
   5. Predicted treatment efficiency and target effluent/emission concentration at discharge;
   6. Status of any applicable permits necessary for system operation or waste disposal/discharge/exhaust (*Note: A CAP Record of Decision may not be approved if necessary permits for operation of a selected technology are not obtained*);
   7. Other limitations of the remedial technology, mechanism, or process (including access issues, technological feasibility, etc.) and proposed measures for dealing with limitations; and
   8. Figures and tables to illustrate system plan (Refer to the actual attached design where applicable.).
6. Description of the process of natural attenuation. Present the proposed monitored natural attenuation schedule following risk reduction through active remediation, to include (as applicable):
   1. Predicted residual contaminant volume/mass following completion of active remediation;
   2. Predicted natural attenuation risk-based cleanup goals based on site risk reclassification following completion of active remediation;
   3. Proposed schedule of the residual contaminant degradation process to achieve risk-based cleanup within ten (10) years of completing active remediation;
   4. Proposed monitored natural attenuation progress milestones (a quarterly, semiannual, annual, or variable schedule for evaluating the efficiency and effectiveness of natural attenuation to achieve the applicable risk-based cleanup goals for soil and groundwater at this site),
   5. Estimated costs for monitoring over the MNA cycle; and
   6. Anticipated costs for risk-based closure mechanisms (institutional or engineering controls, including any projected future monitoring of the maintenance of those controls over time, if applicable).
7. **Provide a full and accurate cost estimate** documenting the turnkey bids for the fabrication and installation of the remedial system (or excavation or chemical injection process), and total lifetime estimated costs for the implementation of the proposed active remedial option and the subsequent monitored natural attenuation cycles over time, from system startup to attainment of cleanup goals, including the costs for routine soil and groundwater monitoring, operation and maintenance, periodic reporting, waste disposal, engineering/institutional controls, etc.
8. Public Notice

If public notice is required under 15A NCAC 2L .0114(b) or .0409(a) for the remedial action alternative selected, provide any applicable modifications to the plan presented in the CA Study to ensure that the public notice will be properly completed and records of the notice maintained. If applicable, refer to Appendix H and provide updates to any of the following: a list of names and addresses of the local authorities and property owners/occupants to whom the public notice will be sent (and reference property owners/occupants table provided using Table B-6, if applicable), an example copy of the proposed public notice, and a copy of any notice that will be posted publicly and the proposed mechanism for that public posting. ***The final CAP Record of Decision (CA Decision) will not be approved until any and all required public notice is complete, and documentary proof is provided, as described above.***

1. Statements and Certification

**The following statements must be included at the closing of the document text, and must display the seal and signature of the certifying P.E. or L.G. in addition to the name and certification number of the company or corporation [See 15A NCAC 2L .0103(e).]**

|  |  |  |  |
| --- | --- | --- | --- |
| **1** | **Enter the date the Corrective Action Plan was due.** Click or tap to enter a date. **Will this Corrective Action Plan Design and Specification be submitted after the established due date?** | **YES** | **NO** |
| **2** | **Was any recommended information from the above template missing from this report?** | **YES** | **NO** |
| (IF the answer to question #1 or# 2 is “YES”, please replace this note with additional information in this cell to explain what was missing and why.) | | | |
| **3** | **Are there any known or suspected factors that could prohibit risk reclassification and the use of monitored natural attenuation to risk-based cleanup standards following the completion of two years of active remediation under the proposed strategy?** | **YES** | **NO** |
| (IF the answer to question #3 is “YES”, please replace this note with a short description of the possible reason(s), and outline proposed remedies. Greater detail should be provided in the report text above.) | | | |
| **4** | **Does any potential continuing source for the known contamination onsite remain (e.g., an existing, operating system onsite where a leaking component directly responsible for the discovered release has not been found and repaired/replaced, etc.)?** | **YES** | **NO** |
| **5** | **Does any known or suspected source zone soil contamination or free product remain outside of the assessed area that could inhibit the effectiveness of the proposed strategy?** | **YES** | **NO** |
| **6** | **Since release discovery, has there been any unexpected increase in contaminant mass sufficient to suggest a potential new release from a separate onsite or offsite source?** | **YES** | **NO** |
| (IF the answer to any question from #4 - #6 is “YES”, replace this note with a short description of any recommended actions to address, assess, or clean up any other known, suspected, or potential source. Greater detail should be provided in the report text above.) | | | |
| **7** | **Certification:**  I, [Name of Licensed Professional], a [Select License Type] for [Name of Firm or Company of Employment], do certify that the information contained in this report is correct and accurate to the best of my knowledge.  *(Affix Seal and Signature)*  [Name of Firm or Company of Employment] is licensed to practice [Select Corporate Licensure] in North Carolina*.* The certification number of the company or corporation is [Certification Number]. | | |

##### Figures

Provide the following:

1. A topographic map illustrating the area within 1500-foot radius of the UST system, showing:

* Topographic contours;
* Site location;
* Buildings;
* Adjacent streets, roads, highways (identified by street names and numbers);
* Surface water bodies;
* Groundwater flow direction(s); and
* North arrow and scale.

2. A site map\* and cross-sections illustrating the UST/AST system(s) and any spills, drawn to scale, showing:

* + Buildings and property boundaries;
* Streets, roads, highways;
* Underground utilities, such as sewer lines and other conduits; basements; and vaults;
* Water supply wells, surface water bodies;
* Location and orientation of current and former UST(s), pumps, product lines, sumps, etc.;
* Length, diameter and volume of current and former UST(s);
* Type of material(s) stored in UST(s) (currently and formerly); and
  + North arrow and scale.

3. Map(s)\* and geological cross-sections, drawn to scale, depicting all soil analytical results obtained to date, to include:

* Description of soil and bedrock lithology (as determined by investigation to date);
* Location and orientation of any current or former UST(s), AST(s), pumps, piping, sumps, etc., and any known spills;
* Soil sample identification (unique letter and/or numerical code), location, depth, and date collected;
* Soil sample analytical results;
* Final limits of each stage of excavation for each excavation on site (if applicable); and
* Two geological cross-sections, drawn across the contaminated area and intersecting at right angles, showing the vertical distribution of the contaminants in the unsaturated zone. (Indicate vertical and horizontal scale, orientation of each section, location of water table, soil types and lithology, all borings and sample locations represented by the sections, and soil analytical results for each represented sample, and show sections as labeled lines on the map.)

4. Map(s)\* depicting groundwater elevations, to include:

* Groundwater elevations (relative to MSL and corrected for presence of free product);
* Groundwater elevation data points (identified by monitoring well);
* Date of measurement (each map should represent a single water level measurement event);
* Potentiometric contour lines; and
* Groundwater flow direction.

5. Map\*, drawn to scale, depicting the groundwater and surface water analytical results,\*\* to include:

* Location and orientation of any current or former UST(s), AST(s), pumps, piping, sumps, etc., and any known spills;
* Groundwater sample identification (unique letter and/or numerical code referencing monitoring or water supply well), location, and date of sampling;
* Surface water sample identification (unique letter and/or numerical code), location, and date of sampling; and
* Groundwater and surface water sample analytical results.

6. Individual groundwater contaminant isoconcentration contour maps\* for every contaminant present in concentrations which exceed the 2L standard limits,\*\* including:

* Contaminant concentrations (in µg/L) with concentrations in exceedance of MSCCs indicated);
* Contaminant concentration data points (identified by monitoring well);
* Date of measurement (each map should represent a single sampling event;
* Isoconcentration contour lines (solid, if determined from adequate data points; dotted, if estimated);
* A bold isoconcentration contour line representing the 2L standard limit, or CAP cleanup goal, if different, for the contaminant;
* A general plan depicting the footprint of any groundwater remediation system installed on site; and
* Two geological cross-sections, one drawn along the long axis of the plume and the second, across it at right angles, showing the vertical distribution of the contaminants in the saturated zone. (Indicate vertical and horizontal scale, orientation of each section; location of water table; and all monitoring wells represented by the sections, and show sections as labeled lines on the map.)

7. A free product map\* depicting thickness and extent of free product and date of measurement, with a general plan of the footprint of any free product recovery system installed on site\*\*.

8. A potential receptor map that clearly identifies water supply wells (municipal or public/private wells, etc.) and other potential receptors (surface water bodies, basements, utilities, wellhead protection areas, etc.) within 1500’ of the source of the release.

9. A land use map that identifies the following items within 1500’ of the source of the release:

* Features sensitive to impact from the release (schools, daycare centers, nursing homes, hospitals, playgrounds, parks and recreation areas, churches, camps and other places of assembly);
* Properties within or contiguous to the area containing contamination or within and contiguous to the area where the contamination is expected to migrate; and
* Zoning status.

10. A map\* and cross-sections, to be used in conjunction with soil contamination map/cross-sections in item #3, illustrating 3-dimensional extent of proposed excavation area to scale.\*\*

11. Maps\* and cross-sections, to be used in conjunction with soil contamination map/cross-sections in item #3, illustrating, to scale, the proposed remedial technology for soil contamination (present the anticipated system design and layout, to include all major components of the system) or any proposed remedial excavation footprints.\*\*

12. Maps\* and cross-sections, to be used in conjunction with groundwater elevation map, groundwater contamination map/cross-sections, groundwater isoconcentration maps/cross-sections in items #4-6, illustrating, to scale, the orientation of the proposed remedial technology for groundwater contamination and/or free product recovery (present the anticipated system design and layout, to include all major components of the system), or the proposed chemical injection network (if applicable).\*\*

***\*Note:*** *Use a single base map to prepare site plans using a map scale of 1 in. = 40 ft.; use a smaller scale for large sites. Maps and figures should include conventional symbols, notations, labeling, legends, scales, and north arrows and should conform to accepted practices of map presentation described in the USGS Geological Survey publication "Topographic Map Symbols”,* [http://store.usgs.gov](http://store.usgs.gov/). *Scale should be expressed as a graphic scale and a verbal statement (e.g., 1 in.= 40 ft) or ratio. Refer to* <http://geokov.com/Education/map-scale.aspx>.

\*\* *If applicable*

##### Tables

Provide the following:

1. Site History (Complete Tables B-1 and B-2 from *Guidelines*, Appendix B);
2. Public and Private Water Supply Well and Other Receptor Information (Complete Table B-5 from *Guidelines*, Appendix B)\*;
3. Field Screening Results\*;
4. Summary of Soil Sampling Results (Complete Table B-3 from *Guidelines*, Appendix B)\*;
5. Summary of Groundwater and Surface Water Sampling Results (Complete Table B-4 from *Guidelines*, Appendix B)\*;
6. Monitoring, Pilot, and Remediation Well Construction Information (Complete Table B-7 from *Guidelines*, Appendix B)\*;
7. Free Product Recovery Information (Complete Table B-8A from *Guidelines*, Appendix B)\*;
8. Cumulative Volume of Free Product Recovered from Site (Complete Table B-8B from *Guidelines*, Appendix B)\*;
9. Current and Historical Groundwater Elevations and Free Product Thickness (Complete Table B-9 from *Guidelines*, Appendix B)\*;
10. Land Use (Complete Table B-10 from *Guidelines*, Appendix B);
11. Remediation Schedules and Cleanup Progress Milestones for the Active Remedial Option and Monitored Natural Attenuation Phase;
12. Lifecycle Cost Estimates for the Active Remedial Option and Monitored Natural Attenuation Phase.

*\* If applicable*

***Provide additional tables as necessary to compile information critical to evaluating the proposed remedial technology or procedure (e.g., SVE pilot test data, water supply users to be connected to municipal water supply, etc.) and to validate the proposed schedules and costs for the active remedial option and monitored natural attenuation phase.***

##### Appendices

Provide the following:

Appendix A Site Specific Health and Safety Plan (HASP)\*

Appendix B Copies of permits (soil treatment, wastewater treatment, etc.)\*

Appendix C Geologic logs for borings (related to CAP investigation / pilot studies only)\*

Appendix D Copies of the NORR, NOV, etc. requiring the CAP\*

Appendix E All received bid packages (and bid rejections) related to system fabrication or installation.

Appendix F Full remediation system design and specifications, including any applicable diagrams or maps not included above and any calculations or models to validate the system design.

Appendix G Pilot test data/calculations\*.

Appendix H List of local authorities and property owners/occupants to whom public notice of corrective action is to be sent, an example copy of the public notice and a copy of any notice to be publicly posted (if different).

*\* If applicable (or if modified from any version provided with the CA Study)*

*Provide additional appendices as needed to better illustrate the remedial strategy design and specification.*

#### C. Record of Decision

*This template outlines the* ***typical*** *structure of a Corrective Action Record of Decision (CA Decision) completing the Corrective Action Plan (CAP) at an eligible site operating under the current Reasonable Rate Document (RRD) to maintain access to the Commercial Leaking Petroleum Underground Storage Tank Trust Fund (Trust Fund).*

*The objective of the standalone CA Decision portion of this multi-part CAP process at Trust Fund-eligible sites is to provide a formal statement of objectives, schedules, and milestones for the selected remedial strategy and the associated remedial system design that were provided in the preceding CAP CA Study and CA Design steps, as approved by the Department. The CA Decision should focus on clearly defining these objectives, schedules, and milestones to be used to track cleanup progress for both the active remediation and natural attenuation phases of the CAP, following the strategy described in the June 1, 2016 UST Section Memo entitled “*[North Carolina Petroleum UST Release Corrective Action Phase Project Management: A Calibrated Risk-Based Corrective Action Decision & Implementation Guide](https://files.nc.gov/ncdeq/Waste%20Management/DWM/UST/Corrective%20Action/Corrective%20Action%20Selection_6_1_16.docx)*.” The CA Decision should include any information necessary to validate the proposed cleanup objectives, schedule, and milestones, proof of proper completion of public notice, as required for risk-based cleanup goals, as well as a signature page for all parties to the agreement similar to that depicted below.*

*Please note that this CA Decision may differ from other programs with similar ‘Records of Decision’ as it does not formally bind all parties to the letter of the text under threat of penalties or fines. Instead, the CA Decision represents a statement of agreed-upon expectations for site cleanup that are acceptable to the Responsible Party, their primary environmental consultant, the remediation system design engineer, and the Department of Environmental Quality (as represented by the UST Section Corrective Action and Trust Fund Branches.) If, during the course of the implementation of this CAP, the proposed objectives, schedules, and milestones are not being met for any reason (other than negligence or fraud), or if there is any material change to the site or surrounding area that could alter the applicable risk classification for the site, any party to the agreement has the right to request an amendment to the CA Decision going forward, without penalty.*

1. Site Information
2. Site Identification

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Date of Report: |  | | | | Site Risk/Ranking: | | |  |
| Facility I.D.: |  | | UST Incident Number (if known): | | | | |  |
| Site Name: |  | | | | | | | |
| Street Address: |  | | | | | | | |
| City/Town: |  | | Zip Code: |  | | County: | |  |
| Description of Geographical Data Point (e.g., diesel fill port): | | | |  | | | | |
| Location Method (GPS, topographical map, online map, other): | | | |  | | | | |
| Latitude (***decimal degrees***): | |  | Longitude (***decimal degrees***): | | | |  | |

1. Information about Contacts Associated with the Leaking UST System (Addresses must include street, city, state, zip code and mailing address, if different.)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UST/AST Owner: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| UST/AST Operator: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Property Owner: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Property Occupant: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Consultant/Contractor: | | |  | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Analytical Laboratory: | | |  | | State Certification No: | | | | |  |
| Address: |  | | | | | | Tel: | |  | |

1. Information about Release

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date Discovered: |  | | | |
| Estimated Quantity of Release: | |  | | |
| Cause of Release: |  | | | |
| Source of Release (e.g., Dispenser/Piping/UST): | | |  | |
| Sizes and Contents of Tanks or Other Containment from which the Release Occurred: | | | |  |

1. Executive Summary

Summarize the most pertinent information about the site and the release and indicate the recommended remedy for contamination, using the following outline:

1. Briefly summarize key information about -
   1. The release (such as the source(s), date of discovery, quantity, and type(s) of contaminant released;
   2. Prior remedial actions, including initial abatement, system closure, soil removal, free product recovery, and provision of alternate water;
2. Briefly summarize the conceptual site model based on any previous hydrogeological investigation(s), including key information about:
   1. Soil, groundwater, surface water impacts, and any measured free product (if applicable),
   2. The nature and known extent of contamination, and estimated rate and direction of contaminant migration
   3. The risk classification and ranking and the criteria driving that classification, and likelihood that nearby receptors will be impacted;
3. Briefly summarize the proposed remedial strategy and the basis for this selection, describing in general terms:
   1. The proposed means of accommodating site risk to reduce the risk classification over time,
   2. The target cleanup levels for soil and/or groundwater based on that projected site risk,
   3. The projected timeline for implementation of the remedial strategy, including the schedule for active remediation (typically ~2-3 years), monitored natural attenuation (typically <10 years),
   4. The methods that will be used to evaluate the effectiveness and efficiency of the strategy over time, and
   5. A general total estimate of the anticipated cost for implementation and operation of the strategy over the projected lifetime of the site.
4. Briefly summarize the proposed remediation system design, describing in general terms:
   1. Projected operating capacities of the primary remedial system components, as applicable (such as recovery or injection volumes and rates, areas of influence or remediation zones, etc.),
   2. The proposed orientation of the system with respect to the site (e.g., projected system structure placement, general trenching orientation, general location of remediation points/wells, discharge outfalls, general excavation footprint orientation, etc.),
   3. General name and location for vendors contacted for bids related to fabrication and/or installation (and any other applicable task) and the total costs represented in the winning bids,
   4. Estimated schedule for fabrication and installation or injection once approval of the CAP is completed,
   5. The target active remediation milestones that have been modeled to represent plume stability and receptor protection, and
   6. An estimate of the anticipated cost for implementation and operation of the remediation system during the active remediation phase of cleanup.
5. Briefly summarize the proposed monitored natural attenuation phase, describing in general terms:
   1. Any receptor protection/relocation/replacement steps that will supplement the active remediation in providing for risk reclassification and monitored natural attenuation to a risk-based cleanup goal,
   2. The projected monitoring point count, sampling frequency, and analytical methodologies (and any projected reduction in count, frequency, or methodology changes with time),
   3. The milestones that will be used to evaluate the effectiveness and efficiency of the natural attenuation over time, and
   4. An estimate of the anticipated cost for monitoring the natural attenuation remediation phase of cleanup, and any required supplemental engineering or institutional controls projected to be included as part of a risk-based cleanup onsite.
6. Table of Contents

Provide a table of contents, as follows:

1. List sections, indicating page numbers;
2. List figures, identifying each by number;
3. List tables; identifying each by number; and
4. List appendices, identifying each by letter
5. Update of Site History and Characterization

Any site characterization information provided in the CSA, CA Study, CA Design, or any other report that has been found to be erroneous or otherwise requires updating should be included here. This includes information that would be provided in Sections D through F from the CSA template from the *Guidelines* (Template #6,) covering the site history and characterization, receptor information, and land use. Updates should follow the outlines provided in those sections and include the relevant tables referenced in the CSA template. At a minimum, the receptor survey and land use information must be resurveyed if the existing data have not been updated within the last five years. *Please note: Any deficiencies from the CSA, CA Study, CA Design, or any other report that are not corrected in this section could result in the rejection of the CA Decision by the Department and denial of any claimed costs associated with any preceding part of this multi-step Corrective Action Plan.*

1. Update of Site Assessment Information

Any plume assessment information provided in the CSA, CA Study, CA Design, or any other report that has been found to be erroneous or otherwise requires updating should be included here. This includes information that would be provided in Sections G through M from the CSA template from the *Guidelines* (Template #6,) covering soil or groundwater assessment, free product assessment and recovery, hydrogeological testing, regional or site-specific geology and hydrogeology, and groundwater plume modeling. This also includes updating or otherwise describing any information provided within the earlier CA Design that is found to no longer be accurate or representative, in whole or in part, related to any aspect of the proposed remedial strategy and remediation system design, including any changes that could affect site risk or available remedial strategies (such as unforeseen complications for system implementation, changes to any proposed permits, plans for site redevelopment, installation of public water in the area, etc.) Updates should follow the outlines provided in the applicable CSA, CA Study, or CA Design sections and include the relevant tables referenced in those report templates. *Please note: Any deficiencies from the CSA, CA Study, CA Design, or any other report that are not corrected in this section could result in the rejection of the CA Decision by the Department and denial of any claimed costs associated with any preceding part of this multi-step Corrective Action Plan.*

1. Objectives for Corrective Action at the Site

1. Refer to the Notice of Regulatory Requirements (NORR) directing the preparation and submittal of the CAP and any Notices of Violation (NOV) and/or enforcement documents related to CAP submittal, including the date the Notices were made (include copies within Appendix D.);

2. State the purpose and objectives of the CAP (e.g., free product recovery, containment or retardation of plume migration, reduction of contaminant concentrations, protection of nearby water supplies, etc.); and

3. Examine and evaluate the cleanup goals of the CAP:

* Discuss the extent of contamination (both at the time of the CSA and recent sampling events, if applicable).
* Indicate the maximum contaminant concentration levels.
* Discuss the potential for contaminant migration and the likelihood of impact to any receptors.
* Describe steps that could result in the removal, replacement, or confirmed protection of any receptors, allowing for lowering or the risk classification and/or rank.
* Discuss the applicable active cleanup levels for soil, groundwater, surface water, and free product (and the basis for their determination) that will provide for plume stability and the protection of at-risk receptors.
* Discuss the applicable natural attenuation target levels for soil and groundwater that are predicted to all the site to reach risk-based cleanup levels over time (and the basis for their determination).

1. Remedial Action Implementation and Evaluation

Discuss in detail:

1. The remedial objectives and projected schedule for active remediation based upon the CA Study and CA Design:

* Discuss the baseline total contaminant mass (or other metric) that will be used to evaluate system effectiveness and efficiency (if applicable).
* For each applied recovery/extraction technology, discuss the predicted mass removal rates that will be measured over time.
* For each in situ/injection technology, discuss the remedial impact that is predicted above background natural attenuation that will be measured and modeled over time.
* For maintained engineering controls, barrier, or plume capture technologies, discuss the modeling used to validate this strategy in the CA study and describe how continued control will be maintained and measured over time.
* Provide discrete, measurable milestones against which each technology above will measured for efficiency and effectiveness on a quarterly basis, and where possible, provide metrics that might trigger the need for a reevaluation and/or modification of the active remedial strategy.
* Discuss the procedure for confirming that the active remediation cleanup goal and plume stability, or alternatively, the technological limitations of the remedial strategy, have been reached (e.g., threshold values, modeling, consecutive events with specific readings from the system or site, etc.).

1. The proposed schedule for any potential receptor protection/relocation/replacement strategies to supplement the active cleanup:

* Provide dates for any scheduled receptor replacement or relocation that is currently planned (such as well abandonments and connection to public water, etc.).
* Discuss the possibility for future opportunities to reevaluate receptor replacement (such as plans by public water supply providers to extend water lines into an unserved area, scheduled redevelopment or property transactions, etc.).
* Discuss limitations on receptor replacement (such as well owners who do not wish to connect to public water and/or abandon their wells) and the steps taken to resolve the issues.
* Provide a schedule for reevaluation of the receptor network status throughout the active remediation phase to determine if a change in ownership or use of a specific receptor may allow for a modification to the remedial strategy.

1. The projected schedule for natural attenuation based upon the expectation of remediation of the source area by the active remediation system to provide for plume stabilization and risk reclassification:

* Discuss the predicted natural attenuation rates that will be measured over time, using the projected contaminant concentrations remaining after active remediation is completed as a baseline.
* Provide discrete, measurable milestones against which natural attenuation will measured (quarterly, semi-annually, annually, or over a shifting cycle)
* Provide metrics, where applicable, that might trigger the need for a supplemental temporary active remediation (e.g., MMPE, or a short-term remediation system rental, etc.) or the reevaluation and/or modification of the natural attenuation strategy.
* Provide a schedule for reevaluation of the receptor network status throughout the natural attenuation phase to determine if any changes in the number, location, or use of any receptors could place a receptor at risk of becoming impacted, requiring a site risk reevaluation.
* Discuss the procedure for confirming that the risk-based cleanup goals have been reached, allowing for site closure (with any applicable engineering or institutional control as described below).

1. The proposed schedule and estimated costs for any engineering or institutional controls that are expected to be necessary for the completion of risk-based corrective action at this site, including any efforts associated with maintaining and/or providing proper notice with respect to the applied controls over time.
2. Where an active remediation schedule in excess of 3 years has been proposed as providing for a more cost effective remedial strategy due to offsets from a shortened natural attenuation schedule, provide additional details including cost justifications to validate the savings predicted for the increased active and decreased natural attenuation schedules in the sections.
3. Where additional ineligible cleanup expenses will be incurred above those representing the most cost effective alternative, at the discretion of the responsible party (e.g., to facilitate a property transaction, or as part of redevelopment, etc.), provide additional details to delineate any Trust Fund ineligible efforts that should be recorded within this CA Decision for tracking purposes from any eligible activities for which reimbursement is anticipated. *[Please note, additional documentation will also be required with any claim where ineligible and eligible activities overlap. Please contact the Trust Fund at (919) 707-8171 if you have any questions about necessary claim documentation.]*
4. Public Notice

If public notice is required under 15A NCAC 2L .0114(b) or .0409(a) for the remedial action alternative selected, provide documentation that the public notice was properly completed. Refer to Appendix H and provide therein the following: a list of names and addresses of the local authorities and property owners/occupants to whom the public notice was sent (and reference property owners/occupants table provided using Table B-6, if applicable), an example copy of the public notice, and a copy of any notice that was posted publicly along with a description of the mechanism for that public posting. ***The final CAP Record of Decision (CA Decision) will not be approved until any and all required public notice is complete, and documentary proof is provided, as described above.***

1. Statements and Certification

**The following statements must be included at the closing of the document text, and must display the seal and signature of the certifying P.E. or L.G. in addition to the name and certification number of the company or corporation [See 15A NCAC 2L .0103(e).]**

|  |  |  |  |
| --- | --- | --- | --- |
| **1** | **Enter the date the Corrective Action Plan was due.** Click or tap to enter a date. **Will this Corrective Action Plan Record of Decision be submitted after the established due date?** | **YES** | **NO** |
| **2** | **Was any recommended information from the above template missing from this report?** | **YES** | **NO** |
| (IF the answer to question #1 or# 2 is “YES”, please replace this note with additional information in this cell to explain what was missing and why.) | | | |
| **3** | **Are there any known or suspected factors that could prohibit risk reclassification and the use of monitored natural attenuation to risk-based cleanup standards following the completion of two years of active remediation under the proposed strategy?** | **YES** | **NO** |
| (IF the answer to question #3 is “YES”, please replace this note with a short description of the possible reason(s), and outline proposed remedies. Greater detail should be provided in the report text above.) | | | |
| **4** | **Does any potential continuing source for the known contamination onsite remain (e.g., an existing, operating system onsite where a leaking component directly responsible for the discovered release has not been found and repaired/replaced, etc.)?** | **YES** | **NO** |
| **5** | **Does any known or suspected source zone soil contamination or free product remain outside of the assessed area that could inhibit the effectiveness of the proposed strategy?** | **YES** | **NO** |
| **6** | **Since release discovery, has there been any unexpected increase in contaminant mass sufficient to suggest a potential new release from a separate onsite or offsite source?** | **YES** | **NO** |
| (IF the answer to any question from #4 - #6 is “YES”, replace this note with a short description of any recommended actions to address, assess, or clean up any other known, suspected, or potential source. Greater detail should be provided in the report text above.) | | | |
| **6** | **Primary Consultant Certification:**  I, [Name of Licensed Professional], a [Select License Type] for [Name of Firm or Company of Employment], do certify that the information contained in this report is correct and accurate to the best of my knowledge.  *(Affix Seal and Signature)*  [Name of Firm or Company of Employment] is licensed to practice [Select Corporate Licensure] in North Carolina*.* The certification number of the company or corporation is [Certification Number]. | | |

1. Record of Decision

|  |  |  |  |
| --- | --- | --- | --- |
| By signing the following Record of Decision, we the undersigned state that the Corrective Action Plan that has been presented in the Feasibility Study, Design and Specification, and Record of Decision documents represents, to the best of our individual understanding, the most cost-effective risk-based remediation strategy available for this site, within current technological and fiscal limitations, and under the guidance offered by the Department of Environmental Quality, Division of Waste Management, Underground Storage Tank Section. We acknowledge that this formal statement of agreement is binding to all signatories. Any future changes to the remediation strategy may be recommended by any party without penalty, if site conditions change or if the schedule presented above is not maintained (absent evidence of fraud, negligence, or willful and wanton misconduct.). | | | |
| **Responsible Party and Representatives** | | | |
| **Responsible Party (or Legal Agent)** |  |  |  |
|  | *(signature)* |  |
|  |  |  |
|  | *(printed name of responsible party - individual or corporate)* |  |
|  |  |  |
|  | *(printed name and title of agent signing on behalf of the responsible party, if applicable)* |  |
| **Primary Environmental Consultant Representative (Licensed Geologist, Licensed Soil Scientist, or Professional Engineer)** |  |  |  |
|  | *(signature and seal)* |  |
|  |  |  |
|  | *(printed name, license number, and title of agent signing for the primary consultant)* |  |
|  |  |  |
|  | *(name of primary environmental consulting firm)* |  |
| **Engineer of Record for Remediation System  Design and Specification** *(if applicable)* |  |  |  |
|  | *(signature and seal)* |  |
|  |  |  |
|  | *(printed name and license number)* |  |
|  |  |  |
|  | *(name of professional engineering firm, if applicable)* |  |
| **Department of Environmental Quality - Division of Waste Management  Underground Storage Tank Section Representatives** | | | |
| **Corrective Action Branch Incident Manager** |  |  |  |
|  | *(signature)* |  |
|  |  |  |
| *(printed name and title)* | | |
| **Corrective Action Branch Regional Supervisor  (or Branch Head)** |  |  |  |
|  | *(signature)* |  |
|  |  |  |
| *(printed name and title)* | | |
| **Trust Fund Branch Technical Auditor (or Branch Head)** |  |  |  |
|  | *(signature)* |  |
|  |  |  |
| *(printed name and title)* | | |
| **UST Section Reviewing Engineer** *(if applicable)* |  |  |  |
|  | *(signature)* |  |
|  |  |  |
| *(printed name and title)* | | |

1. Figures

Provide the following:

1. A topographic map illustrating the area within 1500-foot radius of the UST system, showing:

* North arrow and scale;
* Topographic contours;
* Site location;
* Buildings;
* Adjacent streets, roads, highways (identified by street names and numbers);
* Surface water bodies; and
* Groundwater flow direction(s).

1. A land use map that identifies the following items within 1500’ of the source of the release:

* Water supply wells (municipal or public/private wells, etc.) and other potential receptors (surface water bodies, basements, utilities, wellhead protection areas, etc.) within 1500’ of the source of the release;
* Features sensitive to impact from the release (schools, daycare centers, nursing homes, hospitals, playgrounds, parks and recreation areas, churches, camps and other places of assembly);
* Properties within or contiguous to the area containing contamination or within and contiguous to the area where the contamination is expected to migrate; and
* Zoning status.

1. A site map\*, drawn to scale, illustrating the UST/AST system(s), and depicting groundwater elevations, showing:

* North arrow and physical scale;
* Buildings and property boundaries;
* Streets, roads, highways;
* Underground utilities, such as sewer lines and other conduits; basements; and vaults;
* Water supply wells, surface water bodies;
* Location and orientation of current and former UST(s), pumps, product lines, sumps, etc.;
* Length, diameter and volume of current and former UST(s);
* Type of material(s) stored in UST(s) (currently and formerly);
* Groundwater elevations (relative to MSL and corrected for presence of free product);
* Groundwater elevation data points (identified by monitoring well);
* Date of measurement (each map should represent a single water level measurement event);
* Potentiometric contour lines; and
* Groundwater flow direction.

1. Map(s)\*, (and cross-sections, where applicable) drawn to scale, depicting any spills and/or the measured extent of soil and/or groundwater contamination to include:

* Location and orientation of any current or former UST(s), AST(s), pumps, piping, sumps, etc., and any known spills;
* Final limits of each stage of excavation for each previous excavation on site (if applicable);
* Soil sample identification (unique letter and/or numerical code) and location, sampling date, depth, and analytical results for primary constituent(s) of concern (in mg/kg);
* Groundwater and surface water sample identification (unique letter and/or numerical code) and location, sampling date, and analytical results for primary constituent(s) of concern (in µg/L).
* Free product measurements, including identification (unique letter and/or numerical code) and location, measurement date, and measured thickness.
* Projected footprint delineating the horizontal extent of secondary source contaminated soils / residual free product based on soil analytical results and/or free product measurement data;
* Isoconcentration contour lines for groundwater (solid, if determined from adequate data points; dotted, if estimated);
* A bold soil footprint and/or groundwater isoconcentration contour line representing the MSCC / 2L standard limit, or CAP cleanup goal, if different, for the primary contaminant(s) of concern;

1. Map(s)\* (and cross-sections, where applicable) to be used in conjunction with the contamination delineation map/cross-sections above, illustrating to scale:

* Location and orientation of any current or former UST(s), AST(s), pumps, piping, sumps, etc., and any known spills;
* A 3-dimensional projection of the extent of any proposed excavation area\*\*;
* The proposed remedial technology for soil contamination presenting the anticipated system design and layout, to include all major components of the system, and extent of system influence\*\*;
* The proposed remedial technology for groundwater contamination and/or free product recovery presenting the anticipated system design and layout, to include all major components of the system, extent of system influence, and point of discharge (if applicable)\*\*; and
* The proposed chemical injection network\*\*.

***\*Note:*** *Use a single base map to prepare site plans using a map scale of 1 in. = 40 ft.; use a smaller scale for large sites. Maps and figures should include conventional symbols, notations, labeling, legends, scales, and north arrows and should conform to accepted practices of map presentation described in the USGS Geological Survey publication "Topographic Map Symbols”,* [http://store.usgs.gov](http://store.usgs.gov/). *Scale should be expressed as a graphic scale and a verbal statement (e.g., 1 in.= 40 ft) or ratio. Refer to* <http://geokov.com/Education/map-scale.aspx>.

\*\* *If applicable*

##### K. Tables

Provide the following:

1. Remediation Schedules, including Applicable Baseline and Cleanup Progress Milestones for the Active Remedial Option and Monitored Natural Attenuation Phase;
2. Lifecycle Cost Estimates for the Active Remedial Option and Monitored Natural Attenuation Phase.

Where necessary, provide updated tables for each of the following to document any changes to data presented in the equivalent CA Study or CA Design tables:

1. Site History (Complete Tables B-1 and B-2 from *Guidelines*, Appendix B)\*;
2. Public and Private Water Supply Well and Other Receptor Information (Complete Table B-5 from *Guidelines*, Appendix B)\*;
3. Field Screening Results\*;
4. Summary of Soil Sampling Results (Complete Table B-3 from *Guidelines*, Appendix B)\*;
5. Summary of Groundwater and Surface Water Sampling Results (Complete Table B-4 from *Guidelines*, Appendix B)\*;
6. Monitoring, Pilot, and Remediation Well Construction Information (Complete Table B-7 from *Guidelines*, Appendix B)\*;
7. Free Product Recovery Information (Complete Table B-8A from *Guidelines*, Appendix B)\*;
8. Cumulative Volume of Free Product Recovered from Site (Complete Table B-8B from *Guidelines*, Appendix B)\*;
9. Current and Historical Groundwater Elevations and Free Product Thickness (Complete Table B-9 from *Guidelines*, Appendix B)\*;
10. Land Use (Complete Table B-10 from *Guidelines*, Appendix B)\*;

\* *If applicable*

***Provide additional tables as necessary to compile information critical to evaluating the proposed remedial technology or procedure (e.g., SVE pilot test data, water supply users to be connected to municipal water supply, etc.) and to validate the proposed schedules and costs for the active remedial option and monitored natural attenuation phase.***

##### L. Appendices

Provide the following:

1. Copies of the NORR, NOV, etc. requiring the CAP
2. List of local authorities and property owners/occupants to whom public notice of corrective action is to be sent, an example copy of the public notice and a copy of any notice to be publicly posted (if different).

*Where necessary, provide updated appendices for each of the following to document any changes to data presented in the equivalent CA Study or CA Design reports:*

1. Site Specific Health and Safety Plan (HASP)\*
2. Copies of permits (soil treatment, wastewater treatment, etc.)\*
3. Geologic logs for borings (related to CAP investigation / pilot studies only)\*
4. All received bid packages (and bid rejections) related to system fabrication or installation.\*
5. Full remediation system design and specifications, including any applicable diagrams or maps not included above and any calculations or models to validate the system design.\*
6. Pilot test data/calculations\*.

*\* If applicable*

***Provide additional appendices as needed to better illustrate the remedial strategy design and specification.***

### Soil Cleanup Plan

*(For petroleum UST releases for which the risk has been reduced to low following a CSA)*

Minimum elements of the report:

**A. Site Information**

1. Site Identification

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Date of Report: |  | | | | Site Risk: | |  |
| Facility I.D.: |  | | UST Incident Number (if known): | | | |  |
| Site Name: |  | | | | | | |
| Street Address: |  | | | | | | |
| City/Town: |  | | Zip Code: |  | County: | |  |
| Description of Geographical Data Point (e.g., diesel fill port): | | | |  | | | |
| Location Method (GPS, topographical map, other): | | | |  | | | |
| Latitude (***decimal degrees***): | |  | Longitude (***decimal degrees***): | | |  | |

2. Information about Contacts Associated with the Release *(Addresses must include street, city, state, zip code and mailing address, if different)*

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UST/AST Owner: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| UST/AST Operator: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Property Owner: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Property Occupant: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Consultant/Contractor: | | |  | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Analytical Laboratory: | | |  | | State Certification No: | | | | |  |
| Address: |  | | | | | | Tel: | |  | |

3. Information about Release

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date Discovered: |  | | | |
| Estimated Quantity of Release: | |  | | |
| Cause of Release: |  | | | |
| Source of Release (e.g., Dispenser/Piping/UST): | | |  | |
| Sizes and Contents of Tanks or Other Containment from which the Release Occurred: | | | |  |

4. Certification (***The title page must display the seal and signature of the certifying P.E. or L.G. and the name and certification number of the company or corporation [See 15A NCAC 2L .0103(e).]****)*

I, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, a Professional Engineer/Licensed Geologist *(circle one)* for (firm or company of employment), do certify that the information contained in this report is correct and accurate to the best of my knowledge.

*(Please Affix Seal and Signature)*

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(Name of company or corporation) is licensed to practice geology/engineering *(circle one or both)* in North Carolina*.* The certification number of the company or corporation is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

##### B. Executive Summary

Present a brief summary of the most pertinent information about the site and the release and indicate the recommended remedy for soil contamination, using the following outline:

1. Describe the source, date of discovery, and quantity and type(s) of contaminant released;

2. Summarize initial abatement actions, including closure, soil removal, free product recovery, and provision of alternate water;

3. Describe the results of hydrogeological investigation from the CSA;

4. Summarize the results of soil, groundwater, and surface water assessment and free product measurement from the CSA and from subsequent monitoring, indicating the nature and extent of contamination, the estimated rate of migration, and potential for impacting receptors;

5. Indicate the risk classification and the criteria for that determination;

6. Indicate the concentration levels to which soil contamination must be remediated; and

7. Present the selected remedy for soil contamination and discuss the basis for selection, schedule for implementation, remediation progress milestones, and cost.

##### Table of Contents

Provide a table of contents, as follows:

1. List sections, indicating page numbers;

2. List figures, identifying each by number;

3. List tables; identifying each by number; and

4. List appendices, identifying each by letter.

##### D. Site History

Present information relevant to site history and characterization, ***updating information provided in IAA and LSA, and CSA reports***, using the following outline:

1. Provide information for UST/AST owners/ operators and other responsible parties.

Refer to table (Use Table B-2, Site History, UST/AST Owner/Operator and Other Responsible Party Information, from the *Guidelines*, Appendix B.)

2. Provide UST information (inclusive of all USTs, currently and historically in place at facility).

* Refer to table (Use Reporting Table B-1, Site History- UST/AST System and Other Release Information, from the *Guidelines*, Appendix B) and to site map;
* Briefly discuss the spatial and historical relationships among tanks and between tanks and piping and dispensers, describe all historical compliance issues and releases (indicate incident number), and indicate from which UST system(s) the currently investigated release originated.

3. Provide information about petroleum AST systems, petroleum spills, and other petroleum non-UST releases.

* Refer to table (Use Reporting Table B-1, Site History- UST/AST System and Other Release Information, from the *Guidelines*, Appendix B.)and to site map;
* List, describe, and indicate location (refer to location on site map) of spills which have occurred at site.

4. Provide a comprehensive description of the release, including date discovered, cause and source (including tank identification number and contents), and the relationship of historical UST releases, non-UST releases, and off-site releases (indicate incident number) to contamination from current release.

5. Provide a brief description of site characteristics (including land use of site and surrounding area, topography, vegetation, surface water, wells, buildings, surface cover, soil type, depth to and nature of bedrock, depth to groundwater, direction of groundwater flow, etc.).

6. Provide information on owners and occupants of property within or adjacent to area containing contamination or the area where contamination is expected to migrate and describe land use.

* Refer to tables (Use Table B-6, Property Owners/ Occupants; and Table B-10, Land Use) and refer to land use map.

1. Present information on receptors/potential receptors.

* Refer to table (Use Table B-5, Public and Private Water Supply Well and other Receptor Information;) and to potential receptor map.

8. List all report previously submitted.

9. Summarize initial abatement and corrective actions performed to date, including excavation of contaminated soil and free product removal.

**E. Summary of Site Assessment Information**

1. Briefly summarize groundwater, surface water, and free product assessment information provided to date, as follows:

* Refer to tables in Section J (Use Table B-4, Summary of Groundwater and Surface Water Sampling Results); Table B-9, Current and Historical Groundwater Elevations and FP Thickness) and to map(s) showing groundwater elevation and flow; Confirm that no (or less than 0.01 foot) free product exists; and
* Confirm that groundwater contamination is not present in excess of the GCLs or other alternate standards approved for the site and indicate that no further remediation of groundwater is required at the site.

2. Summarize soil assessment information presented in the CSA and previous reports, as follows:

a. Refer to tables in Section J (Use Table B-3, Summary of Soil Sampling Results) and to maps and geological cross-sections depicting soil analytical results and the horizontal and vertical extent of soil contamination;

b. Identify samples that exceed the:

* the residential MSCCs or
* the industrial/commercial MSCCs.; and
* the soil-to-groundwater MSCCs (to determine the need for public notification on site closure)

c. Describe the horizontal and vertical extent of contaminants in soil exceeding applicable cleanup levels and estimate the volume of soil that will require remediation.

3. Describe the geology and hydrogeology of the region and the site.

* Describe soil and bedrock encountered at the site (Refer to geologic cross sections of map illustrating soil contamination and to geologic logs for borings.);
* Discuss site hydrogeology (Include the following information: depth to groundwater, groundwater flow direction (estimated or calculated), and hydraulic gradient (vertical and horizontal), if determined.);

4. Summarize and evaluate assessment information. *Note that the goal of soil assessment at the SCP stage is to delineate soil contamination vertically and horizontally in the unsaturated zone from the source of the release to limits equivalent to the residential or industrial/commercial maximum soil contaminant concentrations, whichever are applicable*:

* Describe extent of contamination;
* Describe maximum contaminant concentration levels;
* Indicate the applicable cleanup levels for soil (and the basis for determination).

**F. Objectives of Corrective Action at the Site**

1. Indicate the NORR requiring preparation and submittal of the SCP and any NOVs and enforcement documents related to SCP submittal (Refer to Appendix D.);

2. State purpose and objectives of the SCP (e.g., to assess and delineate contamination in the unsaturated zone and to propose appropriate remedial action for that soil contamination); and

3. State the cleanup goals of the SCP (Refer to previous Section E, item 4).

**G. Evaluation of Remedial Actions**

1. Present and comprehensively evaluate remedial options:

a. Evaluate excavation as a remedial option for soil (mandatory);

b. In addition to the mandatory evaluation of excavation, evaluate at least one viable option for remediating soil contamination, which can consist of any single technology or any combination of a technology (or technologies) with mechanisms and processes that will achieve full cleanup of contamination, with the stipulation that excavation must be included if determined to be viable when combined with other actions;

c. Insure that the scope of each option is inclusive of all technologies and actions to be utilized, concurrently or sequentially, to clean up all types of contamination at the site.

d. **The responsible party must evaluate each option separately; the evaluation of each option must include the following**:

1) Consideration of the nature of the contamination at the site, including:

* Horizontal and vertical extent of soil contamination in unsaturated zone
* Accessibility of contamination;
* Estimated volume of contaminated soil to be treated.

2) Description of each remedial technology included within a single remedial option.

* Presentation of system design and specifications (for each technology, including SVE, AS), including the following:
* System design and process;
* Radius of influence of system and estimated rates of contaminant removal;
* Anticipated flow rates and pressures for soil vapor extraction/air sparging;
* Anticipated effluent concentration after treatment;
* Copies of approved permits necessary for implementation of the remedial option; and
* Figures and tables to illustrate system design and present specifications. (Refer to Section I and J.).
* Presentation of plan for excavation, including:
* Excavation specifications;
* Estimated volume of soil to be treated/disposed of;
* Waste treatment/disposal plan;
* Sampling/analysis of contaminated soil prior to treatment/disposal;
* Name, and address of and distance to treatment/disposal facility;
* Copies of approved permits necessary for implementation of the excavation option; and
* Figures and tables to illustrate excavation specifications. (Refer to Section I and J.)

3) Discussion of feasibility and effectiveness of each remedial technology, based on:

* Pilot test results;
* Soil monitoring results;
* Other relevant parameters;
* Limitations of each remedial technology (including access issues, technological feasibility, etc.) and proposed measures for dealing with limitations;
* Completed bids.

4) Remedial system operation and maintenance plan (with schedule and discussion of measures to reduce operation and maintenance activities /costs, such as use of automated controls and remote telemetry).

5) Monitoring plan for soil (with proposed sampling locations, analytical methods, sampling frequency, and reporting frequency).

6) Comprehensive, well-substantiated schedule describing, in detail, the progression of all activities, from the date of SCP approval, through implementation of remedial action to the date of attainment of cleanup goals. The schedule for each remedial option should include, but not be limited to, the performance or occurrence of the following actions and processes:

* soil excavation,
* treatment system installation and activation,
* operation and maintenance,
* soil monitoring,
* **cleanup progress** **milestones** (dates on which progressively decreasing cleanup levels for soil contamination are to be reached),
* project completion.

1. Detailed cost estimate for full performance of the remedial option, from approval to attainment of cleanup goals, including the costs proposed as low bid for each remedial system, costs for labor, soil monitoring, operation and maintenance, periodic reporting, waste disposal, etc.

2. Select the best remedial option, discuss the basis for selection of the remedial option, and indicate why it was determined to be the most effective and cost efficient option for remediating soil contamination at the site.

##### H. Public Notice

If public notice was required under 15A NCAC 2L .0409(a) for the remedial action alternative selected, state why it was required. Provide proof that the public notice is complete. Refer to Appendix H and provide therein the following: a list of names and addresses of the local authorities and property owners/occupants to whom the public notice was sent (and reference property owners/occupants table provided using Table B-6), an example copy of the public notice, certified USPS delivery receipts from each addressee (or documentation of refusal by the addressee to accept delivery of the notice), and a copy of any publicly-posted notice. ***The SCP will not be approved until any public notice required is complete and the documentation specified above provided.***

##### I. Figures

Provide the following:

1. A topographic map illustrating the area within 1500-foot radius of the source of the release, showing:

* Topographic contours;
* Site location;
* Buildings;
* Adjacent streets, roads, highways (identified by street names and numbers);
* Surface water bodies;
* Groundwater flow direction (if determined); and
* North arrow and scale.

2. A site map\* and cross-sections illustrating the UST system(s), AST system(s), or spill, drawn to scale, showing:

* Buildings and property boundaries;
* Underground utilities, such as sewer lines and other conduits; basements; and vaults;
* Water supply wells, surface water bodies;
* Location and orientation of current and former UST(s), AST(s), pumps, product lines, sumps, etc.; spills;
* Length, diameter and volume of current and former UST(s)/AST(s);
* Type of material(s) stored in UST(s)/AST(s)(currently and formerly); and
* North arrow and scale.

3. Map(s)\* and geological cross-sections, drawn to scale, depicting all soil analytical results obtained to the date of SAR submittal **and** **final cleanup confirmation analytical results**, to include:

* Description of soil and bedrock lithology (as determined by investigation to date);
* Location and orientation of UST(s)/AST(s), pumps, piping, sumps, etc. (current and former); spills;
* Soil sample identification (unique letter and/or numerical code), location, and depth;
* Soil sample analytical results;
* Date soil sample collected;
* Final limits of each stage of excavation for each excavation on site; and
* Two geological cross-sections, drawn across the contaminated area and intersecting at right angles, showing the vertical distribution of the contaminants in the unsaturated zone. (Indicate vertical and horizontal scale, orientation of each section, location of water table, soil types and lithology, all borings and sample locations represented by the sections, and soil analytical results for each represented sample, and show sections as labeled lines on the map.)

4. Map(s)\* depicting groundwater elevations, to include:

* Groundwater elevations (relative to MSL); and
* Groundwater elevation data points (identified by monitoring well).

5. A map\* and cross-sections, to be used in conjunction with soil contamination map/cross-sections in item #3, illustrating 3-dimensional extent of actual excavation area to scale;\*\*

6. Maps\* and cross-sections, to be used in conjunction with soil contamination map/cross-sections in item #3, illustrating, to scale, the remedial technology for soil contamination (present a detailed plan of each system design and layout, which includes all major components of the system).\*\*

***\*Note:*** *Use a single base map to prepare site plans using a map scale of 1 in. = 40 ft.; use a smaller scale for large sites. Maps and figures should include conventional symbols, notations, labeling, legends, scales, and north arrows and should conform to accepted practices of map presentation described in the USGS Geological Survey publication "Topographic Map Symbols”,* [http://store.usgs.gov](http://store.usgs.gov/). *Scale should be expressed as a graphic scale and a verbal statement (e.g., 1 in.= 40 ft) or ratio. Refer to* <http://geokov.com/Education/map-scale.aspx>.

\*\* *If applicable*

##### J. Tables

Provide the following:

1. Site History (Complete Tables B-1 and B-2 from *Guidelines*, Appendix B);

2. Field Screening Results;

3. Summary of Soil Sampling Results (Complete Table B-3 from *Guidelines*, Appendix B);

4. Current and Historical Groundwater Elevations and Free Product Thickness (Complete Table B-9 from *Guidelines*, Appendix B)\*; and

5. Proposed Remediation Schedule and Cleanup Progress Milestones (from SAR) vs. Actual Remediation Performance Chronology;

6. Estimated Costs from SAR vs. Actual Costs for Remediation.

**Provide additional tables as necessary to compile information critical to describing the remedial action**

**and the results of the remedial action and to presenting the actual schedule and costs.**

##### K. Appendices

Provide the following:

Appendix A Site Specific Health and Safety Plan (HASP)

Appendix B Copies of permits (soil treatment, etc.) and soil disposal manifests\*

Appendix C Geologic logs for borings (related to SCSC final cleanup confirmation sampling only)

Appendix D Copies of the NORR, NOV, etc. requiring the implementation of the SAR and the submittal of the SCSC

Appendix E Cost estimate documentation for each remediation technology evaluated, including bid specification, invitations to bid, and bids received

Appendix F Specifications for remedial system design and layout, with calculations, for each remediation technology evaluated

Appendix G Pilot test data/calculations

Appendix H Names and addresses of the local authorities and property owners to whom copies of the SAR were sent, copies of cover letters which accompanied the SAR copies, and certified USPS delivery receipts \*

*\* If applicable*

### Monitoring Reports (use for Pre- and Post- Cap Monitoring)

Minimum elements of the report:

##### A. Site Information

1. Site Identification

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Date of Report: |  | | | | Site Risk: | |  |
| Facility I.D.: |  | | UST Incident Number (if known): | | | |  |
| Site Name: |  | | | | | | |
| Street Address: |  | | | | | | |
| City/Town: |  | | Zip Code: |  | County: | |  |
| Description of Geographical Data Point (e.g., diesel fill port): | | | |  | | | |
| Location Method (GPS, topographical map, other): | | | |  | | | |
| Latitude (***decimal degrees***): | |  | Longitude (***decimal degrees***): | | |  | |

2. Information about Contacts Associated with the Release *(Addresses must include street, city, state, zip code and mailing address, if different)*

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UST/AST Owner: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| UST/AST Operator: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Property Owner: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Property Occupant: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Consultant/Contractor: | | |  | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Analytical Laboratory: | | |  | | State Certification No: | | | | |  |
| Address: |  | | | | | | Tel: | |  | |

3. Information about Release

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date Discovered: |  | | | |
| Estimated Quantity of Release: | |  | | |
| Cause of Release: |  | | | |
| Source of Release (e.g., Dispenser/Piping/UST): | | |  | |
| Sizes and Contents of Tanks or Other Containment from which the Release Occurred: | | | |  |

##### Executive Summary

Summarize the most pertinent information for the monitoring period presented in this report:

1. Indicate the maximum free product thickness;

2. Compare the maximum contaminant mass in soil and groundwater to the current contaminant mass and/or cleanup goals;

3. Indicate the maximum concentrations of dissolved groundwater contaminants and compare to cleanup goals;

4. Describe the current extent of dissolved groundwater contamination (and free product, if present) and compare to the historical extent;

5. Indicate the maximum contaminant concentrations in soil in the unsaturated zone (from the most recent sampling event) and compare to cleanup goals;

6. *If applicable,* briefly describe any remedial action plan currently or previously in use and comment on the effectiveness of that strategy and/or natural attenuation at reducing the estimated contaminant mass onsite over time (where applicable, based on the most recent Corrective Action Performance Report);

7. Indicate if receptors have been impacted or are at imminent risk of impact, and what response (if any) has been made to address that risk.

##### Table of Contents

Provide a table of contents, as follows:

1. List sections, indicating page numbers;

2. List figures, identifying each by number;

3. List tables; identifying each by number; and

4. List appendices, identifying each by letter

##### Site History and Characterization

Present information relevant to site history and characterization, ***updating information provided in the CAP and previous monitoring reports*** using the following outline:

1. Provide UST owner and operator information.

Refer to table (Use Table B-2, Site History, UST Owner/Operator and Other Responsible Party Information, from the *Guidelines*, Appendix B.)

2. Provide UST information (inclusive of all USTs, currently and historically in place at facility).

Refer to table (Use Reporting Table B-1, Site History- UST/AST System and Other Release Information, from the *Guidelines*, Appendix B) and to site map.

3. Provide non-UST (AST, spill) information.

Refer to table (Use Reporting Table B-1, Site History- UST/AST System and Other Release Information, from the *Guidelines*, Appendix B.) and to site map.

4. Provide a description of the release, including date discovered, cause and source (including tank identification number and contents), and the relationship of historical UST releases, non-UST releases, and off-site releases (indicate incident number) to contamination from current release.

5. Provide a brief description of site characteristics (including land use of site and surrounding area, topography, vegetation, surface water, wells, buildings, surface cover, soil type, depth to and nature of bedrock, depth to groundwater, direction of groundwater flow, etc.).

6. Provide information on owners and occupants of property within or adjacent to area containing contamination or the area where contamination is expected to migrate and describe land use.

Refer to tables (Use Table B-6, Property Owners/ Occupants; and Table B-10, Land Use) and refer to land use map.

7. Present information on receptors/potential receptors.

* Refer to table (Use Table B-5, Public and Private Water Supply Well and other Receptor Information;) and to potential receptor map.
* Describe current proximity of plumes to potential receptors.
* Present current information on the provision of bottled water or on the connection of properties to municipal water.

8. Summarize implementation of the remedial plan proposed in the CAP.

9. Describe the progress of remediation at the site, as indicated in monitoring reports, from initial implementation of the remedial plan to the latest monitoring of soil and/or groundwater contamination.

##### E. Presentation of Current Site Assessment Information/ Comparison to Historical Assessment Information

1. Present current water level and free product thickness measurements (indicating dates, monitoring wells gauged).

2. Describe groundwater monitoring events (indicating dates, monitoring wells sampled, screened intervals, analytical methods).

3. Describe surface water monitoring events (indicating dates, locations, analytical methods).

4. Describe soil monitoring events (indicating dates, sample location and depth, analytical methods).

5. *Summarize* all soil, groundwater, surface water, and free product assessment information acquired to date.

* Refer to tables (Use Table B-3, Summary of Soil Sampling Results; Table B-4, Summary of Groundwater and Surface Water Sampling Results); Table B-9, Current and Historical Groundwater Elevations and FP Thickness) and to map(s) showing groundwater elevation and flow; maps and geological cross-sections depicting soil and groundwater analytical results and the horizontal and vertical extent of contamination, and map(s) depicting free product thickness and extent.

6. Describe the geology and hydrogeology of the region and the site.

* Describe soil and bedrock encountered at the site. (Refer to geologic cross sections of map illustrating soil contamination and to geologic logs for borings.)
* Discuss site hydrogeology, as determined from groundwater monitoring and from the hydrogeological investigation reported in the CSA (include the following information: groundwater flow direction, hydraulic gradient (vertical and horizontal), hydraulic conductivity, and groundwater velocity; rate of contaminant transport).

7. Evaluate soil, groundwater, surface water, and free product assessment information (including field data):

* Describe maximum historical extent of contamination (including the horizontal and vertical extent of soil contamination in unsaturated zone, the horizontal and vertical extent of groundwater contamination in the saturated zone, the thickness and extent of free product, and the presence of surface water contamination);
* Describe the current extent of contamination, estimated contaminant mass, and the current maximum contaminant concentration levels;
* Indicate if the applicable cleanup levels for soil, groundwater, surface water, and free producthave been achieved.

##### F. Free Product Removal *(if applicable)*

Discuss the status of free product at the site, as follows:

1. If free product is, or has been, present at the site, describe its current and historical status (product distribution, thickness, recovery activities). Refer to tables in Section L (Using Table B-7, Monitoring and Remediation Well Construction Information; Table B-8A, Free Product Recovery Information; Table B-8B, Cumulative Volume of Free Product Recovered from Site; and Table B-9, Current and Historical Groundwater Elevations and Free Product Thickness). Also refer to map(s) showing extent of free product in Section K.

2. Identify any on-site or off-site effluent discharges, treatment used, effluent quality, permitting actions taken, and location of such discharges and identify the disposition of recovered free product (refer to attached product disposal manifests).

3. Document the performance, total cost, and cost per gallon to date of each method of free product recovery used at site. Justify why the technology is or was used.

4. Provide conclusions and recommendations concerning historical, current, and future recovery activities, including:

* Any proposal to change the current method of free product recovery to a better or more cost-effective technology;
* A justification for continued product recovery, if planned; and
* Any determination that free product has been eliminated from the site with a recommendation to reclassify the risk posed by the release, if applicable.

##### Monitored Natural Attenuation / Natural Source Zone Depletion Status *(if applicable)*

1. Describe any monitored natural attenuation plan, where implemented, to remediate contaminated soil and groundwater.

Include the following:

1. Parameters selected to monitor progress of natural attenuation;
2. Monitoring plan for contaminants in groundwater and natural attenuation parameters (with proposed sampling locations, analytical methods, sampling frequency, and reporting frequency);
3. Reference to historical groundwater monitoring results including estimates for the soil and/or groundwater contaminant mass that is naturally attenuating (in Table 5, below) for initial, historic, and current estimated mass);
4. Evaluation of the effectiveness of natural attenuation based on a comparison of the initial contaminant mass estimates calculated in the Comprehensive Site Assessment with other historic and current contaminant mass estimates, including, *where applicable*, any modeling/calculation of the apparent mass attenuation/depletion rate over time in relation to the progress milestones presented in the CAP (Appendix E and J);
5. *Based on a schedule defined in the CAP*, an evaluation of plume stability based on modeling of groundwater analytical and natural attenuation parameter results (Appendix C).

2. *Where applicable*, present a chronology of other remediation activities (including any prior excavation and/or remedial system installation, activation, operation and maintenance, monitoring, etc.,) performed from the date of any CAP implementation through completion of active remediation; compare the performance chronology since active remediation was halted, with the cleanup schedule for natural attenuation proposed in the CAP (along with any subsequent revisions); and indicate if the natural attenuation cleanup progress milestones (initial or revised)are being met.(Appendix G and H.)

3. *Where applicable*, present actual costs for full performance of the remedial option, from CAP approval to attainment of cleanup goals, including any prior costs for excavation, remedial system installation and activation, labor, monitoring, operation and maintenance, waste disposal, periodic modeling and reporting, etc. (Appendix F.)

##### H. Conclusions

Describe the progress of attenuation/remediation at the site. Compare the current extents of the contaminant plumes and contaminant mass/concentration levels to the historical extents and mass/concentrations and the associated risk profile for the site (whether the cleanup/attenuation is occurring as part of a formal approved CAP or not). Where applicable, indicate if the proposed performance milestones for this monitoring period have been met or if applicable cleanup levels for soil, groundwater, surface water and free product have been achieved.

##### Statements and Certification

**The following statements must be included at the closing of the document text, and must display the seal and signature of the certifying P.E. or L.G. in addition to the name and certification number of the company or corporation [See 15A NCAC 2L .0103(e).]**

|  |  |  |  |
| --- | --- | --- | --- |
| **1** | **Enter the date the monitoring report was due.** Click or tap to enter a date. **Will this report be submitted after the established due date?** | **YES** | **NO** |
| **2** | **Was any required information from the above template missing from this report?** | **YES** | **NO** |
| IF the answer to question #1 or# 2 is “YES”, please provide additional information in this cell to explain what was missing and why. | | | |
| **3** | **If applicable, will any of the proposed attenuation milestones under the schedule approved in the Corrective Action Plan not be met?** *(within a reasonable margin of error)* | **YES** | **NO** |
| IF the answer to question #3 is “NO”, skip to the certification under #8 below.  IF the answer to question #3 is “YES”, please generally describe in this cell the possible reason(s) and outline proposed remedies. (This should be described in more detail in the report text above.) | | | |
| **4** | **Does any known or suspected source zone soil contamination or free product remain outside of the assessed area that could be inhibiting natural attenuation?** | **YES** | **NO** |
| **5** | **Has there been an unexpected increase in contaminant mass sufficient to suggest a potential new release from a separate onsite or offsite source?** | **YES** | **NO** |
| IF the answer to either question #4 or #5 is “YES”, generally describe in this cell any actions recommended to further assess or clean up this known or suspected source. (This should be described in more detail in the report text above.) | | | |
| **6** | **Certification:**  I, [Name of Licensed Professional], a [Select License Type] for [Name of Firm or Company of Employment], do certify that the information contained in this report is correct and accurate to the best of my knowledge.  *(Affix Seal and Signature)*  [Name of Firm or Company of Employment] is licensed to practice [Select Corporate Licensure] in North Carolina*.* The certification number of the company or corporation is [Certification Number]. | | |

##### J. Figures

Provide the following:

1. A topographic map illustrating the area within 1500-foot radius of the UST system, showing:

* Topographic contours;
* Site location;
* Buildings;
* Adjacent streets, roads, highways (identified by street names and numbers);
* Surface water bodies;
* Groundwater flow direction (if determined); and
* North arrow and scale.

2. A site map\* and cross-sections illustrating the UST system(s), drawn to scale, showing:

* Buildings and property boundaries;
* Streets, roads, highways;
* Underground utilities, such as sewer lines and other conduits; basements; and vaults;
* Water supply wells, surface water bodies;
* Location and orientation of current and former UST(s), pumps, product lines, sumps, etc.;
* Length, diameter and volume of current and former UST(s);
* Type of material(s) stored in UST(s) (currently and formerly); and
* North arrow and scale.

3. Map(s)\* and geological cross-sections, drawn to scale, depicting all soil analytical results obtained to date, to include:

* Description of soil and bedrock lithology (as determined by investigation to date);
* Location and orientation of UST(s)/AST(s), pumps, piping, sumps, etc. (current and former), any known spills, and (if applicable) illustrating any excavation dimensions or remediation system components;
* Soil sample identification (unique letter and/or numerical code), location, and depth;
* Soil sample analytical results;
* Date soil sample collected;
* Final limits of each stage of excavation for each excavation on site;
* A general plan depicting the footprint of any soil remediation system installed on site; and
* Two geological cross-sections, drawn across the contaminated area and intersecting at right angles, showing the vertical distribution of the contaminants in the unsaturated zone. (Indicate vertical and horizontal scale, orientation of each section, location of water table, soil types and lithology, all borings and sample locations represented by the sections, and soil analytical results for each represented sample, and show sections as labeled lines on the map.)

4. Map(s)\* depicting groundwater elevations, to include:

* Groundwater elevations (relative to MSL and corrected for presence of free product);
* Groundwater elevation data points (identified by monitoring well);
* Date of measurement (each map should represent a single water level measurement event);
* Potentiometric contour lines; and
* Groundwater flow direction.

5. Map\*, drawn to scale, depicting the groundwater and surface water analytical results,\*\* to include:

* Location and orientation of UST(s), pumps, piping, sumps, etc. (current and former);
* Groundwater sample identification (unique letter and/or numerical code referencing monitoring or water supply well) and location;
* Date of sampling;
* Surface water sample identification (unique letter and/or numerical code) and location; and
* Groundwater and surface water sample analytical results.

6. Individual groundwater contaminant isoconcentration contour maps\* for every contaminant present in concentrations which exceed the 2L standard limits,\*\* including:

* Contaminant concentrations (in µg/ml) with concentrations in exceedance of MSCCs indicated);
* Contaminant concentration data points (identified by monitoring well);
* Date of measurement (each map should represent a single sampling event;
* Isoconcentration contour lines (solid, if determined from adequate data points; dotted, if estimated);
* A bold isoconcentration contour line representing the 2L standard limit, or CAP cleanup goal, if different, for the contaminant;
* A general plan depicting the footprint of any groundwater remediation system installed on site; and
* Two geological cross-sections, one drawn along the long axis of the plume and the second, across it at right angles, showing the vertical distribution of the contaminants in the saturated zone. (Indicate vertical and horizontal scale, orientation of each section; location of water table; and all monitoring wells represented by the sections, and show sections as labeled lines on the map.)

7. A free-product map\* depicting thickness and extent of free product and date of measurement, with a general plan of the footprint of any free product recovery system installed on site\*\*.

8. A potential receptor map that clearly identifies water supply wells (municipal or public/private wells, etc.) and other potential receptors (surface water bodies, basements, utilities, wellhead protection areas, etc.) within 1500’ of the source of the release.

***\*Note:*** *Use a single base map to prepare site plans using a map scale of 1 in. = 40 ft.; use a smaller scale for large sites. Maps and figures should include conventional symbols, notations, labeling, legends, scales, and north arrows and should conform to accepted practices of map presentation described in the USGS Geological Survey publication "Topographic Map Symbols”,* [http://store.usgs.gov](http://store.usgs.gov/). *Scale should be expressed as a graphic scale and a verbal statement (e.g., 1 in.= 40 ft) or ratio. Refer to* <http://geokov.com/Education/map-scale.aspx>.

\*\* *If applicable*

##### K. Tables

Provide the following:

1. Site History (Complete Tables B-1 and B-2 from *Guidelines*, Appendix B);

2. Public and Private Water Supply Well and Other Receptor Information (Complete Table B-5 from *Guidelines*, Appendix B);

3. Summary of Soil Sampling Results (Complete Table B-3 from *Guidelines*, Appendix B)\*;

4. Summary of Groundwater and Surface Water Sampling Results (Complete Table B-4 from *Guidelines*, Appendix B);

5. Summary of Soil Gas and/or Vapor Sampling Results (Complete Table B-11 from *Guidelines*, Appendix B)\*;

6. Initial (i.e., CSA), historic, and current contaminant mass estimates and calculated mass removal rates, tabulated to depict the rate of removal over time, with graphs per Appendix E, below (Complete Table B-12 from *Guidelines*, Appendix B);

7. Monitoring and Remediation Well Construction Information (Complete Table B-7 from *Guidelines*, Appendix B)\*;

8. Free Product Recovery Information (Complete Table B-8A from *Guidelines*, Appendix B)\*;

9. Cumulative Volume of Free Product Recovered from Site (Complete Table B-8B from *Guidelines*, Appendix B)\*;

10. Current and Historical Groundwater Elevations and Free Product Thickness (Complete Table B-9 from *Guidelines*, Appendix B)\*.

*\* If applicable*

##### L. Appendices

Provide the following:

Appendix A Geologic logs for borings (related to final soil cleanup confirmation sampling only)\*

Appendix B Copies of any NORR, NOV, etc. related to the submittal of the Site Closure Report\*

Appendix C Natural attenuation parameters: historical sampling results (from monitoring reports)\*; groundwater field measurements (pH, dissolved oxygen, specific conductivity, temperature, Eh, alkalinity)

Appendix D Remedial system performance tables and graphs (from monitoring reports)\*

Appendix E Contaminant mass vs. time graphs and contaminant concentration vs. time (vs. water level) graphs for contaminants>2L standards

Appendix F Compilation of costs for performance of the remedial plan, from approval to attainment of cleanup goals, including the costs for each remedial system, costs for labor, soil and groundwater monitoring, operation and maintenance, periodic reporting, waste disposal, etc.\*

Appendix G Chronology of remediation activities (excavation; remedial system installation, activation, operation and maintenance, monitoring, reporting, etc.) performed from abatement through assessment, CAP approval and implementation, to the attainment of cleanup goals) and cleanup progress milestones (dates on which progressively decreasing cleanup levels or contaminant mass for soil groundwater contamination were to have been reached)

Appendix H Proposed remediation schedule and cleanup progress milestones for implemented remedial plan (from CAP)\*

Appendix I Copies of laboratory analytical reports (lab name, NC certification number, well ID numbers, sampling date, analysis date, analytical methods, and detection limits should be indicated on reports); copies of chain-of custody forms for all samples collected during reporting period; copies of field data sheets

Appendix J Groundwater modeling and/or other calculations

*\* If applicable*

***Provide additional figures, tables, graphs, and appendices as needed to illustrate cleanup progress.***

### Corrective Action Performance Reports

Minimum elements of the report:

##### Site Information

* + 1. Site Identification

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Date of Report: |  | | | | Site Risk: | |  |
| Facility I.D.: |  | | UST Incident Number (if known): | | | |  |
| Site Name: |  | | | | | | |
| Street Address: |  | | | | | | |
| City/Town: |  | | Zip Code: |  | County: | |  |
| Description of Geographical Data Point (e.g., diesel fill port): | | | |  | | | |
| Location Method (GPS, topographical map, other): | | | |  | | | |
| Latitude (***decimal degrees***): | |  | Longitude (***decimal degrees***): | | |  | |

2. Information about Contacts Associated with the Release *(Addresses must include street, city, state, zip code and mailing address, if different)*

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UST/AST Owner: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| UST/AST Operator: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Property Owner: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Property Occupant: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Consultant/Contractor: | | |  | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Analytical Laboratory: | | |  | | State Certification No: | | | | |  |
| Address: |  | | | | | | Tel: | |  | |

3. Information about Release

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date Discovered: |  | | | |
| Estimated Quantity of Release: | |  | | |
| Cause of Release: |  | | | |
| Source of Release (e.g., Dispenser/Piping/UST): | | |  | |
| Sizes and Contents of Tanks or Other Containment from which the Release Occurred: | | | |  |

##### Executive Summary

Summarize the most pertinent information for the monitoring period presented in this report:

1. Indicate the maximum free product thickness and, if present, compare to the current free product thickness;

2. Compare the maximum contaminant mass in soil and groundwater to the current contaminant mass and/or cleanup goals (from the most recent monitoring report);

3. Briefly outline the remedial action plan in use at the site, as well as any prior remedial plan that was used;

4. Indicate the relative effectiveness of the selected technology at reducing the estimated contaminant mass onsite based on the calculated mass removal rates, both at present and over time;

5. Indicate if receptors have been impacted or are at imminent risk of impact, and what response (if any) has been made to address that risk.

##### Table of Contents

Provide a table of contents, as follows:

1. List sections, indicating page numbers;

2. List figures, identifying each by number;

3. List tables; identifying each by number; and

4. List appendices, identifying each by letter

##### Site History and Characterization

Present information relevant to site history and characterization, ***updating information provided in the CAP and previous monitoring reports*** using the following outline:

1. Provide UST owner and operator information.

Refer to table (Use Table B-2, Site History, UST Owner/Operator and Other Responsible Party Information, from the *Guidelines*, Appendix B.)

2. Provide UST information (inclusive of all USTs, currently and historically in place at facility).

Refer to table (Use Reporting Table B-1, Site History- UST/AST System and Other Release Information, from the *Guidelines*, Appendix B) and to site map.

3. Provide non-UST (AST, spill) information.

* Refer to table (Use Reporting Table B-1, Site History- UST/AST System and Other Release Information, from the *Guidelines*, Appendix B.) and to site map.

4. Provide a description of the release, including date discovered, cause and source (including tank identification number and contents), and the relationship of historical UST releases, non-UST releases, and off-site releases (indicate incident number) to contamination from current release.

5. Provide a brief description of site characteristics (including land use of site and surrounding area, topography, vegetation, surface water, wells, buildings, surface cover, soil type, etc.).

6. Describe the geology and hydrogeology of the region and the site.

* Describe soil and bedrock encountered at the site. (Refer to geologic cross sections of map illustrating soil contamination and to geologic logs for borings.)
* Discuss site hydrogeology, as determined from groundwater monitoring and from the hydrogeological investigation reported in the CSA (include the following information: typical/seasonal depths-to-water and free product thickness, groundwater flow direction, hydraulic gradient (vertical and horizontal), hydraulic conductivity, and groundwater velocity; rate of contaminant transport).

7. Provide information on owners and occupants of property within or adjacent to area containing contamination or the area where contamination is expected to migrate and describe land use.

* Refer to tables (Use Table B-6, Property Owners/ Occupants; and Table B-10, Land Use) and refer to land use map.

8. Present information on receptors/potential receptors.

* Refer to table (Use Table B-5, Public and Private Water Supply Well and other Receptor Information;) and to potential receptor map.
* Describe current proximity of plumes to potential receptors.
* Present current information on the provision of bottled water or on the connection of properties to municipal water.

9. Summarize implementation of the remedial plan proposed in the CAP, including a reference to the most recent monitoring event report.

10. Summarize the progress of remediation at the site, as indicated in monitoring reports, from initial implementation of the remedial plan to the latest monitoring of soil and/or groundwater contamination.

##### Free Product Removal *(if applicable)*

Discuss the status of free product at the site, as follows:

1. If free product is, or has been, present at the site, describe its current and historical status (product distribution, thickness, recovery activities). Refer to tables in Section L (Using Table B-7, Monitoring and Remediation Well Construction Information; Table B-8A, Free Product Recovery Information; Table B-8B, Cumulative Volume of Free Product Recovered from Site; and Table B-9, Current and Historical Groundwater Elevations and Free Product Thickness). Also refer to map(s) showing extent of free product in Section K.

2. Identify any on-site or off-site effluent discharges, treatment used, effluent quality, permitting actions taken, and location of such discharges and identify the disposition of recovered free product (refer to attached product disposal manifests).

3. Document the performance, total cost, and cost per gallon to date of each method of free product recovery used at site. Justify why the technology is or was used.

4. Provide conclusions and recommendations concerning historical, current, and future recovery activities, including:

* Any proposal to change the current method of free product recovery to a better or more cost-effective technology;
* A justification for continued product recovery, if planned; and
* Any determination that free product has been eliminated from the site with a recommendation to reclassify the risk posed by the release, if applicable.

##### Soil Remediation

1. Describe soil remediation activities performed during the reporting period.

1. Excavation (*if applicable)*, including:

* Excavation specifications (location, dimensions and shape, etc.);
* Volume of soil treated/disposed of;
* Contaminated soil treatment/disposal method;
* Sampling/analysis of contaminated soil prior to treatment/disposal;
* Name and address of excavation contractor;
* Name and address of transporter;
* Name, and address of and distance to treatment/disposal facility;
* Chronological listing of excavation activities;
* Problems and limitations (including access issues, risk to structures, etc.) and measures taken to resolve them;
* Copies of permits, permit numbers, and dates permits issued/approved;
* Copies of soil disposal manifests; and
* Figures and tables to illustrate excavation specifications. (Refer to Section K and L.)

1. Installation, activation, operation and maintenance, monitoring, and shutdown of a remedial system *(if applicable),* including the following:

* System design and process;
* Volume and extent of soil treated;
* Radius of influence of system;
* Rates of contaminant mass removal, tracked from startup to final shutdown (Refer to Appendix D);
* Flow rates and pressures for soil vapor extraction/air sparging, from startup to final shutdown (Refer to Appendix D);
* Effluent concentrations after treatment, from startup to final shutdown (Refer to Appendix D);
* Operation and maintenance plan (with a schedule and description of measures implemented to reduce operation and maintenance activities and costs, such as use of automated controls and remote telemetry);
* Chronological listing of operation and maintenance activities (from startup to final shutdown);
* Problems and limitations (including access issues, mechanical problems, etc.) and measures taken to resolve them;
* Monitoring plan for soil (with proposed sampling locations, analytical methods, sampling frequency, and reporting frequency);
* Reference to historical soil monitoring results / contaminant mass estimates (system startup to final shutdown);
* Evaluation of effectiveness (comparing total contaminant mass removal rates and the change in mass removal over time, with the schedule provided in the original CAP);
* Copies of permits, permit numbers, and dates permits issued/approved; and
* Figures and tables to illustrate system design and to present operation. (Refer to Section K and L.)

2. Present a chronology of soil remediation activities performed (excavation or remedial system installation, activation, etc.) and change in contaminant mass from the date of CAP approval to present; compare the performance chronology with the schedule for cleanup formally defined in the original CAP and indicate if **cleanup progress milestones** are being met by the active remediation. If not, provide information on the potential factors influencing the contaminant mass removal. (Appendices G and H.)

3. Present costs for performance of the soil remediation during this reporting period, including the costs for excavation, remedial system installation and activation, labor, monitoring, operation and maintenance, periodic reporting, waste disposal, etc. (Refer to Appendix F.)

##### Groundwater Remediation

1. Describe the remedial plan implemented to remediate contaminated groundwater.

1. Installation, activation, operation and maintenance, monitoring, and shutdown of a remedial system *(if applicable),* including the following:

* System design and process;
* Extent of groundwater treated;
* Radius of influence of system;
* Rates of contaminant mass removal, from startup to final shutdown (Refer to Appendix D);
* Flow rates and pressures for soil vapor extraction, groundwater recovery (i.e., both after stripper and after carbon), air sparging, and groundwater injection, from startup to final shutdown (Refer to Appendix D);
* Effluent concentrations after treatment, from startup to final shutdown (Refer to Appendix D);
* Operation and maintenance plan (with a schedule and description of measures implemented to reduce operation and maintenance activities and costs, such as use of automated controls and remote telemetry);
* Chronological listing of operation and maintenance activities (from startup to final shutdown);
* Problems and limitations (including access issues, mechanical problems, etc.) and measures taken to resolve them;
* Monitoring plan for groundwater (with proposed sampling locations, analytical methods, sampling frequency, and reporting frequency);
* Reference to historical groundwater monitoring results / contaminant mass estimates (system startup to final shutdown);
* Evaluation of effectiveness (comparing total contaminant mass removal rates and the change in mass removal over time, with the schedule provided in the original CAP);
* Copies of permits, permit numbers, and dates permits issued/approved; and
* Figures and tables to illustrate system design and to present operation. (Refer to Section K and L.)

2. Present a chronology of remediation activities performed (excavation or remedial system installation, activation, operation and maintenance, monitoring, etc.) and change in contaminant mass from the date of CAP approval, through implementation of remedial action to present; compare the performance chronology with the schedule for cleanup formally defined in the original CAP and indicate if **cleanup progress milestones** are being met by the active remediation. (Refer to Appendix G and H.)

3. Present actual costs for full performance of the remedial option, from approval to attainment of cleanup goals, including the costs for excavation, remedial system installation and activation, labor, monitoring, operation and maintenance, periodic reporting, waste disposal, etc. (Refer to Appendix F.)

##### Conclusions

Describe the progress of remediation at the site. Compare the current extents of the contaminant plumes and contaminant mass/concentration levels to the historical extents and mass/concentrations and the associated risk profile for the site. Indicate if the proposed performance milestones for this monitoring period have been met or if applicable cleanup levels for soil, groundwater, surface water and free product have been achieved.

##### Statements and Certification

**The following statements must be included at the closing of the document text, and must display the seal and signature of the certifying P.E. or L.G. in addition to the name and certification number of the company or corporation [See 15A NCAC 2L .0103(e).]**

|  |  |  |  |
| --- | --- | --- | --- |
| **1** | **Enter the date the performance report was due.** Click or tap to enter a date. **Will this report be submitted after the established due date?** | **YES** | **NO** |
| **2** | **Was any required information from the above template missing from this report?** | **YES** | **NO** |
| IF the answer to question #1 or# 2 is “YES”, please provide additional information in this cell to explain what was missing and why. | | | |
| **3** | **Has the operation of the installed active remediation system experienced any complications during this reporting period?** *(i.e., answer ‘NO’ if the system has been operational except for normal maintenance events, with no unscheduled shutdowns.)* | **YES** | **NO** |
| **4** | **Have all issues that were responsible for causing these complications been resolved?** | **YES** | **NO** |
| IF the answer to question #3 or #4 is “YES”, please provide additional information in this cell describing the issue(s) and any troubleshooting and/or repair steps that have been taken (or are planned) to resolve the issue(s). | | | |
| **5** | **Will any of the proposed cleanup milestones under the schedule approved in the Corrective Action Plan not be met?** *(within a reasonable margin of error)* | **YES** | **NO** |
| IF the answer to question #5 is “NO”, skip to the certification under #8 below.  IF the answer to question #5 is “YES”, please generally describe in this cell the possible reason(s) and outline proposed remedies. (This should be described in more detail in the report text above.) | | | |
| **6** | **Does any known or suspected source zone soil contamination or free product remain outside of the remediation system area of influence that could be inhibiting cleanup?** | **YES** | **NO** |
| **7** | **Has there been an unexpected increase in contaminant mass sufficient to suggest a potential new release from a separate onsite or offsite source?** | **YES** | **NO** |
| IF the answer to either question #6 or #7 is “YES”, generally describe in this cell any actions recommended to further assess or clean up this known or suspected source. (This should be described in more detail in the report text above.) | | | |
| **8** | **Certification:**  I, [Name of Licensed Professional], a [Select License Type] for [Name of Firm or Company of Employment], do certify that the information contained in this report is correct and accurate to the best of my knowledge.  *(Affix Seal and Signature)*  [Name of Firm or Company of Employment] is licensed to practice [Select Corporate Licensure] in North Carolina*.* The certification number of the company or corporation is [Certification Number]. | | |

##### Figures

Provide the following:

1. A topographic map illustrating the area within 1500-foot radius of the UST system, showing:

* Topographic contours;
* Site location;
* Buildings;
* Adjacent streets, roads, highways (identified by street names and numbers);
* Surface water bodies;
* Groundwater flow direction (most recently determined); and
* North arrow and scale.

2. A site map\* and cross-sections illustrating the UST system(s), drawn to scale, showing:

* Buildings and property boundaries;
* Streets, roads, highways;
* Underground utilities, such as sewer lines and other conduits; basements; and vaults;
* Water supply wells, surface water bodies;
* Location and orientation of current and former UST(s), pumps, product lines, sumps, etc.;
* Length, diameter and volume of current and former UST(s);
* Type of material(s) stored in UST(s) (currently and formerly); and
* North arrow and scale.

3. Map(s)\* and geological cross-sections, drawn to scale, depicting the initial and most recent soil analytical results obtained (from the most recent Monitoring Report), and illustrating the 3-dimensional extent of any excavation area to scale, and/or any soil contamination remediation system footprint. Include\*\*:

* Description of soil and bedrock lithology (as determined by investigation to date);
* Location and orientation of UST(s)/AST(s), pumps, piping, sumps, etc.(current and former);spills;
* Soil sample identification (unique letter and/or numerical code), location, and depth;
* Soil sample analytical results;
* Date soil sample collected;
* Final limits of each stage of excavation for each excavation on site;
* A detailed plan of any soil remediation system design and layout, which includes all major components of the system; and
* Two geological cross-sections, drawn across the contaminated area and intersecting at right angles, showing the vertical distribution of the contaminants in the unsaturated zone and the approximate depth and orientation of any excavation conducted onsite, projected onto the section. (Indicate vertical and horizontal scale, orientation of each section, location of water table, soil types and lithology, all borings and sample locations represented by the sections, and soil analytical results for each represented sample, and show sections as labeled lines on the map.)

4. Map(s)\* depicting groundwater elevations (from the most recent Monitoring Report), to include:

* Groundwater elevations (relative to MSL and corrected for presence of free product);
* Groundwater elevation data points (identified by monitoring well);
* Date of measurement (each map should represent a single water level measurement event);
* Potentiometric contour lines; and
* Groundwater flow direction.

5. Map\*, drawn to scale, depicting the groundwater and surface water analytical results (from the most recent Monitoring Report) to include\*\*:

* Location and orientation of UST(s), pumps, piping, sumps, etc. (current and former);
* Groundwater sample identification (unique letter and/or numerical code referencing monitoring or water supply well) and location;
* Date of sampling;
* Surface water sample identification (unique letter and/or numerical code) and location; and
* Groundwater and surface water sample analytical results.

6. Individual groundwater contaminant isoconcentration contour maps\* for every contaminant present in concentrations which exceed the 2L standard limits or CAP cleanup goal, if different (from the most recent Monitoring Report), and any groundwater contamination remediation system footprint. Include\*\*:

* Contaminant concentrations (in µg/ml) with concentrations in exceedance of MSCCs indicated);
* Contaminant concentration data points (identified by monitoring well);
* Date of measurement (each map should represent a single sampling event;
* Isoconcentration contour lines (solid, if determined from adequate data points; dotted, if estimated);
* A bold isoconcentration contour line representing the 2L standard limit, or CAP cleanup goal, if different, for the contaminant;
* Present a detailed plan of any groundwater remediation system design and layout, which includes all major components of the system; and
* Two geological cross-sections, one drawn along the long axis of the plume and the second, across it at right angles, showing the vertical distribution of the contaminants in the saturated zone. (Indicate vertical and horizontal scale, orientation of each section; location of water table; and all monitoring wells represented by the sections, and show sections as labeled lines on the map.)

7. A free product map\* depicting thickness and extent of free product and date of measurement, and a detailed plan of any free product recovery system design and layout, which includes all major components of the system \*\*.

8. A potential receptor map that clearly identifies water supply wells (municipal or public/private wells, etc.) and other potential receptors (surface water bodies, basements, utilities, wellhead protection areas, etc.) within 1500’ of the source of the release.

***\*Note:*** *Use a single base map to prepare site plans using a map scale of 1 in. = 40 ft.; use a smaller scale for large sites. Maps and figures should include conventional symbols, notations, labeling, legends, scales, and north arrows and should conform to accepted practices of map presentation described in the USGS Geological Survey publication "Topographic Map Symbols”,* [http://store.usgs.gov](http://store.usgs.gov/). *Scale should be expressed as a graphic scale and a verbal statement (e.g., 1 in.= 40 ft) or ratio. Refer to* <http://geokov.com/Education/map-scale.aspx>.

\*\* *If applicable*

##### J. Tables

Provide the following:

1. Site History (Complete Tables B-1 and B-2 from *Guidelines*, Appendix B);

2. Public and Private Water Supply Well and Other Receptor Information (Complete Table B-5 from *Guidelines*, Appendix B);

3. Summary of Soil Sampling Results (Complete Table B-3 from *Guidelines*, Appendix B)\*;

4. Summary of System Liquid Influent/Effluent (and any Other Necessary Water) Sampling Results (Complete Table B-4 from *Guidelines*, Appendix B)\*;

5. Summary of System Air Influent/Emission (and any Other Necessary Gas or Vapor) Sampling Results (Complete Table B-11 from *Guidelines*, Appendix B)\*;

6. Initial (i.e., CSA), historic, and current contaminant mass estimates and measured/calculated mass removal rates, tabulated to depict the rate of removal over time, with graphs per Appendix E, below (Complete Table B‑12 from *Guidelines*, Appendix B);

7. Remediation Well / Injection Point Construction Information (Complete Table B-7 from *Guidelines*, Appendix B)\*;

8. Free Product Recovery Information (Complete Table B-8A from *Guidelines*, Appendix B)\*;

9. Cumulative Volume of Free Product Recovered from Site (Complete Table B-8B from *Guidelines*, Appendix B)\*;

10. Current and Historical Groundwater Elevations and Free Product Thickness (based on the most recent Monitoring Report) (Complete Table B-9 from *Guidelines*, Appendix B)\*.

*\* If applicable*

##### Appendices

Provide the following:

Appendix A Geologic logs for borings (related to final soil cleanup confirmation sampling only)\*

Appendix B Copies of any NORR, NOV, etc. related to the submittal of the Site Closure Report\*

Appendix C Natural attenuation parameters: historical sampling results (from monitoring reports)\*; groundwater field measurements (pH, dissolved oxygen, specific conductivity, temperature, Eh, alkalinity)

Appendix D Remedial system performance tables and graphs (from monitoring reports)\*

Appendix E Contaminant mass vs. time graphs and contaminant concentration vs. time (vs. water level) graphs for contaminants>2L standards

Appendix F Compilation of costs for performance of the remedial plan, from approval to attainment of cleanup goals, including the costs for each remedial system, costs for labor, soil and groundwater monitoring, operation and maintenance, periodic reporting, waste disposal, etc.

Appendix G Chronology of remediation activities (excavation; remedial system installation, activation, operation and maintenance, monitoring, reporting, etc.) performed from the date of CAP approval, through implementation of remedial action to the date of attainment of cleanup goals) and cleanup progress milestones (dates on which progressively decreasing cleanup levels for groundwater contamination were to have been reached)

Appendix H Proposed remediation schedule and cleanup progress milestones for implemented remedial plan (from CAP)

Appendix I Copies of laboratory analytical reports (lab name, NC certification number, well ID numbers, sampling date, analysis date, analytical methods, and detection limits should be indicated on reports); copies of chain-of custody forms for all samples collected during reporting period; copies of field data sheets

Appendix J Calculations

*\* If applicable*

***Provide additional figures, tables, and appendices as needed to illustrate cleanup progress.***

### System Enhancement Recommendation Report

*(For proposing material changes to an existing remediation technology)*

Minimum elements of the report:

**A. Site Information**

1. Site Identification

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Date of Report: |  | | | | Site Risk: | |  |
| Facility I.D.: |  | | UST Incident Number (if known): | | | |  |
| Site Name: |  | | | | | | |
| Street Address: |  | | | | | | |
| City/Town: |  | | Zip Code: |  | County: | |  |
| Description of Geographical Data Point (e.g., diesel fill port): | | | |  | | | |
| Location Method (GPS, topographical map, other): | | | |  | | | |
| Latitude (***decimal degrees***): | |  | Longitude (***decimal degrees***): | | |  | |

2. Information about Contacts Associated with the Release *(Addresses must include street, city, state, zip code and mailing address, if different)*

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UST/AST Owner: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| UST/AST Operator: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Property Owner: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Property Occupant: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Consultant/Contractor: | | |  | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Analytical Laboratory: | | |  | | State Certification No: | | | | |  |
| Address: |  | | | | | | Tel: | |  | |

3. Information about Release

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date Discovered: |  | | | |
| Estimated Quantity of Release: | |  | | |
| Cause of Release: |  | | | |
| Source of Release (e.g., Dispenser/Piping/UST): | | |  | |
| Sizes and Contents of Tanks or Other Containment from which the Release Occurred: | | | |  |

4. Certification (***The title page must display the seal and signature of the certifying P.E. or L.G. and the name and certification number of the company or corporation [See 15A NCAC 2L .0103(e).]****)*

I, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, a Professional Engineer/Licensed Geologist *(circle one)* for (firm or company of employment), do certify that the information contained in this report is correct and accurate to the best of my knowledge.

*(Please Affix Seal and Signature)*

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (Name of company or corporation) is licensed to practice geology/engineering *(circle one or both)* in North Carolina*.* The certification number of the company or corporation is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

##### B. Table of Contents

Provide a table of contents, as follows:

1. List sections, indicating page numbers;

2. List figures, identifying each by number;

3. List tables; identifying each by number; and

4. List appendices, identifying each by letter

##### C. Discussion of remedial system problems

1. Explain why the remedial system(s) requires enhancement or modification (e.g., costs for maintenance and operation are excessive, system design is no longer adequate to address plume, system is no longer operating efficiently, progress milestone for cleanup established in CAP was not reached etc.); and

2. Indicate reasons why enhancement of the remedial system at this site is especially important (e.g., risk of impact to water supply well.

##### Description of the proposed enhancement of the system or resolution of the problem

1. Present/compare alternatives for improving system design/process and select the enhancement which will achieve the most efficient, effective remediation; and

2. Provide a description of the proposed enhancement to system design and process (Refer to appendices.).

##### Description of any modifications to existing monitoring plan required by the enhancement\*

##### List of all costs associated with the system enhancement

1. Provide detailed estimates for equipment, labor, subcontracting, and other costs, referencing completed bids when required; and

2. Present a cost-benefit analysis of the proposed enhancement.

##### Figures

Provide the following:

1. A topographic map illustrating the area within 1500-foot radius of the UST/AST system(s), or spill, showing:

* Topographic contours;
* Site location;
* Buildings;
* Adjacent streets, roads, highways (identified by street names and numbers);
* Surface water bodies;
* Groundwater flow direction (if determined); and
* North arrow and scale.

2. A site map\* and cross-sections illustrating the UST/AST system(s), or spill, drawn to scale, showing:

* Buildings and property boundaries;
* Underground utilities, such as sewer lines and other conduits; basements; and vaults;
* Water supply wells, surface water bodies;
* Location and orientation of current and former UST(s), pumps, product lines, sumps, etc.;
* Length, diameter and volume of current and former UST(s);
* Type of material(s) stored in UST(s) (currently and formerly); and
* North arrow and scale.

3. Map(s)\* and geological cross-sections, drawn to scale, depicting all soil analytical results obtained to date,\*\* to include:

* Description of soil and bedrock lithology (as determined by investigation to date);
* Location and orientation of UST(s)/AST(s), pumps, piping, sumps, etc.(current and former);spills;
* Soil sample identification (unique letter and/or numerical code), location, and depth;
* Soil sample analytical results;
* Date soil sample collected;
* Final limits of each stage of excavation for each excavation on site; and
* Two geological cross-sections, drawn across the contaminated area and intersecting at right angles, showing the vertical distribution of the contaminants in the unsaturated zone. (Indicate vertical and horizontal scale, orientation of each section, location of water table, soil types and lithology, all borings and sample locations represented by the sections, and soil analytical results for each represented sample, and show sections as labeled lines on the map.)

4. Map(s)\* depicting groundwater elevations, to include:

* Groundwater elevations (relative to MSL);
* Groundwater elevation data points (identified by monitoring well);
* Date of measurement (each map should represent a single water level measurement event);
* Potentiometric contour lines; and
* Groundwater flow direction.

5. Map\*, drawn to scale, depicting the groundwater and surface water analytical results,\*\* to include:

* Location and orientation of UST(s)/AST (s), pumps, piping, sumps, etc. (current and former); spills;
* Groundwater sample identification (unique letter and/or numerical code referencing monitoring or water supply well) and location;
* Date of sampling;
* Surface water sample identification (unique letter and/or numerical code) and location; and
* Groundwater and surface water sample analytical results.

6. Individual groundwater contaminant iso-concentration contour maps\* for every contaminant present in concentrations which exceed the 2L standard limits,\*\* including:

* Contaminant concentrations (in µg/ml) with concentrations in exceedance of MSCCs indicated);
* Contaminant concentration data points (identified by monitoring well);
* Date of measurement (each map should represent a single sampling event;
* Iso-concentration contour lines (solid, if determined from adequate data points; dotted, if estimated);
* An iso-concentration contour line representing the 2L standard limit and, if applicable, the GCL for the contaminant; and
* Two geological cross-sections, one drawn along the long axis of the plume and the second, across it at right angles, showing the vertical distribution of the contaminants in the saturated zone. (Indicate vertical and horizontal scale, orientation of each section; location of water table; and all monitoring wells represented by the sections, and show sections as labeled lines on the map.)

7. A free product map\* depicting thickness and extent of free product and date of measurement.\*\*

8. Maps\* and cross-sections, to be used in conjunction with soil contamination map/cross-sections in item #3, illustrating, to scale, the remedial technology for soil contamination (present a detailed plan of system design and layout, which includes all major components of the system) **and the proposed enhancement**;\*\*

9. Maps\* and cross-sections, to be used in conjunction with groundwater elevation map, groundwater contamination map/cross-sections, groundwater isoconcentration maps/cross-sections in items #4-6, illustrating, to scale, the remedial technology for groundwater contamination and/or free product recovery (present a detailed plan of system design and layout, which includes all major components of the system) **and the proposed enhancement**.\*\*

***\*Note:*** *Use a single base map to prepare site plans using a map scale of 1 in. = 40 ft.; use a smaller scale for large sites. Maps and figures should include conventional symbols, notations, labeling, legends, scales, and north arrows and should conform to accepted practices of map presentation described in the USGS Geological Survey publication "Topographic Map Symbols”,* [http://store.usgs.gov](http://store.usgs.gov/). *Scale should be expressed as a graphic scale and a verbal statement (e.g., 1 in.= 40 ft) or ratio. Refer to* <http://geokov.com/Education/map-scale.aspx>.

\*\* *If applicable*

##### H. Tables

Provide the following:

1. Schedule for Implementation of System Enhancement;

2. Remediation Schedule and Cleanup Progress Milestones;

3. Cost Estimates (equipment, labor, subcontracting, etc.).

##### I. Appendices

Provide the following:

Appendix A Copies of the NORR, NOV, etc. requiring the System Enhancement Recommendation Report;

Appendix B Cost estimate documentation, including bid specification, invitations to bid, and bids received;

Appendix C Specifications for remedial system modifications, with calculations;

Appendix D Pilot test data/calculations.

***Provide additional figures, tables, and appendices, as necessary, to present information critical to evaluation of the technology***

### New Technology Cleanup Plan

*Use the New Technology Cleanup Plan (NTCP) when a remedial system requires replacement by or addition of a new technology (to include excavation and connection to municipal water). Note that this plan must be based on an adequate, up-to-date assessment of the site. If on receipt, a NTCP is not deemed adequate by the UST Section to so modify an existing CAP, then a new CAP may be required.*

*Minimum elements of the report:*

**A. Site Information**

1. Site Identification

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Date of Report: |  | | | | Site Risk: | |  |
| Facility I.D.: |  | | UST Incident Number (if known): | | | |  |
| Site Name: |  | | | | | | |
| Street Address: |  | | | | | | |
| City/Town: |  | | Zip Code: |  | County: | |  |
| Description of Geographical Data Point (e.g., diesel fill port): | | | |  | | | |
| Location Method (GPS, topographical map, other): | | | |  | | | |
| Latitude (***decimal degrees***): | |  | Longitude (***decimal degrees***): | | |  | |

2. Information about Contacts Associated with the Release *(Addresses must include street, city, state, zip code and mailing address, if different)*

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UST/AST Owner: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| UST/AST Operator: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Property Owner: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Property Occupant: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Consultant/Contractor: | | |  | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Analytical Laboratory: | | |  | | State Certification No: | | | | |  |
| Address: |  | | | | | | Tel: | |  | |

3. Information about Release

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date Discovered: |  | | | |
| Estimated Quantity of Release: | |  | | |
| Cause of Release: |  | | | |
| Source of Release (e.g., Dispenser/Piping/UST): | | |  | |
| Sizes and Contents of Tanks or Other Containment from which the Release Occurred: | | | |  |

4. Certification (***The title page must display the seal and signature of the certifying P.E. or L.G. and the name and certification number of the company or corporation [See 15A NCAC 2L .0103(e).]****)*

I, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, a Professional Engineer/Licensed Geologist *(circle one)* for (firm or company of employment), do certify that the information contained in this report is correct and accurate to the best of my knowledge.

*(Please Affix Seal and Signature)*

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(Name of company or corporation) is licensed to practice geology/engineering *(circle one or both)* in North Carolina*.* The certification number of the company or corporation is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

##### B. Executive Summary

Present a brief summary of the most pertinent information about the site and the release and indicate the remedial technology or risk-reduction mechanism recommended to replace or complement the existing remedial system, using the following outline:

1. Describe the source, date of discovery, and quantity and type(s) of contaminant released;

2. Summarize initial abatement actions;

3. Describe the results of the hydrogeological investigation;

4. Summarize the results of soil, groundwater, and surface water assessment and free product measurement;

5. Indicate the risk classification (or non-UST petroleum/non-petroleum UST rank) and the relevant criteria;

6. Indicate the soil, groundwater, and surface water contamination cleanup goals; and

7. Present the selected remedial technology or mechanism and state the basis for selection, schedule for implementation, remediation progress milestones, and cost.

##### Table of Contents

Provide a table of contents, as follows:

1. List sections, indicating page numbers;

2. List figures, identifying each by number;

3. List tables; identifying each by number; and

4. List appendices, identifying each by letter

**D. Site History and Characterization**

Present information relevant to site history and characterization, ***updating information provided in previous reports***, using the following outline:

1. Provide a description of the release, including date discovered, cause and source, and the relationship of historical UST releases, non-UST releases, and off-site releases (indicate incident number) to contamination from current release.

2. Provide a description of site characteristics (including land use of site and surrounding area, topography, vegetation, surface water, wells, buildings, surface cover, soil type, depth to and nature of bedrock, depth to groundwater, direction of groundwater flow, etc.).

3. Present information on receptors/potential receptors.

* Refer to table (Use Table B-5, Public and Private Water Supply Well and other Receptor Information;) and to potential receptor map.

4. Summarize initial abatement and corrective actions performed to date, including excavation of contaminated soil and free product removal (Refer to free product recovery information tables; use Table B-8Aand Table B-8B).

5. Refer to NORR/NOV requiring preparation and submittal of the CAP (Appendix A) and to any subsequent notices or letters from NC DEQ.

1. **Summary of Site Assessment Information**

1. Summarize soil, groundwater, surface water, and free product assessment information presented in the CSA Report (and updated in any subsequent Monitoring Reports, Free Product Recovery Reports, or CSA Addendum).

* Refer to tables (Use Table B-3, Summary of Soil Sampling Results; Table B-4, Summary of Groundwater and Surface Water Sampling Results); Table B-9, Current and Historical Groundwater Elevations and FP Thickness) and to map(s) showing groundwater elevation and flow; maps and geological cross-sections depicting soil and groundwater analytical results and the horizontal and vertical extent of contamination, and map(s) depicting free product thickness and extent.

2. Describe the geology and hydrogeology of the region and the site.

* Describe soil and bedrock encountered at the site. (Refer to geologic cross sections of map illustrating soil contamination and to geologic logs for borings.)
* Discuss site hydrogeology, as determined from groundwater monitoring and from the hydrogeological investigation reported in the CSA. (Include the following information: groundwater flow direction, hydraulic gradient (vertical and horizontal), hydraulic conductivity, and groundwater velocity.)
* Describe the relationship of the geological and hydrogeological characteristics of the site to the potential migration or natural attenuation of contaminants.

3. Examine and evaluate assessment information.

* Describe extent of contamination.
* Describe maximum contaminant concentration levels.
* Indicate the applicable cleanup levels for soil, groundwater, surface water, and free product.
* Indicate potential for contaminant migration and for impact of receptors.
* Describe any action that could result in lowering the risk classification (or rank).

##### Discussion of remedial system problems

* + - 1. State purpose and objectives of the CAP (e.g., free product recovery, containment or retardation of plume migration, reduction of contaminant concentrations, protection of nearby water supplies, etc);
      2. State the cleanup goals of the CAP (Refer to Section E, item 3.);
      3. Explain why the existing remedial system(s) requires replacement or why an additional remedial technology is needed;
      4. Present evidence to show that the design, installation, operation, and maintenance of the existing remedial system(s) were adequate and approved (Refer to NORR requiring implementation of the CAP and any NOVs and enforcement documents related to CAP implementation (Refer to Appendix A.);
      5. Discuss why replacement of (or addition to)the existing remedial system is important (e.g., risk of impact to water supply well, costs, etc.).

##### Re-evaluation of remedial actions

1. Present and compare remedial options to replace the currently-implemented option

1. **Evaluate risk reduction mechanisms** (e.g. connecting water supply well users to alternate water sources); as the sole remedial process for soil and/or groundwater contamination to replace the existing remedial option. *(Only applicable to petroleum UST releases)*
2. **Evaluate excavation** as the sole remedial process for soil contamination to replace the existing technology.
3. **Evaluate natural attenuation** as the sole remedial process for groundwater contamination to replace the existing technologically-based remedial option and state why it would not be acceptable if used alone. *(If natural attenuation is acceptable as stand-alone option then a monitoring report, not a NTCP, is the vehicle for presenting the natural attenuation plan.)*
4. **Evaluate a minimum of two viable technologically-based remedial options** for soil and groundwater to replace the existing remedial option**,** each option consisting of a single technology or any combination of a technology with another technology, risk reduction mechanism, excavation, or natural attenuation, with the following stipulations.
5. The scope of each option must be inclusive all technologies, mechanisms, and processes to be utilized, concurrently or sequentially, to achieve remediation of all types of contamination at the site to the cleanup goals required for site closure;
6. Natural attenuation, risk reduction mechanism, and excavation must be incorporated into the remedial options when determined to be viable when combined with remedial technologies;
7. In the NTCP, all of the components of the technologically-based remedial option originally implemented from the CAP (e.g., excavation, P&T, natural attenuation), must be re-evaluated; even though it is only the technological component (e.g., P&T) which is being replaced or added, the other components, if not already completely implemented, may require modification.
8. **For ach evaluation required in items a-d**, include the following:
9. Consideration of the nature of the contamination at the site, inclusive of:
   1. Horizontal and vertical extent of soil contamination in unsaturated zone, thickness and extent of free product, and horizontal and vertical extent of individual contaminants dissolved in groundwater;
   2. Accessibility of contamination; and
   3. Estimated volume of contaminated soil or groundwater to be treated.
10. Description of each remedial technology, mechanism, or process included within an option, including:
11. Presentation of system design and specifications, inclusive of

* System design and process;
* Radius of influence of system and estimated rates of contaminant removal;
* Anticipated flow rates and pressures for soil vapor extraction, for groundwater recovery (i.e., both after stripper and after carbon), air sparging, and groundwater injection;
* Anticipated effluent concentration after each unit of treatment;
* Radius of influence of system and estimated rates of contaminant removal;
* Plan for waste disposal;
* Determination of permits necessary for implementation of the remedial option and assessment of feasibility for permit approval;
* Figures and tables to illustrate system design and present specifications (Refer to Sections
* H, I, and J.).

1. Description of the process of natural attenuation of groundwater contamination, *if proposed as part of a technologically-based remedial option*, to include

* Presentation of the parameters selected to monitor the progress of natural attenuation, with an explanation of the basis for selection; and
* Schedule of the contaminant degradation process based on modeling.

1. Discussion of feasibility and effectiveness of each remedial technology, mechanism, or process included within a remedial option, based on:
2. Pilot test results;
3. Aquifer test results and hydrogeological information;
4. Water supply well user information;
5. Soil and groundwater monitoring results;
6. Free product thickness;
7. Natural attenuation parameter sampling results;
8. Groundwater modeling results;
9. Other relevant parameters; and
10. Limitations of each remedial technology, mechanism, or process (including access issues, technological feasibility, etc.) and proposed measures for dealing with limitations;
11. Completed bids (for technologies, extension of municipal lines, etc.).
12. Remedial system operation and maintenance plan for each remedial option (with schedule and discussion of measures to reduce operation and maintenance activities /costs, such as use of automated controls and remote telemetry).
13. Waste treatment/disposal plan for each remedial option (for contaminated soil, contaminated groundwater, free product, used filters, etc.):
14. Estimated volume to be treated/disposed of;
15. Treatment/disposal method;
16. Name and address of treatment/disposal facility;
17. Analytical results for any pre-treatment/disposal samples; and
18. Copies of approved permits necessary for implementation of the remedial option;
19. Monitoring plan for soil, groundwater, and free product for each remedial option (with proposed sampling locations, analytical methods, sampling frequency, and reporting frequency) *(if modification to existing plan are necessary)*.
20. Comprehensive, well-substantiated schedule for each remedial option describing, in detail, the progression of all activities, from the date of CAP approval *and from NTCP approval*, through implementation of remedial action to the date of attainment of cleanup goals. The schedule for each remedial option should include, but not be limited to, the performance or occurrence of the following actions and processes:
21. risk reduction mechanism implementation,
22. soil excavation,
23. treatment system installation and activation,
24. operation and maintenance,
25. natural attenuation,
26. monitoring,
27. **cleanup progress milestones** (dates, of no greater than annual frequency, on which progressively decreasing cleanup levels for soil and groundwater contamination are to be reached),
28. project completion.
29. Detailed cost estimate for full performance of each remedial option, from approval to attainment of cleanup goals, including the costs proposed as low bid for each remedial system, costs for labor, soil and groundwater monitoring, operation and maintenance, periodic reporting, waste disposal, etc.

2. Select the best remedial option, discuss the basis for selection of the remedial option, and indicate why it was determined to be the most effective and cost efficient option for remediating contamination at the site.

Provide a copy(s) of the approved permit(s) necessary for implementation of the selected remedial technology or mechanism.

##### Figures

Provide the following:

1. A topographic map illustrating the area within 1500-foot radius of the UST/AST system(s), or spill, showing:

* Topographic contours;
* Site location;
* Buildings;
* Adjacent streets, roads, highways (identified by street names and numbers);
* Surface water bodies;
* Groundwater flow direction (if determined); and
* North arrow and scale.

2. A site map\* and cross-sections illustrating the UST/AST system(s), or spill, drawn to scale, showing:

* Buildings and property boundaries;
* Underground utilities, such as sewer lines and other conduits; basements; and vaults;
* Water supply wells, surface water bodies;
* Location and orientation of current and former UST(s), pumps, product lines, sumps, etc.;
* Length, diameter and volume of current and former UST(s);
* Type of material(s) stored in UST(s) (currently and formerly); and
* North arrow and scale.

3. Map(s)\* and geological cross-sections, drawn to scale, depicting all soil analytical results obtained to date,\*\* to include:

* Description of soil and bedrock lithology (as determined by investigation to date);
* Location and orientation of UST(s)/AST(s), pumps, piping, sumps, etc. (current and former); spills;
* Soil sample identification (unique letter and/or numerical code), location, and depth;
* Soil sample analytical results;
* Date soil sample collected;
* Final limits of each stage of excavation for each excavation on site; and
* Two geological cross-sections, drawn across the contaminated area and intersecting at right angles, showing the vertical distribution of the contaminants in the unsaturated zone. (Indicate vertical and horizontal scale, orientation of each section, location of water table, soil types and lithology, all borings and sample locations represented by the sections, and soil analytical results for each represented sample, and show sections as labeled lines on the map.)

4. Map(s)\* depicting groundwater elevations, to include:

* Groundwater elevations (relative to MSL);
* Groundwater elevation data points (identified by monitoring well);
* Date of measurement (each map should represent a single water level measurement event);
* Potentiometric contour lines; and
* Groundwater flow direction.

5. Map\*, drawn to scale, depicting the groundwater and surface water analytical results,\*\* to include:

* Location and orientation of UST(s)/AST (s), pumps, piping, sumps, etc. (current and former); spills;
* Groundwater sample identification (unique letter and/or numerical code referencing monitoring or water supply well) and location;
* Date of sampling;
* Surface water sample identification (unique letter and/or numerical code) and location; and
* Groundwater and surface water sample analytical results.

6. Individual groundwater contaminant iso-concentration contour maps\* for every contaminant present in concentrations which exceed the 2L standard limits,\*\* including:

* Contaminant concentrations (in µg/ml) with concentrations in exceedance of MSCCs indicated);
* Contaminant concentration data points (identified by monitoring well);
* Date of measurement (each map should represent a single sampling event;
* Iso-concentration contour lines (solid, if determined from adequate data points; dotted, if estimated);
* An iso-concentration contour line representing the 2L standard limit and, if applicable, the GCL for the contaminant; and
* Two geological cross-sections, one drawn along the long axis of the plume and the second, across it at right angles, showing the vertical distribution of the contaminants in the saturated zone. (Indicate vertical and horizontal scale, orientation of each section; location of water table; and all monitoring wells represented by the sections, and show sections as labeled lines on the map.)

7. A free product map\* depicting thickness and extent of free product and date of measurement.\*\*

8. A map\* and cross-sections, to be used in conjunction with soil contamination map/cross-sections in item #3, illustrating 3-dimensional extent of proposed excavation area to scale.\*\*

9. Maps\* and cross-sections, to be used in conjunction with soil contamination map/cross-sections in item #3, illustrating, to scale, the remedial technology for soil contamination (present a detailed plan of each system design and layout, which includes all major components of the system) **and the proposed technology**.\*\*

10. Maps\* and cross-sections, to be used in conjunction with groundwater elevation map, groundwater contamination map/cross-sections, groundwater isoconcentration maps/cross-sections in items #4-6, illustrating, to scale, the remedial technology for groundwater contamination and/or free product recovery (present a detailed plan of each system design and layout, which includes all major components of the system) **and the proposed technology**.\*\*

***\*Note:*** *Use a single base map to prepare site plans using a map scale of 1 in. = 40 ft.; use a smaller scale for large sites. Maps and figures should include conventional symbols, notations, labeling, legends, scales, and north arrows and should conform to accepted practices of map presentation described in the USGS Geological Survey publication "Topographic Map Symbols”,* [http://store.usgs.gov](http://store.usgs.gov/). *Scale should be expressed as a graphic scale and a verbal statement (e.g., 1 in.= 40 ft) or ratio. Refer to* <http://geokov.com/Education/map-scale.aspx>.

\*\* *If applicable*

##### Tables

Provide the following:

1. Site History (Complete Tables B-1 and B-2 from *Guidelines*, Appendix B);

2. Public and Private Water Supply Well and Other Receptor Information (Complete Table B-5 from *Guidelines*, Appendix B);

4. Summary of Soil Sampling Results (Complete Table B-3 from *Guidelines*, Appendix B);

5. Summary of Groundwater and Surface Water Sampling Results (Complete Table B-4 from *Guidelines*, Appendix B)\*;

6. Monitoring and Remediation Well Construction Information (Complete Table B-7 from *Guidelines*, Appendix B)\*;

7. Free Product Recovery Information (Complete Table B-8A from *Guidelines*, Appendix B)\*;

8. Cumulative Volume of Free Product Recovered from Site (Complete Table B-8B from *Guidelines*, Appendix B)\*;

9. Current and Historical Groundwater Elevations and Free Product Thickness (Complete Table B-9 from *Guidelines*, Appendix B)\*;

10. Remediation Schedules and Cleanup Progress Milestones for the Selected Remedial Option;

11. Cost Estimates for the Selected Remedial Option (equipment, labor, subcontracting, etc.)

##### Appendices

Provide the following:

Appendix A Copies of the NORR, NOV, etc. requiring the New Technology Cleanup Plan;

Appendix B Cost estimate documentation for each remediation technology evaluated, including bid specification, invitations to bid, and bids received;

Appendix C Specifications for remedial system design and layout for each remediation technology evaluated, with calculations;

Appendix D Pilot test data/calculations;

Appendix E Copies of permits.

***Provide additional figures, tables, and appendices, as necessary, to present information critical to evaluation of the technology/mechanism.***

### Soil Cleanup Report with Site Closure Request

*(For low-risk petroleum UST releases only)*

Minimum elements of the report:

**A. Site Information**

1. Site Identification

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Date of Report: |  | | | | Site Risk: | |  |
| Facility I.D.: |  | | UST Incident Number (if known): | | | |  |
| Site Name: |  | | | | | | |
| Street Address: |  | | | | | | |
| City/Town: |  | | Zip Code: |  | County: | |  |
| Description of Geographical Data Point (e.g., diesel fill port): | | | |  | | | |
| Location Method (GPS, topographical map, other): | | | |  | | | |
| Latitude (***decimal degrees***): | |  | Longitude (***decimal degrees***): | | |  | |

2. Information about Contacts Associated with the Release *(Addresses must include street, city, state, zip code and mailing address, if different)*

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UST/AST Owner: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| UST/AST Operator: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Property Owner: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Property Occupant: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Consultant/Contractor: | | |  | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Analytical Laboratory: | | |  | | State Certification No: | | | | |  |
| Address: |  | | | | | | Tel: | |  | |

3. Information about Release

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date Discovered: |  | | | |
| Estimated Quantity of Release: | |  | | |
| Cause of Release: |  | | | |
| Source of Release (e.g., Dispenser/Piping/UST): | | |  | |
| Sizes and Contents of Tanks or Other Containment from which the Release Occurred: | | | |  |

4. Certification (***The title page must display the seal and signature of the certifying P.E. or L.G. and the name and certification number of the company or corporation [See 15A NCAC 2L .0103(e).]****)*

I, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, a Professional Engineer/Licensed Geologist *(circle one)* for (firm or company of employment), do certify that the information contained in this report is correct and accurate to the best of my knowledge.

*(Please Affix Seal and Signature)*

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(Name of company or corporation) is licensed to practice geology/engineering *(circle one or both)* in North Carolina*.* The certification number of the company or corporation is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

##### B. Executive Summary

Present a brief summary of the most pertinent information about the site and the release and indicate the recommended remedy for contamination, using the following outline:

1. Describe the source, date of discovery, and quantity and type(s) of contaminant released;

2. Summarize initial abatement actions, including closure, soil removal, free product recovery, and provision of alternate water;

3. Describe the results of the hydrogeological investigation;

4. Summarize the results of soil, groundwater, and surface water assessment and free product measurement, indicating the nature and extent of contamination, the estimated rate of migration, and potential for impacting receptors;

5. Indicate the risk classification and the criteria for that determination;

6. Indicate the concentration levels to which soil contamination must be remediated;

7. Describe the implementation of the remedial plan selected in the SAR for soil contamination, indicating the schedule of implementation, the effectiveness relative to the cleanup goals, and the cost; and

8. Request site closure.

##### C. Table of Contents

Provide a table of contents, as follows:

1. List sections, indicating page numbers;

2. List figures, identifying each by number;

3. List tables; identifying each by number; and

4. List appendices, identifying each by letter

**D. Site History and Characterization**

Present information relevant to site history and characterization, ***updating information provided in the SAR***, using the following outline:

1. Provide UST owner and operator information.

* Refer to table (Use Table B-2, Site History, UST Owner/Operator and Other Responsible Party Information, from the *Guidelines*, Appendix B.).

2. Provide UST information (inclusive of all USTs, currently and historically in place at facility).

* Refer to table (Use Reporting Table B-1, Site History- UST/AST System and Other Release Information, from the *Guidelines*, Appendix B) and to site map;
* Briefly discuss the spatial and historical relationships among tanks and between tanks and piping and dispensers, describe all historical compliance issues and releases (indicate incident number), and indicate from which UST system(s) the currently investigated release originated.

3. Provide non-UST (AST, spill) information.

* Refer to table (Use Reporting Table B-1, Site History- UST/AST System and Other Release Information, from the *Guidelines*, Appendix B.)and to site map;
* List, describe, and indicate location (refer to location on site map) of spills which have occurred at site.

4. Provide a comprehensive description of the release, including date discovered, cause and source (including tank identification number and contents), and the relationship of historical UST releases, non-UST releases, and off-site releases (indicate incident number) to contamination from current release.

5. Provide a brief description of site characteristics (including land use of site and surrounding area, topography, vegetation, surface water, wells, buildings, surface cover, soil type, depth to and nature of bedrock, depth to groundwater, direction of groundwater flow, etc.).

6. Provide information on owners and occupants of property within or adjacent to area containing contamination or the area where contamination is expected to migrate and describe land use.

* Refer to tables (Use Table B-6, Property Owners/ Occupants; and Table B-10, Land Use) and refer to land use map.

7. Present information on receptors/potential receptors.

* Refer to table (Use Table B-5, Public and Private Water Supply Well and other Receptor Information;) and to potential receptor map.

8. List all reports previously submitted.

9. Summarize initial abatement and corrective actions prior to implementation of the remedial plan proposed in the SAR, including previous excavation of contaminated soil and free product removal.

##### E. Summary of Site Assessment Information

1. Briefly summarize groundwater, surface water, and free product assessment information provided to date, confirming that groundwater contamination is not present in excess of the GCLs or other alternate standards approved for the site; that surface water is not impacted in excess of the applicable surface water standards: and that no (or less than 0.01 foot) free product exists.

2. Summarize soil assessment information presented in the SAR and previous reports prior to implementation of any remedial plan proposed in the SAR *(Soil contamination should have been delineated vertically and horizontally in the unsaturated zone from the source of the release to concentration limits equivalent to the residential or industrial/commercial maximum soil contaminant concentrations, whichever are applicable*:

* Refer to tables in Section L (Use Table B-3, Summary of Soil Sampling Results) and to maps and geological cross-sections depicting soil analytical results and the horizontal and vertical extent of soil contamination;
* Describe horizontal and vertical extent of contamination in unsaturated zone;
* Describe maximum contaminant concentration levels;
* Indicate the applicable cleanup levels for soil (and the basis for determination);
* Indicate estimated volume of contaminated soil to be treated or disposed of; and
* Indicate anticipated accessibility of the contaminated soil.

**F. Objectives of Corrective Action at the Site**

1. Indicate the NORR requiring implementation of the SAR (including remedial plan and subsequent submittal of the SCSC) and any NOVs and enforcement documents related to the implementation of the SAR or to SCSC submittal (Refer to Appendix D.);

2. State purpose and objectives of the remedial plan (e.g., remediate soil to cleanup goals); and

3. State the cleanup goals (Refer to previous Section E, item 2).

##### G. Soil Remediation

1. Describe the remedial plan implemented to remediate contaminated soil.

a. Excavation (*if applicable)*, including:

* Excavation specifications (location, dimensions and shape, etc.);
* Volume of soil treated/disposed of;
* Contaminated soil treatment/disposal method;
* Sampling/analysis of contaminated soil prior to treatment/disposal;
* Name and address of excavation contractor;
* Name and address of transporter;
* Name, and address of and distance to treatment/disposal facility;
* Chronological listing of excavation activities;
* Problems and limitations (including access issues, risk to structures, etc.) and measures taken to resolve them;
* Copies of permits, permit numbers, and dates permits issued/approved;
* Copies of soil disposal manifests; and
* Figures and tables to illustrate excavation specifications (Refer to Section K and L.).

b. Installation, activation, operation and maintenance, monitoring, and shutdown of a remedial system *(if applicable),* including the following:

* System design and process;
* Volume and extent of soil treated;
* Radius of influence of system; Rates of contaminant removal (from startup to final shutdown);
* Flow rates and pressures for soil vapor extraction/air sparging (from startup to final shutdown);
* Effluent concentrations after treatment (from startup to final shutdown);
* Operation and maintenance plan (with schedule and description of measures implemented to reduce operation and maintenance activities /costs, such as use of automated controls and remote telemetry);
* Chronological listing of operation and maintenance activities (from startup to final shutdown);
* Problems and limitations (including access issues, mechanical problems, etc.) and measures taken to resolve them;
* Monitoring plan for soil (with proposed sampling locations, analytical methods, sampling frequency, and reporting frequency);
* Chronological report of soil monitoring results (system startup to final shutdown);
* Evaluation of effectiveness;
* Copies of permits, permit numbers, and dates permits issued/approved; and
* Figures and tables to illustrate system design and to present operation. (Refer to Section K and L.)

2. Present a chronology of remediation activities (excavation or remedial system installation, activation, etc.) performed from the date of SAR approval, through implementation of remedial action to the date of attainment of cleanup goals; compare the performance chronology with the schedule for cleanup proposed in the SAR; and indicate if **cleanup progress milestones (**dates on which progressively decreasing cleanup levels for soil contamination were to have been reached) were met (Refer to Appendices F and G.).

3. Compile actual costs for full performance of the remedial option, from approval to attainment of cleanup goals, including the costs for excavation, remedial system installation and activation, labor, monitoring, operation and maintenance, periodic reporting, waste disposal, etc. (Refer to Appendix E.)

##### H. Post-Remediation Sampling

Describe sampling performed following completion of remedial action to document that soil was cleaned up to applicable cleanup levels. Include Table B-3, *Summary of Soil Sampling Results*. The information should correspond to the maps and tables requested below.

##### I. Conclusions and Petition for Site Closure

Provide basis for request for site closure.

##### J. Public Notice

Indicate if public notice will be required under 15A NCAC 2L .0409(b) following receipt by the responsible party of a Notice of No Further Action (NFA). (If groundwater contamination has not been remediated to the standards or interim standards established under 15A NCAC 2L .0202 and/ or if soil contamination has not been remediated to the lower of the soil-to-groundwater or residential maximum soil contaminant concentrations (MSCCs), the responsible party must provide public notice in accordance with 15A NCAC 2L .0409(b)). Refer to Appendix I and provide therein a list of names and addresses of the local authorities and property owners/occupants to whom the public notice should be sent.

***The NFA will not be considered final until any public notice required is complete and the documentation required as proof has been provided.*** *Note that the public notice consists of a copy of the Notice of NFA.*

##### K. Figures

Provide the following:

1. A topographic map illustrating the area within 1500-foot radius of the source of the release, showing:

* Topographic contours;
* Site location;
* Buildings;
* Adjacent streets, roads, highways (identified by street names and numbers);
* Surface water bodies;
* Groundwater flow direction (if determined); and
* North arrow and scale.

2. A site map\* and cross-sections illustrating the UST/AST system(s) or spill, drawn to scale, showing:

* Buildings and property boundaries;
* Underground utilities, such as sewer lines and other conduits; basements; and vaults;
* Water supply wells, surface water bodies;
* Location and orientation of current and former UST(s)/AST(s), pumps, product lines, sumps, etc.; spills;
* Length, diameter and volume of current and former UST(s)/AST(s);
* Type of material(s) stored in UST(s)/AST(s) (currently and formerly); and
* North arrow and scale.

3. Map(s)\* and geological cross-sections, drawn to scale, depicting all soil analytical results obtained to date, to include:

* Description of soil and bedrock lithology (as determined by investigation to date);
* Location and orientation of UST(s)/AST(s), pumps, piping, sumps, etc.(current and former);spills;
* Soil sample identification (unique letter and/or numerical code), location, and depth;
* Soil sample analytical results;
* Date soil sample collected;
* Final limits of each stage of excavation for each excavation on site; and
* Two geological cross-sections, drawn across the contaminated area and intersecting at right angles, showing the vertical distribution of the contaminants in the unsaturated zone. (Indicate vertical and horizontal scale, orientation of each section, location of water table, soil types and lithology, all borings and sample locations represented by the sections, and soil analytical results for each represented sample, and show sections as labeled lines on the map.)

4. A map\* and cross-sections, to be used in conjunction with soil contamination map/cross-sections in item #3, illustrating 3-dimensional extent of post-SAR excavation, drawn precisely to scale;\*\*

5. Maps\* and cross-sections, to be used in conjunction with soil contamination map/cross-sections in item #3, illustrating, to scale, a remedial system for soil contamination (present a detailed plan of each system design and layout, which includes all major components of the system).\*\*

***\*Note:*** *Use a single base map to prepare site plans using a map scale of 1 in. = 40 ft.; use a smaller scale for large sites. Maps and figures should include conventional symbols, notations, labeling, legends, scales, and north arrows and should conform to accepted practices of map presentation described in the USGS Geological Survey publication "Topographic Map Symbols”,* [http://store.usgs.gov](http://store.usgs.gov/). *Scale should be expressed as a graphic scale and a verbal statement (e.g., 1 in.= 40 ft) or ratio. Refer to* <http://geokov.com/Education/map-scale.aspx>.

\*\* *If applicable*

##### L. Tables

Provide the following:

1. Site History (Complete Tables B-1 and B-2 from *Guidelines*, Appendix B);

2. Field Screening Results;

3. Summary of Soil Sampling Results (Complete Table B-3 from *Guidelines*, Appendix B);

4. Current and Historical Groundwater Elevations and Free Product Thickness (Complete Table B-9 from *Guidelines*, Appendix B)\*; and

5. Property Owners/Occupants (Complete Table B-6) from *Guidelines*, Appendix B, listing the names and addresses of property owners and occupants within or contiguous to the area containing contamination and all property owners and occupants within or contiguous to the area where the contamination is expected to migrate.

*\* If applicable*

##### M. Appendices

Provide the following:

Appendix A Copies of permits (soil treatment, etc.)/completed permit applications\*

Appendix B Copies of soil disposal manifests

Appendix C Geologic logs for borings (related to final soil cleanup confirmation sampling only)

Appendix D Copies of the NORR, NOV, etc. requiring the implementation of the remedial plan from the SAR and the submittal of the SCSC

Appendix E Compilation of costs for excavation process or remedial system installation, activation, etc, (from system start up to shutdown)

Appendix F Chronology of remediation activities (excavation; remedial system installation, activation, operation and maintenance, monitoring, reporting, etc.) performed from the date of SAR approval, through implementation of remedial action to the date of attainment of cleanup goals) and cleanup progress milestones **(**dates on which progressively decreasing cleanup levels for groundwater contamination were to have been reached)

Appendix G Proposed remediation schedule and cleanup progress milestones for the implemented remedial action (from the SAR)

Appendix H Specifications for remedial system design, layout, and components

Appendix I Names and addresses of the local authorities to whom copies of the SAR were sent, copies of cover letters which accompanied the SAR copies, and certified USPS delivery receipts \*

* *If applicable*

***Provide additional tables as necessary to document remediation process.***

### Site Closure Report

*(For high- and intermediate-risk petroleum UST releases, non-petroleum UST releases, and non-UST petroleum releases)*

Minimum elements of the report:

**A. Site Information**

1. Site Identification

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Date of Report: |  | | | | Site Risk: | |  |
| Facility I.D.: |  | | UST Incident Number (if known): | | | |  |
| Site Name: |  | | | | | | |
| Street Address: |  | | | | | | |
| City/Town: |  | | Zip Code: |  | County: | |  |
| Description of Geographical Data Point (e.g., diesel fill port): | | | |  | | | |
| Location Method (GPS, topographical map, other): | | | |  | | | |
| Latitude (***decimal degrees***): | |  | Longitude (***decimal degrees***): | | |  | |

2. Information about Contacts Associated with the Release *(Addresses must include street, city, state, zip code and mailing address, if different)*

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UST/AST Owner: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| UST/AST Operator: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Property Owner: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Property Occupant: | |  | | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Consultant/Contractor: | | |  | Email: | |  | | | | |
| Address: |  | | | | | | Tel: |  | | |
| Analytical Laboratory: | | |  | | State Certification No: | | | | |  |
| Address: |  | | | | | | Tel: | |  | |

3. Information about Release

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date Discovered: |  | | | |
| Estimated Quantity of Release: | |  | | |
| Cause of Release: |  | | | |
| Source of Release (e.g., Dispenser/Piping/UST): | | |  | |
| Sizes and Contents of Tanks or Other Containment from which the Release Occurred: | | | |  |

4. Certification (***The title page must display the seal and signature of the certifying P.E. or L.G. and the name and certification number of the company or corporation [See 15A NCAC 2L .0103(e).]****)*

I, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, a Professional Engineer/Licensed Geologist *(circle one)* for (firm or company of employment), do certify that the information contained in this report is correct and accurate to the best of my knowledge.

*(Please Affix Seal and Signature)*

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(Name of company or corporation) is licensed to practice geology/engineering *(circle one or both)* in North Carolina*.* The certification number of the company or corporation is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**B. Executive Summary**

Present a brief summary of the most pertinent information about the site and the release and indicate the recommended remedy for contamination, using the following outline:

1. Describe the source, date of discovery, and quantity and type(s) of contaminant released;

2. Summarize initial abatement actions, including closure, soil removal, free product recovery, and provision of alternate water;

3. Describe the results of hydrogeological investigation from the CSA and subsequent monitoring;

4. Summarize the results of soil, groundwater, and surface water assessment and free product measurement, indicating the historical and the current nature and horizontal and vertical extent of contamination;

5. Indicate the risk classification (or non-UST petroleum/non-petroleum UST rank) and the criteria for that determination;

6. Indicate the concentration levels to which soil contamination must be remediated and to which groundwater contamination must be remediated;

7. Describe the implementation of the remedial plans for removal of free product (if present) and for remediation of soil and/or groundwater contamination, indicating the schedule of implementation, the effectiveness relative to the cleanup goals, and the cost; and

8. Request site closure.

**C. Table of Contents**

Provide a table of contents, as follows:

1. List sections, indicating page numbers;

2. List figures, identifying each by number;

3. List tables; identifying each by number; and

4. List appendices, identifying each by letter

**D. Site History and Characterization**

Present information relevant to site history and characterization, ***updating information provided in the CAP and monitoring reports*** using the following outline:

1. Provide information for UST/AST owner/operators and other responsible parties.

* Refer to table (Use Table B-2, Site History, UST/AST Owner/Operator and Other Responsible Party Information, from *Guidelines*, Appendix B).

2. Provide information about UST systems (inclusive of all USTs, currently and historically in place at site).

* Refer to table (Use Table B-1, Site History, UST/AST System and Other Release Information, from *Guidelines*, Appendix B) and to site map.
* Briefly discuss the spatial and historical relationships among tanks and between tanks and piping and dispensers, describe all historical compliance issues and releases (indicate incident number), and indicate from which UST system(s) the currently investigated release originated.
* List, describe, and indicate location (refer to location on site map) of all other UST releases which have occurred at site.

3. Provide information about petroleum AST systems, petroleum spills, and other non-UST petroleum releases (inclusive of all ASTs, currently and historically in place at site and all spills at site).

* Refer to table (Use Table B-1, Site History, UST/AST System and Other Release Information) and to site map.
* Briefly discuss the spatial and historical relationships among tanks and between tanks and piping and dispensers, describe all historical compliance issues and releases (indicate incident number), and indicate from which AST system(s) or other non-UST source the currently investigated release originated.
* List, describe, and indicate location (refer to location on site map) of all other non-UST petroleum releases and non-petroleum releases which have occurred at site.

4. Provide a comprehensive description of the release, including date discovered, cause and source (including tank identification number and contents), and the relationship of historical UST releases, petroleum AST releases, petroleum spills and other non-UST petroleum releases, non-petroleum releases, and off-site releases (indicate incident numbers) to contamination from current release.

5. Provide a brief description of site characteristics (including land use of site and surrounding area, topography, vegetation, surface water, wells, buildings, surface cover, soil type, depth to and nature of bedrock, depth to groundwater, direction of groundwater flow, etc.).

6. Provide information on owners and occupants of property within or adjacent to area containing contamination or the area where contamination is expected to migrate and describe land use.

* Refer to tables (Use Table B-6, Property Owners/ Occupants, and Table B-10, Land Use from *Guidelines*, Appendix B) and refer to land use map.

7. Present information on receptors/potential receptors.

* Refer to table (Use Table B-5, Public and Private Water Supply Well and Other Receptor Information, from *Guidelines*, Appendix B) and to potential receptor map.

8. List all reports previously submitted, including monitoring reports.

9. Summarize initial abatement and corrective actions prior to implementation of the remedial plan proposed in the CAP, including previous excavation of contaminated soil and free product removal.

10. Summarize implementation of the remedial plan proposed in the CAP.

11. Describe the progress of remediation at the site, as indicated in monitoring reports, from initial implementation of the remedial plan to the latest monitoring of soil and/or groundwater contamination.

**E. Summary of Site Assessment Information**

1. Summarize all soil, groundwater, surface water, and free product assessment information acquired to date.

* Refer to tables (Use Table B-3, Summary of Soil Sampling Results; Table B-4, Summary of Groundwater and Surface Water Sampling Results; Table B-9, Current and Historical Groundwater Elevations and FP Thickness, from *Guidelines*, Appendix B) and to map(s) showing groundwater elevation and flow; maps and geological cross-sections depicting soil and groundwater analytical results and the horizontal and vertical extent of contamination, and map(s) depicting free product thickness and extent.

2. Describe the geology and hydrogeology of the region and the site.

* Describe soil and bedrock encountered at the site. (Refer to geologic cross sections of map illustrating soil contamination and to geologic logs for borings.)
* Discuss site hydrogeology, as determined from groundwater monitoring and from the hydrogeological investigation reported in the CSA (include the following information: groundwater flow direction, hydraulic gradient (vertical and horizontal), hydraulic conductivity, and groundwater velocity.)

3. Evaluate soil, groundwater, surface water, and free product assessment information:

* Describe maximum historical extent of contamination (including the horizontal and vertical extent of soil contamination in unsaturated zone, the horizontal and vertical extent of groundwater contamination in the saturated zone, the thickness and extent of free product, and the presence of surface water contamination):
* Describe the current extent (or absence) of contamination and the current maximum contaminant concentration levels;
* Indicate if the applicable cleanup levels for soil (*soil-to-groundwater maximum soil contaminant concentrations*, groundwater *(2L standard concentrations*), surface water *(2B standard concentrations*) and free product *(0.01’)* have been achieved

##### Soil Remediation

1. Describe the remedial plan implemented to remediate contaminated soil.

1. Excavation (*if applicable)*, including:
2. Excavation specifications (location, dimensions and shape, etc.)
3. Volume of soil treated/disposed of;
4. Contaminated soil treatment/disposal method;
5. Sampling/analysis of contaminated soil prior to treatment/disposal;
6. Name and address of excavation contractor;
7. Name and address of transporter;
8. Name, and address of and distance to treatment/disposal facility;
9. Chronological listing of excavation activities;
10. Problems and limitations (including access issues, risk to structures, etc.) and measures taken to resolve them;
11. Copies of permits, permit numbers, and dates permits issued/approved; and
12. Copies of soil disposal manifests; and
13. Figures and tables to illustrate excavation specifications (Refer to Section K and L.).
14. Installation, activation, operation and maintenance, monitoring, and shutdown of a remedial system *(if applicable),* including the following:
15. System design and process;
16. Volume and extent of soil treated;
17. Radius of influence of system;
18. Rates of contaminant removal, from startup to final shutdown (Refer to Appendix D);
19. Flow rates and pressures for soil vapor extraction/air sparging, from startup to final shutdown (Refer to Appendix D);
20. Effluent concentrations after treatment, from startup to final shutdown (Refer to Appendix D);
21. Operation and maintenance plan (with schedule and description of measures implemented to reduce operation and maintenance activities /costs, such as use of automated controls and remote telemetry);
22. Chronological listing of operation and maintenance activities (from startup to final shutdown);
23. Problems and limitations (including access issues, mechanical problems, etc.) and measures taken to resolve them;
24. Monitoring plan for soil (with proposed sampling locations, analytical methods, sampling frequency, and reporting frequency);
25. Historical soil monitoring results (system startup to final shutdown);
26. Evaluation of effectiveness;
27. Copies of permits, permit numbers, and dates permits issued/approved; and
28. Figures and tables to illustrate system design and to present operation. (Refer to Section K and L.)

2. Present a chronology of remediation activities (excavation or remedial system installation, activation, etc.) performed from the date of CAP approval, through implementation of remedial action to the date of attainment of cleanup goals; compare the performance chronology with the schedule for cleanup proposed in the CAP and indicate if **cleanup progress milestones (**dates on which progressively decreasing cleanup levels for soil contamination were to have been reached) were met. (Refer to Appendices G and H.)

3. Present costs for full performance of the remedial option, from approval to attainment of cleanup goals, including the costs for excavation, remedial system installation and activation, labor, monitoring, operation and maintenance, periodic reporting, waste disposal, etc. (Refer to Appendix F.)

##### Groundwater Remediation

1. Describe the remedial plan implemented to remediate contaminated groundwater.

1. Natural attenuation *(if applicable),* including the following:
2. Parameters selected to monitor progress of natural attenuation;
3. Monitoring plan for contaminants in groundwater and natural attenuation parameters (with proposed sampling locations, analytical methods, sampling frequency, and reporting frequency);
4. Reference to historical groundwater monitoring results (system startup to final shutdown
5. Evaluation of effectiveness (include comparison of the proposed remediation schedule and performance milestones, based on modeling, from the CAP for the contaminant degradation process (Appendix H) to historical groundwater analytical results and natural attenuation parameter results (Appendix C);
6. Installation, activation, operation and maintenance, monitoring, and shutdown of a remedial system *(if applicable),* including the following:
7. System design and process;
8. Extent of groundwater treated;
9. Radius of influence of system;
10. Rates of contaminant removal, from startup to final shutdown (Refer to Appendix D);
11. Flow rates and pressures for soil vapor extraction, groundwater recovery (i.e., both after stripper and after carbon), air sparging, and groundwater injection, from startup to final shutdown (Refer to Appendix D);
12. Effluent concentrations after treatment, from startup to final shutdown (Refer to Appendix D);
13. Operation and maintenance plan (with proposed schedule and a description of measures implemented to reduce operation and maintenance activities /costs, such as use of automated controls and remote telemetry);
14. Chronological listing of operation and maintenance activities (from startup to final shutdown
15. Problems and limitations (including access issues, mechanical problems, etc.) and measures taken to resolve them;
16. Monitoring plan for groundwater (with proposed sampling locations, analytical methods, sampling frequency, and reporting frequency);
17. Reference to historical groundwater monitoring results (system startup to final shutdown);
18. Evaluation of effectiveness;
19. Copies of permits, permit numbers, and dates permits issued/approved; and
20. Figures and tables to illustrate system design and to present operation. (Refer to Section K and L.)

2. Present a chronology of remediation activities (excavation or remedial system installation, activation, operation and maintenance, monitoring, etc.) performed from the date of CAP approval, through implementation of remedial action to the date of attainment of cleanup goals; compare the performance chronology with the schedule for cleanup proposed in the CAP; and indicate if **cleanup progress milestones (**dates on which progressively decreasing cleanup levels for groundwater contamination were to have been reached) were met. (Refer to Appendix G and H.)

3. Present actual costs for full performance of the remedial option, from approval to attainment of cleanup goals, including the costs for excavation, remedial system installation and activation, labor, monitoring, operation and maintenance, periodic reporting, waste disposal, etc. (Refer to Appendix F.)

##### H. Post-Remediation Sampling

Referring to Section E, items 1and 3, describe final sampling performed following completion of remedial actions to document that free product has been removed and that soil, groundwater and surface water have been cleaned up to applicable cleanup levels.

* Refer to tables (Use Table B-3, Summary of Soil Sampling Results; Table B-4, Summary of Groundwater and Surface Water Sampling Results; Table B-9, Current and Historical Groundwater Elevations and FP Thickness, from *Guidelines*, Appendix B) and to map(s) showing groundwater elevation and flow; maps and geological cross-sections depicting soil and groundwater analytical results and the horizontal and vertical extent of contamination, and map(s) depicting free product thickness and extent.

##### I. Conclusions

Present conclusions.

##### J. Petition for Site Closure

Demonstrate that the site meets the requirements for site closure. Request site closure.

##### K. Figures

Provide the following:

1. A topographic map illustrating the area within 1500-foot radius of the source of the release, showing:

* Topographic contours;
* Site location;
* Buildings;
* Adjacent streets, roads, highways (identified by street names and numbers);
* Surface water bodies;
* Groundwater flow direction (if determined); and
* North arrow and scale.

2. A site map\* and cross-sections illustrating the release site (AST system(s), UST system(s), location of spill, etc.) drawn to scale, showing:

* Buildings and property boundaries;
* Underground utilities, such as sewer lines and other conduits; basements; and vaults;
* Water supply wells, surface water bodies;
* Location and orientation of current and former AST(s), UST(s), pumps, product lines, sumps, etc.;
* Length, diameter and volume of current and former AST(s), UST(s);
* Type of material(s) stored (currently and formerly) in AST(s) or UST(s) or spilled; and
* North arrow and scale.

3. Map(s)\* and geological cross-sections, drawn to scale, depicting all soil analytical results obtained to date, to include:

Description of soil and bedrock lithology (as determined by investigation to date);

* Location and orientation of AST(s), UST(s), pumps, piping, sumps, etc.(current and former), spills;
* Soil sample identification (unique letter and/or numerical code), location, and depth;
* Soil sample analytical results;
* Date soil sample collected;
* Final limits of each stage of excavation for each excavation on site; and
* Two geological cross-sections, drawn across the contaminated area and intersecting at right angles, showing the vertical distribution of the contaminants in the unsaturated zone. (Indicate vertical and horizontal scale, orientation of each section, location of water table, soil types and lithology, all borings and sample locations represented by the sections, and soil analytical results for each represented sample, and show sections as labeled lines on the map.)

4. Map(s)\* depicting groundwater elevations, to include:

* Groundwater elevations (relative to MSL);
* Groundwater elevation data points (identified by monitoring well);
* Date of measurement (each map should represent a single water level measurement event);
* Potentiometric contour lines; and
* Groundwater flow direction.

5. Map\*, drawn to scale, depicting the groundwater and surface water analytical results,\*\* to include:

* Location and orientation of AST(s), UST(s), pumps, piping, sumps, etc. (current and former), spills;
* Groundwater sample identification (unique letter and/or numerical code referencing monitoring or water supply well) and location;
* Date of sampling;
* Surface water sample identification (unique letter and/or numerical code) and location; and
* Groundwater and surface water sample analytical results.

6. Individual groundwater contaminant iso-concentration contour maps\* for every contaminant present in concentrations which exceed the 2L standard limits,\*\* including:

* Contaminant concentrations (in µg/ml) with concentrations in exceedance of MSCCs indicated);
* Contaminant concentration data points (identified by monitoring well);
* Date of measurement (each map should represent a single sampling event;
* Iso-concentration contour lines (solid, if determined from adequate data points; dotted, if estimated);
* An iso-concentration contour line representing the 2L standard limit for the contaminant; and
* Two geological cross-sections, one drawn along the long axis of the plume and the second, across it at right angles, showing the vertical distribution of the contaminants in the saturated zone. (Indicate vertical and horizontal scale, orientation of each section; location of water table; and all monitoring wells represented by the sections, and show sections as labeled lines on the map.)

7. A free product map\* depicting thickness and extent of free product and date of measurement.

8. A potential receptor map that clearly identifies water supply wells (municipal or public/private wells, etc.) and other potential receptors (surface water bodies, basements, utilities, wellhead protection areas, etc.) within 1500’ of the source of the release.

1. A map\* and cross-sections, to be used in conjunction with soil contamination map/cross-sections in item #3, illustrating 3-dimensional extent of excavation area to scale.\*\*
2. Maps\* and cross-sections, to be used in conjunction with soil contamination map/cross-sections in item #3, illustrating, to scale, the remedial technology for soil contamination (present a detailed plan of each system design and layout, which includes all major components of the system).\*\*
3. Maps\* and cross-sections, to be used in conjunction with groundwater elevation map, groundwater contamination map/cross-sections, groundwater isoconcentration maps/cross-sections in items #4-6, illustrating, to scale, the remedial technology(ies) for groundwater contamination and/or free product recovery (present a detailed plan of system design and layout, which includes all major components of the system).\*\*

***\*Note:*** *Use a single base map to prepare site plans using a map scale of 1 in. = 40 ft.; use a smaller scale for large sites. Maps and figures should include conventional symbols, notations, labeling, legends, scales, and north arrows and should conform to accepted practices of map presentation described in the USGS Geological Survey publication "Topographic Map Symbols”,* [http://store.usgs.gov](http://store.usgs.gov/). *Scale should be expressed as a graphic scale and a verbal statement (e.g., 1 in.= 40 ft) or ratio. Refer to* <http://geokov.com/Education/map-scale.aspx>.

\*\* *If applicable*

##### L. Tables

Provide the following:

1. Site History (Complete Tables B-1 and B-2 from *Guidelines*, Appendix B, Reporting Tables);

2. Public and Private Water Supply Well and Other Receptor Information (Complete Table B-5 from *Guidelines*, Appendix B);

3. Summary of Soil Sampling Results (Complete Table B-3 from *Guidelines*, Appendix B);

4. Summary of Groundwater Sampling Results (Complete Table B-4 from *Guidelines*, Chapter 14)\*;

5. Monitoring and Remediation Well Construction Information (Complete Table B-7 from *Guidelines*, Chapter Appendix B)\*;

6. Free Product Recovery Information (Complete Table B-8A from *Guidelines*, Appendix B)\*;

7. Cumulative Volume of Free Product Recovered from Site (Complete Table B-8B from *Guideline,* Appendix B)\*;

8. Current and Historical Groundwater Elevations and Free Product Thickness (Complete Table B-9 from *Guidelines*, Appendix B)\*.

***\**** *If applicable*

##### M. Appendices

Provide the following:

Appendix A Geologic logs for borings (related to final soil cleanup confirmation sampling only)\*

Appendix B Copies of any NORR, NOV, etc.\*

Appendix C Natural attenuation parameters: historical sampling results (from monitoring reports)\*; groundwater field measurements (pH, dissolved oxygen, specific conductivity, temperature, Eh, alkalinity)

Appendix D Remedial system performance tables and graphs (from monitoring reports)\*

Appendix E Contaminant concentration vs. time (vs. water level) graphs\*

Appendix F Compilation of costs for performance of the remedial plan, from approval to attainment of cleanup goals, including the costs for each remedial system, costs for labor, soil and groundwater monitoring, operation and maintenance, periodic reporting, waste disposal, etc.

Appendix G Chronology of remediation activities (excavation; remedial system installation, activation, operation and maintenance, monitoring, reporting, etc.) performed from the date of CAP approval, through implementation of remedial action to the date of attainment of cleanup goals) and cleanup progress milestones **(**dates on which progressively decreasing cleanup levels for groundwater contamination were to have been reached)

Appendix H Proposed remediation schedule and cleanup progress milestones for implemented remedial plan (from CAP)

*\* If applicable*

***Provide additional figures, tables, and appendices as needed to illustrate cleanup progress.***

### Format of Individual Public Notice

15A NCAC 2L .0409(a)

***Date***

CERTIFIED MAIL ***(Give number of receipt)***

RETURN RECEIPT REQUESTED

***[Name and address of person***

***Required to be notified under 15A NCAC 2L .0409(a))]***

Subject: Notice of Request for Approval of a ***Corrective Action Plan, Soil Assessment Report, or Soil Clean up Plan***

***Site name***

***Address***

***County***

***Incident No.***

Dear ***(Name of Property Owner/Occupant)****:*

This letter is to inform you that the NC Division of Waste Management has received a request for approval of a proposal to cleanup a release from a petroleum underground storage tank system located in your area. Because the property that you own or occupy is located within or contiguous to an area containing contamination or within or contiguous to an area where the contamination is expected to migrate, the State rules governing groundwater classifications and standards (15A NCAC 2L .0400), require that you be informed of the proposed activities.

***(Name of Environmental Consultant)***on behalf of the responsible party ***(Name of responsible party)***is providing notice of the request for approval of a ***(Corrective Action Plan, Soil Assessment Report, or Soil Cleanup Plan)***that proposes: ***(Choose all that apply)***

***To use natural processes of degradation and attenuation as a method to clean up contaminated groundwater,***

***To cleanup groundwater contamination to a standard other than the groundwater standard or interim standard established in 15A NCAC 2L .0202, and***

***To cleanup soil contamination to a standard other than the residential or soil-to-groundwater maximum contaminant concentration, whichever is lower.***

The source area of the contamination is located at ***[Give the location of the source area of the release using at least two street names/numbers. If this is not feasible, use the name/number of one road and the distance to an identified landmark (e.g., named body of water, historic site, park, or federal land) on the NCDOT county map.]***Please see the attached map showing the location of the source area of the release and the location of your property.

***(Describe the cleanup proposal and provide the reasons supporting it. Include a discussion of how the public health and environment is protected and cite any additional reasons why this proposal should be relied on to reduce the risk posed by the release.)***

If you would like to examine the plan, please contact ***(contact person for the proponent of the plan)*** at ***(area code and telephone number).*** A copy will be mailed to you promptly. In addition, the DWM ***(name of appropriate Regional Office)*** has the ***(Corrective action Plan, Soil Assessment Report, or Soil Cleanup Plan)*** along with other site information on file and available for public review. You may make copies of this information for a small fee. Any written comments concerning this request should be submitted to the following address within thirty (30) days of the date that this letter was issued:

***(DWM regional office project manager)***

***(Appropriate Regional Office)***

***(Regional office address and zip code)***

***(Regional office telephone number)***

All comments received within this time frame will be considered in approving the ***(Corrective Action Plan, Soil Assessment Report, or Soil Cleanup Plan)***.A public meeting may be held should the Department find a significant degree of public interest in the proposed activities.

***(Name of Regional Office staff person)***may be contacted during normal weekday business hours to answer questions or to arrange an appointment to review the information on file pertaining to the release. Notification of this request for approval of a ***(Corrective action Plan, Soil Assessment Report, or Soil Cleanup Plan)***is also being made by certified mail to ***(name and title of local Health Director)*, *(name and title of Chief Administrative Officer)***, and other property owners and occupants within or near the source area of the release.

Sincerely,

***(Environmental Consultant name and title)***

Attachment: Scaled site map showing source area of release and location of property owned or occupied by person being notified.

### Format of Public Notice by Posting (15A NCAC 2L .0409(a))

**PUBLIC NOTICE**

NOTIFICATION OF PROPOSED CLEANUP OF A RELEASE FROM A PETROLEUM UNDERGROUND STORAGE TANK SYSTEM

***Date***

***Site name***

***Address***

***County***

***Incident No.***

In accordance with 15A NCAC 2L .0409(a), public notice is hereby given of receipt of a request for approval by the North Carolina Division of Waste Management of a **(*Corrective Action Plan, Soil Assessment Report, or Soil Cleanup Plan)***for the above-referenced site. The***(Corrective Action Plan, Soil Assessment Report, or Soil Cleanup Plan*)** proposes: ***(Choose all that apply)***

***To use natural processes of degradation and attenuation as a method to clean up contaminated groundwater,***

***To cleanup groundwater contamination to a standard other than the groundwater standard or interim standard established in 15A NCAC 2L .0202, and***

***To cleanup soil contamination to a standard other than the residential or soil-to-groundwater maximum contaminant concentration, whichever is lower.***

Interested parties may examine the ***(Corrective Action Plan, Soil Assessment Report, or Soil Cleanup Plan)*** by contacting ***(contact person for the proponent of the plan)*** at ***(area code and telephone number).*** In addition, the DWM ***(name of appropriate Regional Office)*** has the ***(Corrective Action Plan, Soil Assessment Report, or Soil Cleanup Plan)*** along with other site information on file and available for public review. You may arrange to review this information by contacting the regional office listed below.

Any written comments concerning this request should be submitted to the following address within thirty (30) days of the date that this notice was posted:

***(DWM Regional Office project manager)***

***(Appropriate Regional Office)***

***(Regional Office address and zip code)***

***(Regional Office telephone number)***

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date Name of Responsible Party

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Signature of Responsible Party

### Format of Individual Public Notice for Non-Petroleum UST Releases

(15A NCAC 2L .0114(b))

***(date)***

CERTIFIED MAIL ***(give number of receipt)***

RETURN RECEIPT REQUESTED

***(name and address of property* *owner/occupant required to be notified* *under 15A NCAC 2L .0114(b))***

SUBJECT: NOTICE CONCERNING THE REQUEST FOR APPROVAL OF A CORRECTIVE ACTION PLAN PURSUANT TO ***15A NCAC 2L .0106(k), 15A NCAC 2L .0106(l) or 15A NCAC 2L .0106(m)***

***Site Name***

***Address***

***County***

***DWM Incident*** *N****umber***

Dear Mr./Ms. ***(property owner(s), occupant(s), or other party):***

This letter is being provided to inform you that the State's Division of Waste Management has been requested to approve an environmental cleanup activity in your area. In accordance with the North Carolina General Statutes, a set of Groundwater Classifications and Standards has been put in place for the protection of all groundwater across the State. Because your property is located adjacent to or near other properties that may be involved in groundwater cleanup, the law requires that you be informed of the proposed activities.

Pursuant to the notification requirements of Title 15A NCAC 2L .0114(b), ***(environmental consultant)***on behalf of ***(responsible* *party)*** is providing notice of the request for approval of a corrective action plan under 15A NCAC 2L .0106 ***((k), (1) and/or (m)).*** This property is located at **(*give* *the location of the property using at least two* *street names/numbers. If this is not feasible use one road and the* *distance to an identified landmark on the NCDOT county map, e.g.,* *named body of water, historic site, park, federal land).***

Some of the constituents found at the above location are typical of (***name of product/ material that is source of contamination, e.g., dry cleaning solvent, degreasing solvent, etc.)***and have been detected beneath this site in concentrations which exceed the ***(Groundwater Quality Standards or Interim Standards established in 15A NCAC 2L .0202. (Environmental consultant)*** believes that if the proposed corrective action plan is approved by the Department, implementation will result in the following:

***Provide a brief summary of the information sent to the* *Director that supports the request for a corrective* *action plan under 15A NCAC 2L .0106(k), (1) and/or (m).* *Give reasons supporting the use of a 15A NCAC 2L* *.0106(k), (l) and/or (m) corrective action in lieu of any* *other corrective action. Include a description of how the* *public health,* *environment and adjacent property* *uses/values are protected by this proposed corrective* *action. Present any additional reasons why this* *corrective action plan should be relied on to remediate* *the site and impacted lands. Use a number format for* *each reason.***

If you would like to examine the plan, please contact **(*contact* *person for the proponent of the corrective action plan)***at **(*area* *code and phone number).***A copy will be mailed to you promptly. In addition, the ***(name of)***Regional Office has this proposed corrective action plan with detailed site information on file for public examination. You may make an appointment to view the files and/or make copies of the information at a charge of 10 cents per page. Any written comments concerning this request should be submitted within 30 days of **(*the* *date requested CAP was submitted to DWM)***to***(appropriate DWM* *regional supervisor)***of the ***(appropriate DWM regional* *office*).** Please send written comments to the following address:

***DWM REGIONAL SUPERVISOR***

***APPROPRIATE REGIONAL OFFICE***

***REGIONAL OFFICE ADDRESS AND ZIP CODE***

***(PHONE NUMBER)***

***(name of)***Regional Office staff may be contacted during normal weekday business hours to answer questions pertaining to this request or to arrange an examination of the information on file related to this incident. Notification of this request for approval of a corrective action plan is also being made by certified mail to the ***(local health director)*** and ***(chief administrative officer(s))*.**

Sincerely,

***(Environmental consultant’s name, title, and***

***professional seal)***

### VPH (Aliphatics/Aromatics) Laboratory Reporting Form



Instructions for Completing the VPH Laboratory Reporting Form

1) Client Name: Enter the consultant’s or contractor’s company name.

2) Project Name: It could be the Incident Number, facility name, or a residence.

3) Site Location: The address

4) Laboratory Name: Enter the laboratory’s name which the laboratory analyzed the sample. The laboratory should have been certified by the Certification Section of North Carolina.

5) NC Certification # (Lab): Enter the certification number issued by the Certification Section of North Carolina.

6) Lab ID: The ID number was assigned by the laboratory to track the sample.

7) Sample Description: Enter the field ID. It could be the well number or the depth of soil.

8) Sample Matrix: Indicate the sample as soil or aqueous

9) Dry Weight %: Enter the moisture % of the sample.

10) Date Collected: Enter the day that the sample was collected.

11) Date Received: Enter the day that sample was received by the laboratory.

12) Date Extracted (if Applicable): This entry is for samples that were not preserved before or after they were collected on site, for example, a sample collected with a EnCore sampling device.

13) Date Analyzed: Enter the date that the sample was analyzed.

14) Diluting Factor:

a) Aqueous sample - If the sample was not analyzed straight, enter the dilution factor.

b) Soil sample - Based on a 1:1 ratio of methanol: soil and analysis of a 100uL aliquot of the methanol extract in 5mL water. There is a 50 times dilution factor when the lab deposits 100uL extract to 5mL water for the initial purge-and-trap. However, the Report Limit (RL) will not be multiplied on this initial 50 times dilution. The RL will be multiplied only if the analysis needs to be further diluted. (Refer the SOP for VPH calculation in 9.6.2 and 12.0.)

15) Report Limit (RL):

a) The RLs for target VPH analytes shall be based on the concentration of the lowest calibration standard for the analyte of interest.

b) The RLs for the hydrocarbon ranges will be set at 100x the concentration of the lowest calibration standard for the associated analyte. Therefore, the RL for aqueous is 100 µg/L, and soil/sediment sample is 5mg/kg. (100ug/Lx5000uL/100uL=5000µg/kg=5mg/kg)

16) Unit: Distinguish carefully between ug/l and mg/L; or µg/kg and mg/kg.

17 -19): Unadjusted C5-C8 and C9-C12 Aliphatics, and unadjusted C9-C10 Aromatics

The result before the known target compounds within the range are subtracted. An unadjusted value should exclude the concentration of any surrogate(s), internal standards, and/or concentrations of other ranges that elute within the specified range. (The unadjusted concentration of C9-C12 is defined as the value remaining after the concentration of the unadjusted C9-C10 is subtracted from the raw concentration of C9-C12.)

20 - 26): Enter the results of individual target compounds. These results should match/confirm each other between the FID and PID detectors if both results are available (WSC-CAM-IVA, Section 2.1, p.17), but it is optional for the lab to report the individual target compounds or not.

27 - 29): Adjusted C5-C8 and C9-C12 Aliphatics, and adjusted C9-C10 Aromatics

The result after the known target compounds within the range from the unadjusted C5-C8 and C9-C12 Aliphatics, and unadjusted C9-C10 Aromatics are subtracted.

30 - 31): Enter the PID and FID Surrogate % Recovery. Use the one that will be eluted out after Naphthalene, then there is no concern about the overlap.

32) Comments: Report the result and qualify any QA/QC issues in a narrative summary.

### EPH (Aliphatics/Aromatics) Laboratory Reporting Form



**North Carolina Underground Storage Tank Section**

Instructions for Completing the EPH Laboratory Reporting Form

1) Client Name: Enter the consultant’s or contractor’s company name.

2) Project Name: It could be the Incident Number, facility name, or a residence.

3) Site Location: The address

4) Laboratory Name: Enter the laboratory’s name which the laboratory analyzed the sample. The laboratory should have been certified by the Certification Section of North Carolina.

5) NC Certification # (Lab): Enter the certification number issued by the Certification Section of North Carolina.

6) Lab ID: The ID number was assigned by the laboratory to track the sample.

7) Sample Description: Enter the field ID. It could be the well number or the depth of soil.

8) Sample Matrix: Indicate the sample as soil or aqueous

9) Dry Weight %: Enter the moisture % of the sample.

10) Date Collected: Enter the day that the sample was collected.

11) Date Received: Enter the day that sample was received by the laboratory.

12) Date Extracted: Enter the date that sample was extracted.

13) Date Analyzed: Enter the date that sample was analyzed.

14) Diluting Factor: Based on 1-liter aqueous sample or 10 grams of the solid sample. Adjust the final extract volume to 1 ml as undiluted sample. Analytical conditions that require sample dilution include:

a) Any target concentration exceeds the concentration of their respective highest calibration standard;

b) Any non-target peak exceed twice the peak height of the highest range-specific calibration standard;

c) Anytime a saturated chromatographic peak, flap-topped peak, is encountered;

d) For 1 ml extract with 5 grams silica gel/cartridges must not be overloaded, no more than 25,000 µg/ml.

e) The target post-dilution concentration must be at least 50% of its highest calibration standard.

15) Report Limit (RL):

a) The RLs for target EPH analytes shall be based on the concentration of the lowest calibration standard for the analyte of interest.

b) The RLs for the hydrocarbon ranges will be set at 100x the concentration of the lowest calibration standard for the associated analyte.

16) Unit: Distinguish carefully between µg/l and mg/L; or µg/kg and mg/kg.

17) Unadjusted C11-C22 Aromatics:

The result before the known polyaromatic hydrocarbon (PAH) target compounds within the range are subtracted. An unadjusted value should exclude the concentration of any surrogate(s), internal standards, and/or concentrations of other ranges that elute within the specified range.

18 - 34) Enter the results of individual target compounds. These results should be confirmed by GC/MS at the first time of that particular site, but it is optional for the lab to report the individual target compounds or not.

35 - 36) Unadjusted C9-C18 and C19-C36 Aliphatics:

By definition, it is not necessary to identify or quantify individual aliphatic compounds within this range. Therefore, there is no any target compound need to be subtracted. An unadjusted value should exclude the concentration of any surrogate(s), internal standards, and/or concentrations of other ranges that elute within the specified range.

37) Adjusted C11-C22 Aromatics:

The result after the known polyaromatic hydrocarbon (PAH) target compounds within the range from the unadjusted C11-C22 Aromatics are subtracted.

38 - 41) Enter the Surrogate % Recovery.

42) LCS/LCSD naphthalene or 2-methylnaphthalene breakthrough must ≤5% for either constituent in EPH aliphatic fraction. Sample must be re-fractionated if concentration of either compound >5% in aliphatic fraction.

43) Comments: Report the result and qualify any QA/QC issues in a narrative summary.

# Appendix B – Reporting Tables

* + - 1. Table B-1 Site History- UST/AST System and Other Release Information

2. Table B-2 Site History – UST/AST Owner/Operator and Other Responsible Party Information

3. Table B-3 Summary of Soil Sampling Results

4. Table B-4 Summary of Groundwater and Surface Water Sampling Results

5. Table B-5 Public and Private Water Supply Well and Other Receptor Information

1. Table B-6 Property Owners/ Occupants
2. Table B-7 Monitoring and Remediation Well Construction Information
3. Table B-8A NAPL Recovery Information
4. Table B-8B Cumulative Volume of NAPL Recovered from Site
5. Table 9 Current and Historical Groundwater Elevations and NAPL Thickness

## Table B-1: Site History – UST/AST System and Other Release Information

Revision Date: Incident Number and Name:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UST ID Number | Current / Most-Recent Contents\* | Previous Contents\* | Capacity *(in gallons)* | Construction Details\*\* | Tank Dimensions | Description of Piping and Pumps | Date Tank Installed | Status of UST\*\*\* | Release associated with this UST System? |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |

*Add additional records as necessary*

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| AST ID Number | Current / Most-Recent Contents\* | Previous Contents\* | Capacity *(in gallons)* | Construction Details\*\* | Tank Dimensions | Description of Piping and Pumps | Date Tank Installed | Status of AST\*\*\* | Release associated with this AST System? |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |

*Add additional records as necessary*

|  |  |  |  |
| --- | --- | --- | --- |
| Incident Number | Material Released | Date of Release | Description of Release |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

*Add additional records as necessary*

\* Gasoline (unleaded or leaded), diesel, used oil, waste oil, aviation fuel, etc., or pesticides, non-halogenated or halogenated solvents, etc.

\*\* Fiberglass (single- or double-walled), steel (single- or double-walled), steel with FRP (single- or double-walled), steel with liner, other, unknown.

\*\*\* Currently operational, not in use or temporarily closed (specify date), permanently closed in place (specify date), permanently closed by removal (specify date)

## Table B-2: Site History - UST/AST Owner/Operator and Other Responsible Party Information

Revision Date:       Incident Number and Name:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| UST ID Number |  | | Facility ID Number | |  |
| Owner Name (and Contact) | | | Dates of Operation  (mm/dd/yy to mm/dd/yy) | | |
| North East Oil Company | | |  | | |
| Street Address | | | | | |
|  | | | | | |
| City | | State | Zip | Telephone Number | |
|  | |  |  |  | |
| Operator Name (and Contact) | | | Dates of Operation  (mm/dd/yy to mm/dd/yy) | | |
|  | | |  | | |
| Street Address | | | | | |
|  | | | | | |
| City | | State | Zip | Telephone Number | |
|  | |  |  |  | |
| Other Incidents Onsite or Commingled/In Close Proximity | | | | | |
| Incident Number |  | | Date Incident Occurred | |  |
| Name of Responsible Party  for Other Incident | | | Date Incident Reported | |  |
|  | | | Date Incident Closed *(i/a)* | |  |
| Street Address | | | | | |
|  | | | | | |
| City | | State | Zip | Telephone Number | |
|  | |  |  |  | |

*Add additional records for all owners, operators and responsible parties as necessary.*

## Table B-3: Summary of Soil Sampling Results

Revision Date: Incident Number and Name: Facility ID#:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Analytical Method (e.g., VOC by EPA 8260) ** | | | | |  |  |  |  |  |  |  |  |  |  |
| **Contaminant of Concern ** | | | | |  |  |  |  |  |  |  |  |  |  |
| **Sample ID** | **Date Collected** (mm/dd/yy) | **Source Area**  (e.g.,  Tank Pit 1) | **Sample Depth** (ft BGS**)** | **Incident Phase** (IAA, LSA, etc.) |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| **Minimum Reporting Limit (mg/kg)** | | | | |  |  |  |  |  |  |  |  |  |  |
| **Soil to Groundwater MSCC (mg/kg)** | | | | |  |  |  |  |  |  |  |  |  |  |
| **Residential MSCC (mg/kg)** | | | | |  |  |  |  |  |  |  |  |  |  |
| **Industrial/Commercial MSCC (mg/kg)** | | | | |  |  |  |  |  |  |  |  |  |  |

Indicate detection limit for contaminants when analyzed, but not detected (e.g., < 1, 10, 42)

Include in the table all of the target analytes listed for the method in Apx. B of the *Guidelines for Sampling*, current version.

MSCC = maximum soil contaminant concentration

ft. BGS = feet below ground surface

Results must be reported in mg/kg.

mg/kg =milligrams per kilogram

## Table B-4: Summary of Groundwater and Surface Water Sampling Results

Revision Date:       Incident Number and Name:       Facility ID#:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Analytical Method** (e.g., VOC by SM6000B)   **or Field Measurement** (FM) | | | |  |  |  |  |  |  |  |  |  |  |
| **Contaminant of Concern/Field Measurement ** | | | |  |  |  |  |  |  |  |  |  |  |
| **Well or SW ID** | **Date Collected** (mm/dd/yy) | **Sample ID** | **Incident Phase**  (IAA LSA, etc.) |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| **Minimum Reporting Limit (ug/l)** | | | |  |  |  |  |  |  |  |  |  |  |
| **2L Standard (ug/l)** | | | |  |  |  |  |  |  |  |  |  |  |
| **GCL (ug/l)** | | | |  |  |  |  |  |  |  |  |  |  |
| **NC 2B Standard or EPA National Criteria (ug/l)** | | | |  |  |  |  |  |  |  |  |  |  |

Field measurement parameters include temperature, pH, dissolved oxygen, specific conductivity, Eh, and alkalinity.

Indicate detection limit for contaminants when analyzed, but not detected (e.g., < 1, 10, 42)

Include in the table all of the target analytes listed for the method in Apx. B of the *Guidelines for Sampling*, current version.

Results must be reported in ug/l

ug/l =micrograms per liter GCL = gross contamination level

## Table B-5: Public and Private Water Supply Well and Other Receptor Information

Revision Date: Incident Number and Name: Facility ID#:

**Water Supply Well and Other Receptor Information**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Well # / Receptor ID** | **Type** \* | **Contact Name** | **Own/ User/ Both** | **Contact Phone #** | **Street Address for Receptor** | **Receptor Description and Location Details\*\*** | **Latitude / Longitude\*\*** *(Decimal Degrees)* | **Source Status & Use \*\*\*** | **Dist. from Source**  *(ft)* | **Up- or Down-**  **Gradient** *(if known)* |
|  |  |  |  |  |  |  |  |  |  |  |
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\* Ex: WSW = Water Supply Well, SWB = Surface Water Body, Resvr = Reservoir, PWS = Public Water Supply, PW = Public Well, SW = Supply Well, WPA = Wellhead Protection Areas, RA = Recharge Areas (for deep aquifers), Sub = Subsurface Structures, Con = Conduits, Other:

\*\* The location and/or latitude/longitude (IN DECIMAL DEGREES) must be sufficiently accurate and precise to allow easy location of wells (or recovery if buried/paved/covered-over, lost, or otherwise damaged) and for the location / replication of sampling points for any other receptor.

\*\*\* Status: A = Active or IA = Inactive ***\*and\**** Use: P = Potable or NP = Non-Potable Use. (Describe further in Additional Information for Water Supply Wells table below.)

**Additional Information for Water Supply Wells** *(and Other Receptors, if applicable)*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Well # \ ID**  *(same as above)* | **Public Water: Connected / Available /**  **Not Available** | **Well Status** | | | **Well Construction Details** | | | |
| **Well Currently**  **Used for:** | **Active / Inactive / Abandoned** | **Private / Public / Semi-Public** | **Construction Method**  **and Well Type** | **Total Depth**  (ft BGS) | **Casing Depth**  (ft BGS) | **Screened Interval**  (x to y ft BGS) |
|  |  |  |  |  |  |  |  |  |
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Ft BGS = Feet below ground surface

## Table B-6: Contiguous Property Owners/ Occupants

Revision Date:       Incident Number and Name:       Facility ID#:

|  |  |  |  |
| --- | --- | --- | --- |
| **Tax Parcel Number/ Map ID** | **Owner/ Occupant Name**  **(Last, First MI)** | **Address** | |
| **Physical** | **Mailing** |
|  |  |  |  |
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## Table B-7: Monitoring and Remediation Well Construction Information

Revision Date:       Incident Number and Name:       Facility ID#:

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Well ID** | **Latitude/ Longitude\***  (In Decimal Degrees) | **Well Construction Details** | | | | | | **Date Water Level Measured** (mm/dd/yy) | **Depth to Water from Top of Casing** (ft.) | **NAPL Thickness \*\*\*** (ft.) | **Ground- water Elevation \*\*\***(AMSL) |
| **Date Installed** (mm/dd/yy) | **Well Diameter** (in.) | **Casing Depth** (ft. BGS) | **Screened Interval**  (x to y  ft. BGS) | **Total Depth**  (ft. BGS) | **Top of Casing Elevation\*\*** (ft.) |
|  |  |  |  |  |  |  |  |  |  |  |  |
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ft BGS = feet below ground surface AMSL = Above Mean Sea Level

\* The location must be sufficiently accurate and precise to allow easy recovery of lost or damaged wells.

\*\* Reference Point for Elevation Measurements      , Assumed Elevation:       ft.

\*\*\* If NAPL is present in a well, groundwater elevation is calculated by: [Top of Casing Elevation - Depth to Water] + [NAPL thickness x 0.8581]

## Table B-8A: NAPL Recovery Information

Revision Date:       Incident Number and Name:       Facility ID#:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Date** (m/dd/yy) | **Well ID #** | **Product Type** (gas, diesel, etc.) | **NAPL Recovery Method\*** | **Product Thickness before Recovery** (feet) | **Product Thickness after Recovery** (feet) | **Amount of Vaporized Product**  (gallons) | **Amount of Liquid (Water + Product)**  (gallons) | **Amount of Liquid Product**  (gallons) | **Total Amount of Product Recovered** (gallons) | **Cost of Event** |
|  |  |  |  |  |  |  |  |  |  |  |
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(Present all calculations in an attachment)

\* Bailing, Skimming, Aggressive Fluid Vapor Recovery, Mobile Multiphase Extraction, etc,

## Table B-8B: Cumulative Volume of NAPL Recovered from Site

|  |  |  |
| --- | --- | --- |
| **Date of Recovery Event** (m/dd/yy) | **Total Volume Recovered from Site During Current Recovery Event** (gallons) | **Cumulative Total of Volume Recovered to Date from All Recovery Events** (gallons) |
|  |  |  |

## Table B-9: Current and Historical Groundwater Elevations and NAPL Thickness

Revision Date:       Incident Number and Name: Facility ID#:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Well**  **ID #** | **Top of Casing Elevation** (AMSL) | **Screened Interval**  (top of screen, bottom of screen) | **Date Measured**  (mm/dd/yy) | **Depth to Water\* (Uncorrected)**  (feet) | **NAPL Thickness** (feet) | **Depth to Water\* (Corrected for NAPL Thickness)** (feet) | **Groundwater Surface Elevation\*\*** (AMSL) |
|  |  |  |  |  |  |  |  |
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\* Depth to Water is measured from Top of Casing

\*\* If NAPL is present in a well, groundwater elevation is calculated by: [Top of Casing Elevation - Depth to Water] + [NAPL thickness x 0.8581]

## Table B-10: Land Use

Revision Date:       Incident Number and Name:       Facility ID#:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Map ID #** | Date Determined | **Land Use Feature**  (include zoning) | Location (complete street address if applicable) | **Distance and Direction from Source Area** |
|  |  |  |  |  |
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## Table B-11: Summary of Air/Vapor Sampling Results

Revision Date:       Incident Number and Name:       Facility ID#:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Analytical Method** (e.g., VOC by EPA Method 18, etc.) | | | |  |  |  |  |  |  |  |  |  |  |
| **Contaminant of Concern ** | | | |  |  |  |  |  |  |  |  |  |  |
| **Sample ID** | **Date Collected** (m/dd/yy) | **Sample Location** (eg. System Stack, etc.) *(and depth, where applicable for Soil Gas, etc.)* | **Incident Phase** (Closure, 20Day, LSA, etc.) |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| **Minimum Reporting Limit (mg/kg)** | | | |  |  |  |  |  |  |  |  |  |  |
| **Soil to groundwater MSCC (mg/kg)** | | | |  |  |  |  |  |  |  |  |  |  |
| **Residential MSCC (mg/kg)** | | | |  |  |  |  |  |  |  |  |  |  |
| **Industrial/Commercial MSCC (mg/kg)** | | | |  |  |  |  |  |  |  |  |  |  |

Indicate detection limit for contaminants when analyzed, but not detected (e.g., < 1, 10, 42)

List any contaminant detected above the method detection limit

MSCC = maximum soil contaminant concentration

ft. BGS = feet below ground surface

Results must be reported in mg/kg.

mg/kg =milligrams per kilogram

## Table B-12: Evaluation of Change in Contaminant Mass

Revision Date:       Incident Number and Name:       Facility ID#:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Initial Mass Estimate / Projected Milestones** *(from CAP)* | **Initial Baseline** | **Milestones1** | | | | | | | **End / Closure** |
| ***(Label 1)*** | ***(Label 2)*** | ***(Label 3)*** | ***(Label 4)*** | ***(Label 5)*** | ***(Label 6)*** | ***(Label 7)*** |
| Projected Mass Reduction *(%)*: | 0% |  |  |  |  |  |  |  |  |
| Soil Source Zone Mass *(Projected)*: |  |  |  |  |  |  |  |  |  |
| Smear Source Zone Mass *(Projected)*: |  |  |  |  |  |  |  |  |  |
| Groundwater Zone Mass *(Projected)*: |  |  |  |  |  |  |  |  |  |
| **Total Mass: Baseline/Milestone** *(Proj)* |  |  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Measured / Calculated Change in Contaminant Mass** *(from sampling)* | **Milestone Sampling / Measurement Event Dates1** | | | | | | | | |
|  |  |  |  |  |  |  |  |  |
| ***Measured Mass2 -*** |  |  |  |  |  |  |  |  |  |
| Soil Source Zone: |  |  |  |  |  |  |  |  |  |
| Smear Source Zone: |  |  |  |  |  |  |  |  |  |
| Groundwater Zone: |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
| ***Removed Mass3 -*** |  |  |  |  |  |  |  |  |  |
| Excavated from Soil/Smear: |  |  |  |  |  |  |  |  |  |
| Extracted as Vapor/Gas: |  |  |  |  |  |  |  |  |  |
| Extracted as Liquid: |  |  |  |  |  |  |  |  |  |
| *Total Mass Removed (est.):* |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
| **Revised Total Mass (est.)4:** |  |  |  |  |  |  |  |  |  |
| **Estimated Reduction Rate5:** |  |  |  |  |  |  |  |  |  |
| Reference Milestone *(label from above)* |  |  |  |  |  |  |  |  |  |
| Reference Milestone *(value from above)* |  |  |  |  |  |  |  |  |  |
| **Reduction Progress vs Milestone6:** |  |  |  |  |  |  |  |  |  |

* + - 1. Milestones are defined in the CAP. Label column headers with a representative title (‘Active Y1’, ‘MNA Yr 5’ etc.) Add sheets/columns as needed to more effectively track progress.
      2. Calculate the measured mass for each unit by multiplying the analytical result times the representative volume (weight or pore space). (See <https://www3.epa.gov/region02/rcra/ra2.pdf>)
      3. Calculate removed amounts based on excavation screening and/or system effluent monitoring, multiplied by total volume excavated or the system throughput during that period.
      4. Where measured from sampling/screening in situ, use the total Measured Mass. Where not screened (or if not representative), use prior Total Mass less current Total Mass Removed.
      5. This equals the % reduction from the prior mass (current Total Mass ÷ prior Total Mass). Very large negative values may indicate a new contribution and may require investigation.
      6. This equals the current mass reduction % progress (1 - (Revised Total Mass ÷ Applicable Milestone)). Zero or positive values indicate that the associated milestone has been reached

# Appendix C- UST Systems: Regulated or Not Regulated under 15A NCAC 2N

*(A partial listing of types of UST systems according to regulatory status per 15A NCAC 2N a)*

|  |  |  |
| --- | --- | --- |
| UST System Type | Regulatory Status per 15A NCAC 2N b | |
| Petroleum or Petroleum Product | Regulated under 2N | Not Regulated under 2N |
| Motor Fuels, Jet Fuels,  Waste Oil, Kerosene, Residual or Distillate Fuel Oils, Lubricants, Petroleum Solvents | X |  |
| Heating Oil  (includes Diesel and Kerosene if used for heating) | X  (if used for resale or if not used on premises where stored) | X |
| Farm or Residential (motor fuels) | X  (if size is greater than 1,100 gal. or fuel is used for commercial purposes) | X |
| Hydraulic Lift Fluid |  | X  (if used for operating purposes in equipment or machinery) |
| Oil-Water Separator c  (not covered by CWA) | X  (requirements are limited to release response and corrective actions) |  |
| Oil-Water Separator c  (covered by CWA) |  | X |
| Emergency Generator d | X | X  (if containing heating oil or fuel oil invoiced as heating oil) |
| Varsol | X |  |
| Automatic Transmission Fluid | X |  |
| Mineral Spirits or “Naptha” | X |  |
| Stoddard Solvent | X |  |
| Gasoline-Ethanol Blend (intended for use as motor fuel) | X |  |
| Diesel-Vegetable Oil Blend (intended for use as motor fuel) | X |  |
| Non-Petroleum | Regulated under 2N | Not Regulated under 2N |
| Hazardous Substance e | X |  |
| Hazardous Waste f |  | X |
| Any mixture of Petroleum or Petroleum Product containing >de minimus concentrations of Hazardous Substance or Hazardous Waste |  | X |
| Ethanol |  | X |
| Vegetable Oil |  | X |
| Propylene Glycol |  | X |

aThis table contains only a partial list of UST systems. For a determination of whether a tank system contains petroleum or a hazardous substance or whether a tank system is regulated or non-regulated, please contact the UST Section.Substances contained in USTs which are not regulated under 15A NCAC 2N are regulated under 15A NCAC 2L (unless naturally occurring and not in exceedance of the naturally-occurring standard) and other state rules and under federal rules and laws. Please refer to the *Guidelines*, Section 3.0, for a discussion of non-regulated USTs.

b A tank is regulated under 2N if the capacity of the tank is greater than 110 gallons.

c Oil-water separator tanks regulated by Sections 402 (NPDES program) or 307(b) (pretreatment program) of the Clean Water Act (CWA), as they discharge effluent to a permitted location, are not regulated by 40 CFR 280 or by Title 15A NCAC 2N (2N). Oil-water separator tanks which are not regulated by the CWA as they do not discharge effluent to a permitted location and which have a capacity of greater than 110 gallons are regulated under 40 CFR 280 and 2N. Only Subparts A and F of 40 CFR 280, adopted by reference in 2N .0201 (applicability) and 2N .0700 (release response and initial abatement action), respectively, apply.

However, NC General Statute 143-215.94A(2) defines all oil-water separator tanks as “commercial USTs”. Therefore,

1. both “regulated” and “non-regulated” oil-water separator tanks must register as “commercial USTs”;
2. both “regulated” and “non-regulated” oil-water separator tanks must pay tank fees (except on military bases in NC, which are exempt from tank fees); and
3. both “regulated” and “non-regulated” oil-water separator tanks, on evidence of a release, must comply with the cleanup and reporting requirements of Title 15A NCAC 2L .0400 (the risk-based rules governing petroleum UST releases), which in turn requires that the rules in 2N apply to all oil-water separators following discovery of a release. So if a release has been discovered from any oil-water separator tank which is located 10% or more below ground, 2N .0700 and 2L .0400 apply.

If the oil-water separator (“regulated” or “non-regulated”) utilizes a separate UST to collect oil, that waste oil UST is considered fully regulated under all of 2N and thus, unlike oil-water separator tanks, must comply with requirements for leak detection and tank closure.

d Release detection requirements for tanks installed after November 1, 2007, will be applied to all emergency generators tanks as of October 1, 2018.

e Hazardous substance is defined in CERCLA section 101(14) [42 USC 103, I, Section 9601(14)] by reference to definitions in other laws. However, a list of over 600 CERCLA hazardous substances is provided in 40 CFR 302.4; the list includes acetone, allyl alcohol, 1-butanol, ethylene dibromide, ethylene glycol, formaldehyde, hexane, isobutyl alcohol, methanol, naphthalene, PCBs, phosphoric acid, sulfuric acid, tetrachloroethylene, toluene, and trichloroethylene. The list is not all inclusive.

f The authority for USTs containing hazardous waste or mixtures of petroleum with > de minimus concentrations of hazardous waste is NC DEQ, DWM, Hazardous Waste Section.

ATSDR = Agency for Toxic Substances and Disease Registry

CWA = Section 402 or 307(b) of the Clean Water Act.

N/A = Not Applicable.

# Appendix D - Collecting Soil and Groundwater Samples

Detailed information on collecting and preserving samples can be found in the *Guidelines for Sampling*, current version. An electronic copy may be downloaded from the UST Section’s web site at <https://deq.nc.gov/about/divisions/waste-management/ust/guidance-documents> . If proper sampling and quality assurance/quality control (QA/QC) protocols are not followed, the DWM may consider the laboratory results invalid.

Table 8, Sample Containers and Preservatives for Soil Analyses, and Table 9, Sample Containers and Preservatives for Groundwater Analyses, which are included this report, provide summaries of sample collection information.

# Appendix E - Disposal of Contaminated Soil and Groundwater

As of January 1, 2018, 15A NCAC 2T .1502(4), defines soil as contaminated with petroleum if analytical results from samples collected during the assessment or from the stockpile show the presence of contaminants at concentrations above the soil-to-groundwater or residential MSCCs, whichever is lower. Once contaminated soil is excavated, it is considered a waste and must be properly disposed of, even if the contaminant concentrations are below applicable risk-based cleanup levels. NC General Statute 143-215.1 requires that the storage, disposal and/or *ex situ* treatment of contaminated soil be permitted by the Department of Environmental Quality. If the responsible party intends that excavated petroleum contaminated soil is to be treated on site, they must apply to the DWM for a soil permit. If soil is to be hauled offsite for treatment/disposal, then disposal manifests are required. Comprehensive guidance on the disposal of contaminated soil is presented in the *Guidelines for Ex Situ Petroleum Contaminated Soil Remediation*, current version.

Soil excavations must be filled with clean compacted fill that is similar to the native soil removed from the excavation. If gravel or some other permeable material is to be used, then a low-permeability fill material must be used to cap the excavation. Excavations cannot be back-filled with contaminated soil. Segregated overburden, benching, or other marginal excavated soils that, when properly screened, are not indicative of ‘petroleum-contaminated soils’ as defined in 15A NCAC 02T .1504, and are not hazardous wastes as defined in 15A NCAC 13A, may be re-used as fill in the excavation from which that soil was removed.

**1.A Temporary Storage or Limited Land Application of Petroleum Contaminated Soil**

* 1. On-site temporary storage must be for a period less than 45 days. Authorization for **off-site** temporary storage requires the approval (through issuance of a "Certificate of Approval for Disposal" (UST-71) of the appropriate regional office. Approval will not be given by the Department, unless:

1. There is a health-based emergency, fire or explosion hazard, or
2. The responsible party has an approved soil permit prior to excavating the soil.

Unauthorized storage of soil or storage in excess of 45 days may be considered a violation of GS 143-215.1.

For temporary storage, contaminated soil must be placed on 10 mils thick plastic sheeting and bermed. The contaminated soil must be covered by 10 mils-thick (at a minimum) plastic sheeting to prevent runoff and the generation of leachate. Any surface water runoff and/or leachate from the contaminated soil storage area must be collected and properly disposed to prevent leachate migration.

* 1. Alternatively, under 15A NCAC 2T, subject to approval (through issuance of a "Certificate of Approval for Disposal" (UST-71)) by the regional office, the land application of less than or equal to 50 cubic yards of petroleum contaminated soils or 50 to 100 cubic yards of petroleum contaminated soils at a minimum rate application is deemed permitted in accordance with NC General Statute 143-215.1(b), and no individual Division permit is required.

**NOTE**: *Applications for soil permits for petroleum contaminated soil originating from UST releases should be submitted to the UST Section regional office.*

**1.B Disposal of Drill Cuttings and Mud**

Drill cuttings and mud produced during field environmental investigation activities such as borehole and well construction are deemed permitted under 15A NCAC 2T .0113 [Waste Not Discharged to Surface Waters - Permitting by Regulation], in accordance with NC General Statute 143-215.1(b). Thus, no individual or general permit must be issued by DWM for the construction or operation of disposal systems for drill cuttings or mud, provided that the system does not result in violations of groundwater or surface water standards, there is no direct discharge to surface waters, and all criteria required for the specific system are met.

However, if the drill cuttings/mud have been contaminated by hazardous waste constituents, the DWM, Hazardous Waste Section) must be contacted, at (919) 707-8200, to determine the regulatory status of the contaminated material.

The flow diagram in Figure E-1 presents detailed guidance for the proper disposal of drill cuttings and mud.

**Figure E-1**

**Disposal of Drill Cuttings and Mud**

**Resulting from Environmental Investigations**

Non-petroleum substances/wastes2 identified

Refer to DEQ’s Division of Waste Management, Hazardous Waste Section.

No contamination detected

Petroleum product 1,2 identified

Non-petroleum substance detected

*Contact regional office*

Obtain Certificate of Approval of Disposal (COA) from DEQ regional office.

Dispose of via a Soil Remediation Non-Discharge Permit

< 50 yds3

**Measure volume of drill cuttings/mud**.

**Spread drill cuttings/mud on ground surface in proximity to well/boring. 3**

Hazardous waste detected

Perform chemical analysis of drill cuttings/mud.

**Temporarily place drill cuttings/mud in leak-proof, sealed containers (drums, etc.).**

> 50 yds3

## Disposal of Groundwater

**Dispose with a permit.**

1 “Petroleum product” means all petroleum products as defined by G.S. 143-215.94A(7) and includes motor gasoline, aviation gasoline, gasohol, jet fuels, kerosene, diesel fuel, fuel oils (#1-#6), and motor oils (new and used).

2 If the soil contaminants include both petroleum products and non-petroleum products/hazardous substances, then the disposal guidance for non-petroleum products/hazardous substances should be followed.

3If the well/boring is located in a paved area (asphalt, concrete, etc.); spread drill cuttings/mud on the nearest open ground surface within site property boundaries.

**Identify type of contamination present in drill cuttings/mud.**

If groundwater is withdrawn from the ground, it must be disposed of according to 15A NCAC 2T and NCGS 143-215.1. Contaminated or treated groundwater is considered wastewater and must be disposed of with the appropriate permits, which are issued by NCDEQ, DWR. However, some types of waste groundwater (purge water, well water from development/construction, condensate/water withdrawn by vapor extraction systems, or water withdrawn during aquifer tests) are deemed permitted.

**2.A. Remediation Treatment System Water**

Remediation treatment system water (including any waters produced that have contact with any contaminated materials) is considered a wastewater and must be disposed of or treated under a permit. The permit may be an on-site or off-site permit.

The kinds of state permits required for the most commonly used types of groundwater remediation methods are described in the *Guidelines for Assessment and Corrective Action* (current version), Appendix C, Required Permits. (Descriptions of the major types of groundwater treatment methods and the permits and/or authorizations required for each treatment method are presented in Appendix C, Table C-1.)

The disposal by pumping and hauling of condensate and groundwater drawn from the ground by the operation of vapor extraction systems is deemed permitted by regulation under 15A NCAC 2T .0203, Disposal of Industrial Wastewater, as discussed in Section 2.C below.

**2.B. Purge Water and Well Water from Construction Activities**

Disposal of purge water from groundwater monitoring wells and of wastewater from the development of wells or from other construction activities including directional boring is deemed permitted under 15A NCAC 2T .0113 [Waste Not Discharged to Surface Waters - Permitting by Regulation], in accordance with NC General Statute 143-215.1(b). Thus, no individual or general permit must be issued by NC DEQ, DWR, for the construction or operation of disposal systems for purge water or well construction water, provided that the system does not result in violations of groundwater or surface water standards, there is no direct discharge to surface waters, and all criteria required for the specific system are met. The water may be discharged onto the ground in proximity to the well in a manner that will preclude runoff if the aquifer is contaminated with equal or higher concentrations than the wastewater; if the aquifer is less contaminated than the wastewater, then the waste water must be containerized and transported to permissible disposal facility.

However, if the purged well water may be contaminated by hazardous waste constituents, the contaminated water should be stored on the site in sealed containers, analyzed to confirm that hazardous waste constituents exceed the groundwater quality standards in 15A NCAC 2L .0202, and, if exceedances are confirmed, the DWM, Hazardous Waste Section, contacted at (919)-707-8200 to determine the regulatory status of the contaminated material and the protocol for disposal.

The flow diagram in Figure E-2, Disposal of Groundwater, presents detailed guidance for the proper disposal of groundwater from well purging or well construction.

**2.C. Aquifer Test Water and Vapor Extraction System Water**

Disposal by pumping and hauling of groundwater withdrawn from the ground during aquifer pump tests and condensate/water withdrawn by vapor extraction systems, which may be considered industrial wastewater, is deemed permitted under 15A NCAC 2T .0203 [Waste Not Discharged to Surface Waters - Wastewater Pump and Haul Systems - Permitting by Regulation], in accordance with NC General Statute 143-215.1(b). Thus, no individual permit must be issued by NC DEQ, DWR, for the operation of “pump and haul” disposal systems for aquifer test water and vapor extraction water, provided that:

* 1. the system does not result in violations of groundwater or surface water standards,
  2. that there is no direct discharge to surface waters,
  3. that all criteria required for the specific system are met,
  4. that the appropriate regional office of the DWR is notified, and
  5. that the other criteria of Paragraph .0203 are met.

This wastewater must be containerized and transported to permissible disposal facility.

However, if any recovered water may be contaminated by hazardous waste constituents, the contaminated water should be stored on the site in sealed containers, analyzed to confirm that hazardous waste constituents exceed the groundwater quality standards in 15A NCAC 2L .0202. If any exceedances are confirmed, the DWM, Hazardous Waste Section, must be contacted at (919)‑707‑8200 to determine the regulatory status of the contaminated material and the protocol for disposal.

**2.D. Tank Pit or Excavation Water**

If a tank pit or an excavation at a contaminated site requires de-watering, the contaminated water must be properly treated to meet discharge levels allowed in a POTW or NPDES permit or must be properly disposed of at a permitted facility.

**Figure E-2**

**Disposal of Groundwater Permitted and Deemed-Permitted Wastewater Disposal Activities**

***(Exclusive of Aquifer Test Water and Vapor Extraction System Water)***

Has Groundwater Contamination Been Confirmed On-Site?

Temporarily contain water on-site until transporting to a permissible disposal facility.

Refer to DEQ’s Division of Waste Management, Hazardous Waste Section**.**

Dispose of through on-site treatment system

Discharge water onto the ground in proximity to the well in a manner that will preclude surface runoff.

YES

NO

YES

NON-HAZARDOUS

HAZARDOUS

Is the aquifer contaminated with equal or higher concentrations of contaminant than the wastewater to be disposed?

NO

NO

YES

YES

NO

Is hazardous waste likely to be present in the groundwater?

Store water on-site in sealed containers until hazardous/non-hazardous waste determination is made.

Is there an operating, on-site treatment system?

# Appendix F - Guidance Pertaining To Releases from Contaminant Sources Other than USTs

## Petroleum ASTs and Petroleum Surface spills

The UST Section of the Division of Waste Management (DWM) must be contacted if a release from a petroleum above ground storage tank or a petroleum surface spill has been detected. (See the *Guidelines for Initial Response and Abatement, Assessment, and Corrective Action for Non-UST Releases of Petroleum*.)

NCDEQ Division of Waste Management, UST Section

1646 Mail Service Center

Raleigh, NC 27699-1646

The telephone number is (919) 707-8171.

## Contamination Related to Naturally Occurring Conditions, Permitted Facilities, and Agricultural Activities

The Division of Water Resources (DWR) must be contacted for response and management of:

* Releases associated wastewater discharge or non-discharge facilities subject to permitting under *Control of sources of water pollution* (G.S. 143-215.1);
* Releases associated well construction activities subject to the *NC Well Construction Act* (G.S. 87-88);
* Releases associated agricultural operations including application of agricultural chemicals, but not including spills or disposal of such chemicals;
* Naturally occurring contamination;
* Any spill that seems likely to immediately reach surface waters; and
* Contamination complaints associated with water supply wells unless it is clear the complaint is directly related to a source for which DWM is responsible.

NCDEQ Division of Water Resources

1617 Mail Service Center

Raleigh, NC 27699-1617

The telephone number is (919) 707-9000

## Hazardous Waste

The Division of Waste Management, Hazardous Waste Section must be contacted if a release from a hazardous waste transport, storage or disposal facility, including a facility with hazardous waste USTs, has been detected.

NCDEQ Division of Waste Management, Hazardous Waste Section

1646 Mail Service Center

Raleigh, NC 27699-1646

The telephone number is (919) 707-8200

## Superfund

The Division of Waste Management, Superfund Section must be contacted for reporting requirements of Superfund (CERCLA) and inactive waste site regulations.

NCDEQ Division of Waste Management, Superfund Section

1646 Mail Service Center

Raleigh, NC 27699-1646

The telephone number is (919) 707-8200

## Pesticide Contamination

The North Carolina Department of Agriculture & Consumer Services (NCDA&CS), Structural Pest Control and Pesticide Division, Pesticide Section, must be contacted when pesticide contamination of soil or groundwater at any concentration is known or suspected. If soil or groundwater contamination is suspected, but it is unknown whether the contaminant is a pesticide, the Division of Water Resources (DWR, See #2 above) must also be notified.

NCDA&CS, Structural Pest Control and Pesticide Division, Pesticides Section

1090 Mail Service Center,

Raleigh, NC 27699-1090

The telephone number is (919) 733-4100

## Dry Cleaning Facilities

The DWM, Superfund Section must be contacted when contamination of soil or groundwater is known or suspected to be caused by dry cleaning facilities. The appropriate regional office must also be notified.

NCDEQ DWM, Superfund Section, Special Remediation Branch

1646 Mail Service Center

Raleigh, NC 27699‑1646

The telephone number is (919) 707-8200

## Non-petroleum Releases not described by Above Items

The DWM, Superfund Section, Inactive Hazardous Sites Branch, must be contacted for non-petroleum releases not described by items 1-6. The appropriate regional office must also be contacted.

NCDEQ Division of Waste Management, Superfund Section

1646 Mail Service Center

Raleigh, NC 27699-1646

The telephone number is (919) 707-8200

# Appendix G - Required Permits

1.0 Wastewater Disposal Management

This section describes the major types of groundwater disposal methods and the types of permits and prior approval(s).

* 1. Municipal Wastewater Treatment Plants

A pretreatment permit must be obtained from the appropriate municipal authority to discharge contaminated or treated groundwater to a municipal wastewater treatment plant. Since this permit will specify the type, concentration, and volume of wastewater acceptable at the facility, municipal approval is required prior to finalizing plans for the on-site remediation system. A pretreatment certification/permit replaces the need for a National Pollutant Discharge Elimination System (NPDES) permit where the discharge of contaminated or treated groundwater is to a municipal waste treatment facility.

* 1. Storm Sewers, Dry Ditches, or Surface Water Bodies

A NPDES Permit from the DWQ, Water Quality Section, which can be an individual or a general permit, is required for discharge of petroleum contaminants into a storm sewer, ditch or surface water body. Design and operation of facilities that utilize these discharge options must be in accordance with 15A NCAC 2B .0100 (Wastewater Discharged to Surface Water). Permit requirements include, but are not limited to, information about types and concentrations of contaminants and location and daily volume of discharge.

* 1. Non-Discharge Permit

Non-discharge permits are required for ex-situ treatment and disposal by infiltration gallery, closed-loop injection well systems, spray irrigation, and treatment lagoons.

A non-discharge permit is required to construct and operate a closed loop injection well system. An injection well permit is not required since the requirements for compliance with the rules governing injection wells (15A NCAC 2C .0200) are incorporated into the non-discharge permit.

* 1. Pumping and Hauling

Hauling potentially contaminated industrial wastewater to a permitted facility is deemed permitted under 2T .0203. Examples of such waste water include, but are not limited to, the following: highly-contaminated purge water or well construction water as described in 6.2.B.; aquifer test water; and vapor extraction water. For a pump and treat system, hauling is not a satisfactory permanent method of handling contaminated groundwater. Permission must be obtained from the NCDEQ, Division of Water Quality, to allow limited pumping, and hauling, the responsible party and the receiving facility must have all necessary authorizations to manage contaminated groundwater.

2.0 Other permits that may be required

* + - For remediation treatment systems that result in emissions to the atmosphere, Air Quality Registration (or in some cases an Air Quality Permit) is required. Contact staff in the Division of Air Quality in the appropriate regional office prior to construction of such systems.
    - An Erosion Control Plan must be approved prior to activities, if one acre or more of land is disturbed (contact Division of Land Resources).
    - A well construction permit from DWQ will be required in the following situations (county permitting requirements may also apply):
    - For monitoring wells constructed on property other than that on which the contaminant source is located, or if the well owner does not own the land upon which the well is located.
    - For recovery wells where groundwater or other liquids will be withdrawn from the subsurface.
    - A construction and operation permit from DWQ, Aquifer Protection Section, will be required for all types of injection wells ***except***:
    - Aquifer test wells into which uncontaminated fluid is injected.
    - Injection wells covered by a non-discharge permit (under 15A NCAC 2T .1600) for *in situ* remediation activities (injection of contaminated groundwater), e.g., in closed loop groundwater remediation systems).
    - Other types of injection wells for *in situ* remediation activities which are regulated under 15A NCAC 2C .0225, including:
    - Air injection (sparge) wells. The air to be injected shall not exceed the ambient air quality standards set forth in 15A NCAC 2D .0400. Notification to DWQ is required within 30 days of construction, abandonment, or other changes and two weeks prior to startup of injection.
    - Passive in-well systems (ORC socks, iSOC systems, ozone, and other gas infusions such as oxygen or hydrogen), small-scale injections (groundwater contaminant plumes are located within a 10,000 square foot area), and pilot tests (limited to 5% of land surface area of the groundwater contaminant plumes but inclusive of multiple wells, injectants, and injection events); these 3 types of injection wells are permitted by rule and require notification to DWQ two weeks prior to construction and two weeks prior to injection.
    - A permit from DWQ is required for hydraulic or pneumatic fracturing. Fracture control must be demonstrated.

Except for closed-loop groundwater remediation systems, the disposal of wastes by the introduction of contaminants into the subsurface via wells is prohibited by statute and rule.

**NOTE:** *There are differences in processing time for the various permits from the DWQ. Issuance of a NPDES individual permit and the authorization to construct, may take a year or more following the submittal of the application. Issuance of a NPDES general permit may take less than 4 months. Issuance of a non-discharge permit, may take two to three months from receipt of a complete application. Well construction permits from the DWQ may be issued in less than 15 days. Injection Well Permits from the DWQ, may be issued in one to two months from receipt of a complete application.*

Table G-1 - Permit Requirements for Groundwater Remediation

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Types of Prior Approval Required** | | | | |
| **Remediation Methods** | Non-discharge  Permit | NPDES  Permit | Air Quality  Permit/  Registration | Well  Construction Permit | Injection Well Construction & Operations Permit |
| I. ***In situ*** (i.e., Air sparging; nutrient/O2 addition to promote biodegradation, addition of select bacteria to promote/enhance biodegradation, thermal treatment, etc.) (2) | (3) | (3) | (1) | (3),(4) | (5) |
| II. ***Ex situ*** treatment, and disposal by:  (a) Infiltration Gallery (2) |  |  | (1) | (4) |  |
| (b) Closed-Loop Injection Well System (2) |  |  | (1) | (4) | (5), (6) |
| (c) Spray Irrigation (2) |  |  | (1) | (4) |  |
| (d) Treatment Lagoon (2) |  |  | (1) | (4) |  |
| (e) Storm Sewer/Sanitary Sewer/Dry Ditch/Surface Water Body (2) |  | (7) | (1) | (4) |  |
| (f) Pumping, Treating, and Hauling (2) | (8) |  |  | (4) |  |

EXPLANATION

(1) For remediation treatment systems that result in emissions to the atmosphere, Air Quality Registration (or in some cases an Air Quality Permit) is required. Contact staff in the Division of Air Quality in the appropriate Regional Office prior to construction of such systems.

(2) An Erosion Control Plan must be approved prior to activities, if one acre or more of land is disturbed (contact Division of Land Resources).

(3) No permit is required. As part of the Department’s review of any Corrective Action Plan proposing this remediation method, there must be a demonstration, based on computer modeling, pilot studies or published reports, which shows that the proposed method will not result in a violation of any environmental rule or standards and does not present a threat to human health or the environment. The Division reserves the authority to require a permit if it deems it appropriate.

(4) A well construction permit will be required in the following situations:

a) For monitoring wells constructed on property other than that on which the contaminant source is located, or if the well owner does not own the land upon which the well is located.

b) For recovery wells where groundwater or other liquids will be withdrawn from the subsurface.

(5) A construction and operation permit will be required for all injection wells other than:

a) Injection wells covered by a non-discharge permit.

b) Air injection wells. The air to be injected shall not exceed the ambient air quality standards set forth in 15A NCAC 2D .0400.

c) Aquifer test wells injecting uncontaminated fluid.

(6) Except for closed-loop groundwater remediation systems, the disposal of wastes by the introduction of contaminants into the subsurface via wells is prohibited by statute and rule. No separate permit to construct and operate an injection well is required; however, requirements for compliance with the rules governing injection wells will be incorporated into the non-discharge permit.

(7) Where discharge is to a municipal waste treatment facility, a pretreatment certification by that facility replaces the need for a NPDES permit.

(8) Authorization to Construct may be required through the DWQ.

**NOTE**: *Nutrients, O2 ,and the addition of bacteria to the subsurface/groundwater require an injection well permit,*

*unless covered by a non-discharge permit.*

# Appendix H - Aquifer Testing

1. Slug Tests

The purpose of a slug test is to estimate average hydraulic conductivity (k) in the saturated zone. Hydraulic conductivity estimates are obtained easily and economically from multiple well slug tests. Bouwer and Rice (1976 and 1989) and Hvorslev (1951) are the most common test methods used for partially penetrating wells in unconfined aquifers. These methods may be used for both “slug-in” tests (falling head tests) and “slug-out” tests (rising head, recovery or bail tests) in monitoring wells where the well screen and sand pack are entirely below the water table. **For monitoring wells screened across the water table, these methods may only be used for slug-out tests.** Slug-in tests are not appropriate in wells screened across the water table, since part of the water added would flow out of the well into the vadose zone resulting in an overestimation of the hydraulic conductivity. Furthermore, it should be noted that only the length of the well screen located in the saturated zone should be used to calculate hydraulic conductivity. Using the total screen length would result in underestimating this parameter.

Slug tests are generally considered an appropriate means of estimating the order of magnitude of hydraulic conductivity, when modeling groundwater flow at locations where there are no threatened water supply wells and where remediation by natural attenuation is proposed. Pump tests will still be required for locations where it is necessary to obtain the most accurate hydrogeologic data possible (e.g., if there are threatened water supply wells or for designing groundwater remediation systems that involve the withdrawal of groundwater).

Slug tests generally underestimate hydraulic conductivity. Therefore, it is recommended that soil/sediment samples be collected from the most transmissive layers of the saturated zone in which the wells are screened, and that these samples be analyzed for grain size distribution (ASTM D422-63). Hydraulic conductivity may be calculated from the grain size distribution data using an appropriate method [e.g., Hazen (1911), Masch and Denny (1966) or Sherard, Dunningan and Talbot (1984)], from slug test values, or from published hydraulic conductivity values for the specific soil/sediment type. Additionally, to determine the variability in hydraulic conductivity at a site, multiple slug tests should be performed in monitoring wells located in strata likely to exhibit differing hydrogeologic properties. For purposes of modeling groundwater flow, the greatest hydraulic conductivity values should then be used to ensure conservative model output.

**NOTE**: *Before slug tests are performed, the slug test wells should always be adequately developed. For STF purposes, the Department will not reimburse for slug tests or any other aquifer test that are performed improperly. Slug tests must be designed and evaluated by either a P.E. or L.G.*

REFERENCES

Bouwer, H., and R.C. Rice, 1976, *A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Partially Penetrating Wells*, Water Resources Research, v. 12, no. 3, pp. 423 - 428.

Bouwer, H., and R.C. Rice, 1989, *The Bouwer and Rice Slug Test - An Update*, Groundwater, v. 27, no. 3, pp. 15 - 20.

Hazen, A., 1911, *Discussion of ‘Dams on Sand Foundations*, by A.C. Koenig , Transactions of the American Society of Civil Engineers, v. 73, p. 199.

Horslev, M.J., 1951, *Time Lag and Soil Permeability in Groundwater Observations*, U.S. Army Corps of Engineers, Waterways Experiment Station Bulletin 36, Vicksburg Mississippi.

Masch, F.D., and K.J. Denny, 1966, *Grain-Size Distribution and its Effects on the Permeability of Unconsolidated Sands*, Water Resources Research, v. 2, pp. 665 - 677.

Sherard, J.L., L.P. Dunningham and J.R. Talbot, 1984, *Basic Properties of Sand and Gravel Filters*, Journal of Geotechnical Engineering, v. 110, no. GT6, pp. 684 – 70

2. Pump Tests

Pump test data provide a means to characterize the response of the aquifer to proposed pumping. Information to characterize the aquifer should include the transmissivity and hydraulic conductivity of the aquifer.

If pumping groundwater is to be part of the mechanisms for remediation; specific capacity (gpm/foot of drawdown), recovery rate, and the radius of influence based on steady state conditions should be incorporated into the remedial design. In some cases, a brief step drawdown test (4-8 hours) may be used to calculate the total well efficiency. Assessment of the well efficiency will provide a means for accurately predicting well yield. If applicable, well yield will allow scheduling of the water disposal to be more accurately predicted.

To reduce human error, it is strongly recommended that water level data be collected both physically and electronically. Multi-channel dataloggers record accurate and uninterrupted water level measurements throughout the duration of the test. However, they should not be the sole method of data collection. Water level measurements should also be physically collected in case of electrical malfunction or equipment failure. All wells (pumping and monitoring) must be screened in the same strata or surficial aquifer.

**NOTE**: *For STF reimbursement, pump tests should only be performed after receiving prior approval from the appropriate regional office. The Department will not reimburse for pump tests that are performed improperly. Pump tests must be designed and evaluated by either a P.E. or L.G.*

# Appendix I - Notices of Residual Petroleum/Notice of Contaminated Sites

1. Instructions for Preparing a 'Notice of Residual Petroleum' Referencing Land Use Restrictions for Filing

1. Instructions for Preparing a 'Notice of Residual Petroleum' Referencing Alternate Land Use Restrictions (for Existing Residences Only) for Filing
2. Instructions for implementing and preparing a ‘Notice of Contaminated Site’ referencing land use restrictions for approval and filing

Official versions of the Instructions and Form for Notice of Residual Petroleum form are available at:

<https://deq.nc.gov/about/divisions/waste-management/ust/forms>

# Appendix J - Development of Maximum Soil Contaminant Concentrations

In accordance with 15A NCAC 2L .0411, three categories of risk-based corrective action levels (maximum soil contaminant concentrations) have been established: residential, industrial/commercial and soil-to-groundwater. The residential maximum soil contaminant concentrations have been determined to be protective of the health of children and adult residents who may be exposed to contaminated soil. The industrial/commercial maximum soil contaminant concentrations have been determined to be protective of the health of an adult worker who may be exposed to contaminated soil for a limited period of time. The soil-to-groundwater maximum soil contaminant concentrations have been determined to be protective of groundwater impacted by contaminants leaching from soil.

The equations used by the Department to calculate the residential, industrial/commercial and soil-to-groundwater maximum soil contaminant concentrations are provided in Figures F1, F2, and F3. To develop the residential and industrial/commercial maximum soil contaminant concentrations, non-cancer and cancer risk-based ingestion concentrations were determined for each contaminant. The maximum soil contaminant concentration represents the lower of the non-cancer and cancer risk-based ingestion concentrations.

The exposure factors used in calculating the residential and industrial/commercial maximum soil contaminant concentrations were taken from the following references:

EPA, 1990. *Exposure Factors Handbook*;

EPA, 1991. *Risk Assessment Guidance for Superfund: Volume I Human Health Evaluation Manual (Part B, Development of Risk Based Preliminary Remediation Goals)*;

EPA Region III. Risk-based Concentration Tables (RBC Tables). Office of RCRA, Technical and Program Support Branch. Available at http://www.epa.gov/reg3hwmd/index.html; and

EPA, 1995. *Supplemental Guidance to RAGS: Region 4 Bulletins Human Health Risk Assessment*, including future amendments.

The oral chronic reference doses and oral cancer slope factors used in calculating the residential and industrial/commercial maximum soil contaminant concentrations were taken from the following references:

EPA. Integrated Risk Information System (IRIS) Computer Database;

EPA. Health Effects Assessment Summary Tables (HEAST);

EPA Region III. Risk-based Concentration Tables (RBC Tables). Office of RCRA, Technical and Program Support Branch. Available at http://www.epa.gov/reg3hwmd/index.html;

EPA, 1995. *Supplemental Guidance to RAGS: Region 4 Bulletins Human Health Risk Assessment*, including future amendments; and

Other appropriate, published health risk assessment data, and scientifically valid peer-reviewed published toxicological data.

The soil organic carbon-water partition coefficients and Henry’s Law Constants used to calculate the soil-to-groundwater maximum contaminant concentrations for the organic compounds were obtained from the following references:

EPA, 1996. *Soil Screening Guidance: Technical Background Document*. (EPA/540/R95/ 128);

EPA, 1986. *Superfund Public Health Evaluation Manual*. Office of Emergency and Remedial Response (EPA/540/1-86/060);

Agency for Toxic Substances and Disease Registry, *Toxicological Profile for [*individual chemical*]*. U.S. Public Health Service;

Montgomery, J.H., 1996. *Groundwater Chemicals Desk Reference*. CRC Press, Inc.;

Sims, R.C., J.L. Sims and S.G. Hansen, 1991. Soil Transport and Fate Database, Version 2.0. EPA Robert S. Kerr Environmental Laboratory; and

Other appropriate, published, peer-reviewed and scientifically valid data.

The soil-water partition coefficients and Henry’s Law Constants used to calculate the soil-to-groundwater maximum contaminant concentrations for the inorganic compounds were taken from the following references:

EPA, 1996. *Soil Screening Guidance: Technical Background Document*. (EPA/540/R95/ 128);

Baes, C.F., III, R.D. Sharp, A.L. Sjoreen, and R.W. Shor, 1984. *A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides through Agriculture*. Oak Ridge National Laboratory;

Agency for Toxic Substances and Disease Registry, *Toxicological Profile for [*individualchemical*]*. U.S. Public Health Service;

Sims, R.C., J.L. Sims and S.G. Hansen, 1991. Soil Transport and Fate Database, Version 2.0. EPA Robert S. Kerr Environmental Laboratory; and

Other appropriate, published, peer-reviewed, and scientifically valid data.

**Figure J1**

**Equations Used in Calculating Residential Maximum Soil**

**Contaminant Concentrations**

**Equation 1 - Non-Cancer Risk-Based Residential Ingestion Concentration - Soilnc (mg/kg)**



Parameters Parameter Values Units

THQ Target Hazard Quotient 0.2 unitless

RfDo Oral chronic reference dose chemical-specific mg/kg/day

BWc Body weight, age 1-6 15 kg

ATn Averaging time noncarcinogens 2,190 days

EFr Exposure frequency 350 days/year

EDc Exposure Duration, age 1-6 6 years

IRSc Soil ingestion, age 1-6 200 mg/day

**Equation 2 - Cancer Risk-Based Residential Ingestion Concentration - Soilc (mg/kg)**



Parameters Parameter Values Units

TR Target cancer risk 10-6 unitless

ATc Averaging time carcinogens 25,550 days

EFr Exposure frequency 350 days/year

CPSo Oral cancer slope factor chemical-specific risk per mg/kg/day

IFSadj Soil ingestion factor, age adjusted 114.29 mg-year/kg-day

where:



Parameters Parameter Values Units

EDc Exposure duration, age 1-6 6 years

IRSc Soil ingestion, age 1-6 200 mg/day

BWc Body weight, age 1-6 15 kg

EDtot Exposure duration, total 30 years

IRSa Soil ingestion, adult 100 mg/day

BWa Body weight, adult 70 kg

**Figure J2**

**Equations Used in Calculating Industrial/Commercial Maximum Soil Contaminant Concentrations**

**Equation 1 - Non-Cancer Risk-Based Industrial/Commercial**

**Ingestion Concentration - Soilnc (mg/kg)**



Parameters Parameter Values Units

THQ Target Hazard Quotient 0.2 unitless

RfDo Oral chronic reference dose chemical-specific mg/kg/day

BWa Body weight, adult 70 kg

ATn Averaging time noncarcinogens 9125 days

EFo Exposure frequency 250 days/year

EDo Exposure duration, adult 25 years

IRSa Soil ingestion, adult 100 mg/day

FC Fraction of contaminated soil ingested 0.5 unitless

**Equation 2 - Cancer Risk-Based Industrial/Commercial Ingestion**

**Concentration - Soilc (mg/kg)**



Parameters Parameter Values Units

TR Target cancer risk 10-6 unitless

BWa Body weight, adult 70 kg

ATc Averaging time carcinogens 25,550 days

EFo Exposure frequency 250 days/year

EDo Exposure duration, adult 25 years

IRSa Soil ingestion, adult 100 mg/day

FC Fraction of contaminated soil ingested 0.5 unitless

CPSo Oral cancer slope factor chemical-specific risk per mg/kg/day

**Figure J3**

**Transport Model for Calculation of Soil-To-Groundwater Maximum Contaminant Concentrations**



Parameters Parameter Values Units

Csoil Maximum Soil Contaminant Concentration not applicable mg/kg - soil

Cgw Groundwater Quality Standard or

Interim Standard chemical-specific mg/L - water

df Dilution factor 20 unitless

ks Soil-water partition coefficient chemical-specific L/kg

for organic constituents ks = kocfoc

for inorganic constituents ks = kd

koc Soil organic carbon-water partition

coefficient chemical-specific L/kg

foc Fraction of organic carbon in subsurface

vadose soil 0.001 (0.1%) kg/kg

kd Soil-water partition coefficient for

inorganics chemical-specific(pH=5.5) L/kg

**w Water-filled soil porosity - vadose soil 0.3 Lwater/Lsoil

**a Air-filled soil porosity - vadose soil 0.13 Lair/Lsoil

Pb Dry bulk density 1.5 kg/L

H' Henry's Law constant - dimensionless chemical-specific unitless

*where: H' = Henry's Law constant (atm-m3/mole) x conversion factor of 41.*