9A. Monitoring 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***): | | |  | |

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: | | | |  |

##### 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.

##### 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

##### 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. Generally 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) and estimated contaminant mass baseline;
* Describe the current extent of contamination, current 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 of treated water along with the 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.

1. Include the following:
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, such as during monitored natural attenuation,*, 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, such as during monitored natural attenuation*, 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/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.

***\*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.*

9B. 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***): | | |  | |

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: | | | |  |

##### 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 estimated contaminant mass baseline for 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 in relation to the projected milestones in the CAP Record of Decision, based on the calculated mass removal rates, both for the reporting period 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.

##### 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

##### Site History and Characterization *(if not already provided in a Monitoring Report covering the same period)*

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 the initial implementation of the remedial plan proposed in the CAP, including a reference to the original estimated contaminant mass baseline calculations and projected milestones.

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 of treated water along with the 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:
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;
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 or capture zone of system;
18. Rates of contaminant mass removal and calculated total mass removed, tracked 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. Influent and effluent concentrations before and after treatment (respectively), from startup to final shutdown (Refer to Appendix D);
21. 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);
22. Chronological listing of major operation and maintenance activities (from startup to final shutdown) with a detailed listing of operation and maintenance activities during the report period, including system run time during the reporting period and to date;
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. Reference to historical soil monitoring results / contaminant mass estimates (system startup to final shutdown);
26. 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);
27. Copies of permits, permit numbers, and dates permits issued/approved; and
28. Figures and tables to illustrate system design and 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:
2. System design and process;
3. Extent of groundwater treated during the reporting period and since startup;
4. Radius of influence or capture zone of system;
5. Rates of contaminant mass removal, from startup to final shutdown (Refer to Appendix D);
6. Recovery rates or flow rates and pressures for dual phase 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);
7. Influent and effluent concentrations before and after treatment (respectively), from startup to final shutdown (Refer to Appendix D);
8. 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);
9. Chronological listing of major operation and maintenance activities (from startup to final shutdown) with a detailed listing of operation and maintenance activities during the report period, including system run time during the reporting period and to date;
10. Problems and limitations (including access issues, mechanical problems, etc.) and measures taken to resolve them;
11. Monitoring plan for groundwater contaminant mass evaluations (with proposed sampling locations, analytical methods, sampling frequency, and reporting frequency) *(not required if submitted at the same time as a Monitoring Report)*;
12. Reference to historical groundwater monitoring results / contaminant mass estimates (system startup to final shutdown) *(not required if submitted at the same time as a Monitoring Report)*;
13. 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);
14. Copies of permits, permit numbers, and dates permits issued/approved; and
15. 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.)

##### H. 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 *(Not required if submitted at the same time as a Monitoring Report that includes this information.)*

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/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;
* 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.*

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, Method TO-15, etc.) | | | |  |  |  |  |  |  |  |  |  |  |
| **Contaminant of Concern 🡪** | | | |  |  |  |  |  |  |  |  |  |  |
| **Sample ID** | **Date Collected** (m/dd/yy) | **Sample Location** (eg. System Stack, etc.) *(Depth BGS, where applicable for Soil Gas, etc.)* | **Incident Phase** (Closure, 20Day, LSA, etc.) |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| **Minimum Reporting Limit (g/m3)** | | | |  |  |  |  |  |  |  |  |  |  |

List any contaminant detected above the method detection limit and indicate detection limit for contaminants when analyzed, but not detected (e.g., < 1, 10, 42)

ft. BGS = feet below ground surface

Report in micrograms per cubic meter (g/m3). [Note: Parts per billion by volume (ppbv) is not equivalent to g/m3, and each constituent must be properly converted independently if reported as such by the laboratory.]

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 by the representative volume (weight, pore space, etc.). (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