GUIDELINES FOR ASSESSMENT AND CORRECTIVE ACTION FOR UST RELEASES

UST Section

North Carolina

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Definitions

- <u>Action Level</u>: the concentration of a contaminant that if exceeded may require further regulatory action such as cleanup or monitoring.
- <u>Aquifer</u>: a permeable body of rock or sediment that stores and transmits groundwater in sufficient quantity to supply wells or springs.
- <u>Bedrock</u>: any consolidated rock which is encountered in the place in which it was formed or deposited and which cannot be readily excavated without the use of explosives or heavy rock cutting equipment. Bedrock generally underlies soil or other unconsolidated, superficial material.
- <u>Cleanup Level</u>: the concentration of a contaminant at which no further cleanup actions are required based on the risk of harm posed by the contaminant.
- <u>Closure</u>: activities conducted during the permanent removal (or abandonment) of underground storage tank systems and not inclusive of corrective actions/remediation.
- <u>Confining Layer</u>: a layer having very low hydraulic conductivity, in relationship to adjacent stratigraphic units, that restricts the movement of water into and out of an aquifer (e.g., dense, unfractured clay).
- <u>Confirmed Release</u>: a release for which an analytical result for sampled media shows any contaminant level above the Method Detection Limit.
- <u>De Minimus Concentration</u>: amount of a regulated substance which does not exceed one percent of the capacity of the tank, excluding piping and vent lines.
- Department: the North Carolina Department of Environment and Natural Resources.

Discharge: a release (See also Release.).

Division: the Division of Waste Management.

- *Ex Situ* Soil: soil that has been excavated.
- <u>Free Product</u>: any accumulation of a substance of greater than or equal to 1/8 inch (0.010417 foot) in contact with groundwater or perched on the water table, with a density less than or greater than water, and existing as a non-aqueous phase liquid (i.e., not dissolved in water).
- <u>Gross Contamination Levels</u>: levels of groundwater contamination for any contaminant (except ethylene dibromide, benzene and the aliphatic and aromatic carbon fraction classes) that exceed 50 percent of the solubility of the contaminant at 25 degrees Celsius or 1,000 times the groundwater quality standard or interim groundwater quality standard established in 15A NCAC 2L .0202, whichever is lower: and levels of groundwater contamination for ethylene dibromide and benzene that exceed 1,000 times the federal drinking water standard set out in 40 CFR 141.

Groundwater: those waters occurring in the subsurface under saturated conditions.

- <u>Hazardous Substance</u>: a hazardous substance defined in Section 101 (14) of the Comprehensive Environmental Response Compensation and Liability (CERCLA) Act of 1980 (but not including any substances regulated as a hazardous waste under Subtitle C or any mixture of such substances and petroleum).
- <u>Hazardous Waste</u>: discarded material which, due to its quantity, concentration, or physical or chemical characteristics, may cause or significantly contribute to an increase in mortality, irreversible or incapacitating reversible illness, or pose a substantial threat or potential hazard to human health or the environment when improperly treated, stored, transported, disposed or otherwise managed (Federal regulations define a waste as a hazardous waste if it exhibits a characteristic of a hazardous waste (40 CFR 261.20 through 261.24); has been listed as hazardous (40 CFR 261.31 through 261.33); or is a mixture containing a listed hazardous waste and a non-hazardous solid waste (unless the mixture is specifically excluded or no longer exhibits any of the characteristics of a hazardous waste).)
- In Situ Soil: soil or fill material that is in the ground and has not been disturbed.
- Land Application: the process of remediating contaminated soil by spreading soil over land. Land application may include remediating soil by natural biological methods, enhanced biological methods, or volatilization.
- <u>Maximum Soil Contaminant Concentration</u>: the concentration of a soil contaminant at which no further cleanup actions are required based upon the risk of harm posed by the contaminant.
- <u>Method Detection Limit</u>: the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte (40 CFR 136 Appendix B).
- <u>Minimum Reporting Limit</u>: the minimum reporting limit that must be achieved by laboratories for target analyte results submitted to the UST Section; it is a reporting limit established by the UST Section for the target analytes required for each approved analytical method as an alternative to the detection limit indicated in the method description and is listed for each analyte in the *Guidelines for Sampling*.
- <u>Petroleum or Petroleum Product</u>: crude oil or any fraction thereof which is liquid at standard conditions of temperature (60 degrees Fahrenheit) and pressure (14.7 pounds per square inch absolute), but excluding substances defined as a hazardous substance in Section 101 (14) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980.
- <u>Petroleum Contaminated Soil or Soil Containing Petroleum Products</u>: any soil that has been exposed to petroleum products because of any emission, spillage, leakage, pumping, pouring, emptying, or dumping of petroleum products onto or beneath the land surface and that exhibits characteristics or

concentrations of typical petroleum product constituents in sufficient quantities as to be detectable by approved analytical procedures.

- <u>Practical Quantitation Limit</u>: the lowest concentration of a given material that can be reliably achieved among laboratories within specified limits of precision and accuracy by a given analytical method during routine laboratory analysis.
- <u>Receptor</u>: any human, plant or animal, structure or surface water body that is or has the potential to be adversely effected by the release or migration of contaminants.
- <u>Release</u>: any spilling, leaking, emitting, discharging, escaping, leaching or disposing into groundwater, surface water or subsurface soils. (Refer to statutes and regulations relevant to UST releases or to AST and surface releases.)
- <u>Responsible Party</u>: a UST owner, UST operator, and/or landowner seeking reimbursement from the State Trust Fund, or any person who is responsible for a discharge or release of petroleum or a hazardous substance. (Refer to statutes and regulations relevant to UST releases or to AST releases and spills.)
- <u>Surface Water</u>: all waters of the state as defined in G.S. 143-215.77 Article 21A, except for underground waters, such that "waters" shall mean any stream, river, creek, brook, run, canal, swamp, lake, sound, tidal estuary, bay, reservoir, waterway, wetlands or any other body or accumulation of water, surface or underground, public or private, natural or artificial, which is contained within, flows through, or borders upon this State, or any portion thereof, including those portions of the Atlantic Ocean over which this State has jurisdiction.
- <u>Soil or Regolith</u>: a general term for the fragmental and unconsolidated geological material of highly varied character that nearly everywhere forms the surface of the land and overlies or covers bedrock. It includes rock debris of all kinds, volcanic ash, glacial till, alluvium, loess and eolian deposits, and vegetal accumulations.
- <u>Soil Scientist</u>: an individual who is a Certified Professional in Soils through the NCRCPS (N.C. Registry of Certified Professionals in Soils) or a Certified Professional Soil Scientist or Soil Specialist by ARCPACS (American Registry of Certified Professionals in Agronomy, Crops and Soils) or a Registered Professional Soil Scientist by NSCSS (the National Society of Consulting Soil Scientist) or can provide documentation that he/she meets the minimum education and experience requirements for certification or registration by one or more of the organizations named in this Subparagraph or upon approval by the Director, an individual with a demonstrated knowledge of soil science.

Source Area: point of release or discharge.

Total Petroleum Hydrocarbons (TPH): the concentration of petroleum fuel contamination present.

<u>Transmissivity</u>: the ability of geologic material to transmit water.

- <u>Underground Storage Tank (UST)</u>: any one or combination of tanks (including underground pipes connected thereto) that is used to contain an accumulation of regulated substances, and the volume of which (including the volume of underground pipes connected thereto) is 10 percent or more beneath the surface of the ground (Refer to full definition in15A NCAC 2N .0203.).
- <u>UST System</u>: an underground storage tank, connected underground piping, underground ancillary equipment, and containment system, if any.
- <u>Waste Oil</u>: any used non-hazardous petroleum product other than crankcase oil. Crankcase oil mixed with other used non-hazardous petroleum products shall be considered as waste oil.
- <u>Water Table</u>: the surface of the saturated zone below which all interconnected voids are filled with water and at which the pressure is atmospheric.

Acronyms

Acronyms

<u>AFVR</u>	Aggressive Fluid - Vapor Recovery
<u>AST</u>	Aboveground Storage Tank
<u>ASTM</u>	American Society for Testing and Materials
CAP	Corrective Action Plan
CAS	Chemical Abstracts Service Number
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
<u>CFR</u>	Code of Federal Regulations
<u>CSA</u>	Comprehensive Site Assessment
<u>DENR</u>	Department of Environment and Natural Resources
<u>DWR</u>	Division of Water Resources
<u>DWM</u>	Division of Waste Management
<u>EDB</u>	Ethylene Dibromide (1,2 Dibromoethane)
<u>EPA</u>	The Environmental Protection Agency
<u>FID</u>	Flame Ionization Detector
<u>GCL</u>	Gross Contamination Level
<u>HC1</u>	Hydrochloric Acid
<u>HNO₃</u>	Nitric Acid
<u>IAA</u>	Initial Abatement Action
IAR	Initial Site Assessment Report
<u>IATA</u>	International Air Transport Association
<u>L.G.</u>	Licensed Geologist
<u>LSA</u>	Limited Site Assessment
MADEP	Massachusetts Department of Environmental Protection
MDL	Method Detection Limit
<u>MMPE</u>	Mobile Multi-phase Extraction
<u>MRL</u>	Minimum Reporting Limit
<u>MSCC</u>	Maximum Soil Contaminant Concentration
<u>NC</u>	North Carolina
<u>NCAC</u>	North Carolina Administrative Code
NCDA&C	S North Carolina Department of Agriculture & Consumer Services

Acronyms

<u>NCGS</u>	North Carolina General Statutes	
<u>NCS</u>	Notice of Contaminated Site	
<u>NFA</u>	No Further Action	
<u>NORR</u>	Notice of Regulatory Requirements	
NOV	Notice of Violation	
<u>NPDES</u>	National Pollutant Discharge Elimination System	
<u>NRP</u>	Notice of Residual Petroleum	
<u>OPHSCA</u>	Oil Pollution and Hazardous Substances Control Act of 1978	
<u>PAH</u>	Polycyclic Aromatic Hydrocarbon	
<u>PCB</u>	Polychlorinated Biphenyl	
<u>P.E.</u>	Professional Engineer	
PID	Photoionization Detector	
<u>POTW</u>	Publicly Owned Treatment Works	
<u>QA/QC</u>	Quality Assurance/Quality Control	
<u>SAR</u>	Soil Assessment Report	
SCR/SCR	Soil Cleanup Report/Site Closure Request	
<u>SM</u>	Standard Method	
<u>STF</u>	State Trust Fund	
<u>SVE</u>	Soil Vapor Extraction	
<u>SVOC</u>	Semi-Volatile Organic Compounds	
<u>SW</u>	Solid Waste	
<u>TCLP</u>	Toxicity Characteristic Leaching Procedure (EPA Method SW-846 1311)	
TOC	Total Organic Carbon	
<u>TPH</u>	Total Petroleum Hydrocarbons	
TPH-DRO Total Petroleum Hydrocarbons - Diesel Range Organics		
TPH-GRO Total Petroleum Hydrocarbons - Gasoline Range Organics		
<u>UST</u>	Underground Storage Tank	
UVF	Ultraviolet Fluorescence	
<u>USGS</u>	United States Geological Survey	
<u>VOA</u>	Volatile Organic Analysis	
<u>VOC</u>	Volatile Organic Compounds	

1.0 Introduction

1.1 Purpose and Application of the Guidelines

The purpose of the *Guidelines for Assessment and Corrective Action for UST Releases* (hereafter referred to as "*Guidelines*") is to provide guidance for implementing assessment and corrective action activities in response to confirmed releases from underground storage tanks (USTs). A primary goal of the guidelines is to direct the assessment and cleanup of contamination activities so that compliance with the regulations, statutes and rules governing releases from USTs is achieved. The guidelines provide methods and procedures for assessing the nature and extent of contamination, characterizing the risk posed to human health and the environment, and performing corrective action to reduce levels of contamination.

Section 2.0 of the *Guidelines* presents guidance for petroleum UST releases, covering assessment actions, risk classification procedures, corrective action plans, public notices, and site closure, beginning with an overview of initial release response actions. Section 3.0 presents guidance for non-petroleum UST releases, using a similar outline format. Section 4.0 provides sampling and analysis guidance specific to the phase of investigation; Section 5.0 provides guidance for water supply well sampling; and Section 6.0 presents guidance on disposal of contaminated soil and groundwater. Report Formats are covered in Appendix A; Reporting Tables are presented in Appendix B; Required Permits are discussed in Appendix C; Aquifer Testing is described in Appendix D; Notices of Residual Petroleum are presented in Appendix E; Development of Maximum Soil Contaminant Concentrations is described in Appendix F; and Guidance Pertinent to Releases from Contaminant Sources Other than USTs is outlined in Appendix G.

The Guidelines for Site Checks, Tank Closure, and Initial Response and Abatement for UST Releases present guidance for performing site checks to investigate suspected releases from regulated UST systems; guidance for permanently closing regulated petroleum and hazardous substance UST systems; and guidance for performing and reporting initial response and abatement action (including determination of source of release) for releases from all UST systems. Any release discovered from a UST system during closure, during site check, or by other means must be initially addressed with initial response and abatement actions in accordance with Guidelines for Site Checks, Tank Closure, and Initial Response and Abatement for UST Releases and then, if further assessment is required, addressed in accordance with this document.

Electronic versions of all guidelines developed by the UST Section are available for download from the Division of Waste Management web site at <u>http://portal.ncdenr.org/web/wm/ust</u>. Questions about the information in this document should be directed to the UST Section, DWM. The address, telephone number, and the jurisdiction of each regional office are presented in Figure 1.

1.2 Guidance Pertaining To Releases from Contaminant Sources Other than USTs

A listing of non-UST contaminant sources which indicates which state agency to contact for guidance is located in Appendix G.

Cleanup goals for contaminants from a non-UST petroleum source which are co-mingled with contaminants from a petroleum UST are described in NCGS 143-215.94V(h). A non-UST derived petroleum contaminant plume in groundwater which is co-mingled with a UST-derived petroleum contaminant plume can be cleaned up under the risk-based rule established in 15A NCAC 2L .0400 for petroleum UST releases to risk-based standard levels. Likewise, an area of soil contamination derived from a non-UST petroleum source which merges with (or cannot be differentiated from) an area of soil contamination derived from a petroleum UST release can be cleaned up under the risk-based rule to risk-based standard levels. However, if the areas

of non-UST and UST soil contamination do not merge, then the non-UST soil contamination must be cleaned up to the soil-to-groundwater MSCCs.

Cleanup goals for contaminants derived from a non-petroleum release (e.g., a chlorinated solvent release from a UST or AST) which are co-mingled with contaminants from a petroleum UST release, are the groundwater quality standards listed in 15A NCAC 2L .0200, for groundwater, and the soil-to-groundwater MSCCs, for soil. The contaminants from the petroleum UST release must be cleaned up only to the risk-based levels.

1.3 Certification and Licensing Requirements for Underground Storage Tank Assessment and Corrective Actions

All work performed pursuant to these *Guidelines* which involves site assessment, interpretation of subsurface geologic conditions, or preparation of corrective action plans or which requires detailed technical knowledge of site conditions must be performed by persons, firms, and corporations licensed by the North Carolina State Board of Professional Engineers or the North Carolina State Board of Licensed Geologists, as required under Title 15A NCAC 2L .0103(e). Furthermore, the title pages of the reports required by these *Guidelines* must display the seal and signature of the certified professional engineer or licensed geologist and the name and corporate certification number of the firm or corporation, as applicable.

If these reports do not contain plans or designs for active groundwater remediation systems, they may be prepared and sealed by either a North Carolina professional engineer or licensed geologist. Active groundwater remediation is defined to mean any remediation method which employs the use of pumps to move liquids and/or gases at a site. All plans and specifications required under 15A NCAC 2L .0106 and .0400 and 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 their seal. However, preliminary or conceptual site restoration plans not intended for use in construction or for obtaining regulatory approval may be prepared by either a professional engineer or a licensed geologist.

Figure 1 Regional Office Locations and Map



2.0 Petroleum UST Releases

2.1 Applicability of Regulatory Requirements

Any person conducting or controlling an activity which causes a release from a UST system must take immediate action to terminate and control the release, mitigate any hazards resulting from exposure to pollutants, and notify the Department of the release. Releases from petroleum USTs are subject to risk-based corrective action as presented in 15A NCAC 2L .0400. Persons that must comply with this rule include owners and operators of petroleum USTs, landowners seeking reimbursement from the State Trust Funds, and anyone responsible for a release from a petroleum UST. Throughout these guidelines, the persons listed above are collectively referred to as the "responsible party."

A flowchart summarizing the regulatory requirements of 15A NCAC 2L .0400 is provided in Figure 2.

The following sections (Sections 2.2 through 2.10) cover the procedures that the responsible party must follow to comply with the assessment and corrective action requirements of 15A NCAC 2L .0400. These procedures include release confirmation and abatement procedures, initial site characterization procedures, soil and groundwater assessment procedures, soil and groundwater cleanup procedures and site closure procedures. A flowchart summarizing the process that the responsible party must follow is provided in Figure 2.

2.2 Review of Release Confirmation and Abatement Measures

Refer to *Guidelines for Site Checks, Tank Closure and Initial Response and Abatement for UST Releases* for full guidance.

The responsible party must comply with the release response and corrective action requirements of 15A NCAC 2L .0404. Once evidence of a petroleum release is discovered, the responsible party must take immediate action to prevent any further release of product from the UST. The responsible party must also identify and mitigate any fire, explosion, or vapor hazards, identify and mitigate hazards from exposure to pollutants, remove any free product, and comply with the requirements of 15A NCAC 2N .0601 through .0604 and .0701 through .0703 and .0705. The responsible party must notify the Department of a confirmed release within 24 hours of discovery, providing the information required to complete the 24-Hour Release and UST Leak Reporting Form (UST Form 62). The responsible party must submit the information to the appropriate UST Section regional office of the Department by telephone, fax, electronic mail, or other means. The information required for the 24-Hour Release and UST Leak Reporting Form includes the nature, location, and time of the release and a description of the initial response action.

If water supply wells are contaminated with release constituents above levels determined to be safe for human consumption, the responsible party must also provide affected parties with an alternate source of water. If a property transfer of the source property occurs after confirmation of a release, the source property must have a notice placed on the deed with appropriate land use restrictions. (Refer to Section 2.10 for details.)

NOTE: Any detectable amount of a contaminant is considered to be a release and must be reported. Human consumption includes, but is not limited to, the following uses: drinking, bathing, showering, cooking, dishwashing, laundering, and oral hygiene. Water used in toilets and sinks is also considered human consumption.

Once the abatement measures begin, the responsible party must provide the Department with the details of the incident in a progress report (15A NCAC 2N.0703). At a minimum, this information must include a description of the incident response, site history, results of the abatement measures taken to date, and steps taken to evaluate whether additional actions are required. This progress report must be submitted using the 20-Day Report format.

The Initial Abatement Action Report includes the initial investigation report(s) and initial assessment action information and reports the results of the initial abatement actions. This report should include the following reports, as appropriate: Site Check Report, UST Closure Report, Post-Excavation Soil Contamination Assessment Report, and Free Product Recovery Report. Submittal of this report is required within 90 days of discovery of the release. The Site Check, UST Closure Report and Post-Excavation Soil Contamination Assessment Report are described in the *Guidelines for Site Checks, Tank Closure, and Initial Response and Abatement for UST Releases*.

Initial abatement may include tank closure or UST system repair. (Refer to the *Guidelines for Site Checks, Tank Closure, and Initial Response and Abatement for UST Releases* if closing a tank as part of initial abatement.)

Information about the site and the nature of the release, as well as information about the surrounding populations, land use, water quality, well use, and receptors, may be gathered and included in the Initial Abatement Action Report.

Figure 2 Flowchart of Requirements for Petroleum Releases

*For guidance on initial actions, see the *Guidelines for*

Site Checks, Tank Closure, and Initial Response and Abatement for UST Releases.



**Note: Risk Classification may change at any time due to changes in site conditions or corrective or interim actions.

2.3. Free Product Recovery and Reporting

The responsible party must investigate to determine the possible presence of free product. Free product may be discovered at any time throughout the initial abatement, assessment and corrective actions. At sites where free product is present in the subsurface, free product recovery must be initiated within 14 days after discovery. Free Product Recovery Reports must be submitted as directed by the Department to comply with 15A NCAC 2N .0705 and in the required format (See Appendix A, Report 2). In place of a separate report, free product recovery reporting should be included in the 20-Day Report, Initial Abatement Action Report, Limited Site Assessment Report, Comprehensive Site Assessment Report, Corrective Action Plan and Monitoring Reports if applicable. Although free product recovery is a corrective action, it should be performed as required prior to the development of a Corrective Action Plan. Performance of free product recovery and other required actions or preparation and submittal of other reports or plans; free product recovery and other required response, abatement, assessment, cleanup, and reporting activities should be performed simultaneously.

Following the initial free product recovery event and 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. The responsible party then must submit the results of this investigation to the appropriate regional office of the UST Section in a FP Recovery System Specification Report (See Appendix A, Report 3). This report should summarize and evaluate the results of the investigation, evaluate several possible active free product recovery system options (e.g., excavation, SVE, MMPE, AFVR), and propose a free product recovery plan which incorporates the most appropriate recovery system option. The free product removal plan should be designed to minimize the spread of contamination and treat, discharge, and dispose of free product in compliance with all applicable regulations. The objectives of the plan should be to halt migration and to remove free product to the maximum extent practicable, usually to a thickness of less than 0.01 foot. The report should conclude with a schedule for the free product recovery plan which includes implementation, attainment of free product recovery progress milestones, and submittal of reports.

The responsible party must implement the free product recovery plan immediately upon approval and continue to execute the plan, simultaneously with all other required abatement, assessment, cleanup, and reporting activities, until free product has been removed or until the plan is superseded by the Corrective Action Plan.

The responsible party is required to handle flammable product safely and competently in order to prevent fire or explosion.

After one Aggressive Fluid-Vapor Recovery (AFVR) event, no additional AFVR free product recovery should be performed without incident manager approval.

NOTE: 15A NCAC 2L .0404(1) requires that non-regulated USTs (e.g., heating oil USTs) and regulated USTs must comply with the sections of 15A NCAC 2N mentioned above.

2.4 Limited Site Assessment (LSA)

If the responsible party cannot demonstrate that soil contamination has been cleaned up as required under 15A NCAC 2L .0404(3), a Limited Site Assessment (LSA) Report must be submitted to the Department within 120 days of the discovery of the release.

The LSA Report must include all of the information needed by the Department to classify the level of risk posed to human health and the environment and to assign a land use classification. In addition, the LSA Report must contain a discussion of site-specific conditions and/or possible actions that might lower the risk classification assigned to the release.

This information should include identification of the source, contaminant migration pathways, and potential receptors and an assessment of the nature and maximum concentrations of the site contaminants. To obtain this information, a responsible party must collect and analyze soil and groundwater samples and must perform a receptor survey, as discussed below. Specific reporting requirements for the LSA Report are provided in Appendix A, Report 4.

2.4.A Soil and Groundwater Sampling

The LSA includes up to two phases of sampling activities as follows:

1. Phase I LSA

For releases from regulated petroleum USTs, the responsible party is required to construct one monitoring well (constructed in accordance with 15A NCAC 2C .0100) in each release source area. The source area is defined as the area within five feet of the point of release from a UST system. During the construction of each source area monitoring well, soil samples should be collected for laboratory analysis at five-foot intervals between the land surface and the water table. If the water table is encountered at a depth greater than 25 feet below the land surface, the soil samples should be collected instead at ten-foot intervals between the land surface and the water table. Clean fill should not be sampled. The samples must be analyzed in accordance with the methods and procedures specified in Section 4.0. Approved methods for soil contamination determination are listed in Table 4.

A groundwater sample must be collected from each source area monitoring well and analyzed in accordance with the methods and procedures specified in Section 4.0. More than one Phase I LSA monitoring well may be required if multiple source areas are identified; a Phase I LSA monitoring well is required for each source area unless a source area is located so close to another source area that a single well will suffice.

If free product is determined to be present before or during preparation of the LSA Report, the LSA Report should present all free product assessment and recovery information obtained to date. If free product is determined to be present in a monitoring well, the responsible party should <u>not</u> collect a groundwater sample but instead should measure the thickness of free product in the monitoring well using either an oil-water interface probe or product paste and record the assessment and any recovery information in the LSA Report. The LSA Report format incorporates the requirements of a Free Product Recovery Report (See Appendix A, Report 4).

NOTES: Only one LSA Report should be generated to present the Phase I information and, if required by 15A NCAC 2L .0405, Phase II information.

All monitoring wells installed for assessment and corrective action must be constructed according to the standards in 15A NCAC 2C .0108(c)

Intensive field investigations should be conducted prior to monitoring well installation to insure that spatial distribution of wells and positioning of well screens are optimal for determining the source, core, and downgradient extent of contaminant plumes (See Section 4.1).

2. Phase II LSA

For releases from regulated petroleum USTs which meet the criteria for high-risk, if contaminant concentrations in the groundwater sample collected from the source area monitoring well exceed the groundwater standards or interim standards established under 15A NCAC 2L .0202 by a factor of 10, the responsible party is required to install three additional monitoring wells. One well must be located upgradient of the contamination source area, and two wells must be located downgradient of the contamination source area. The additional wells must be installed in locations that allow groundwater flow direction to be determined.

For sites with multiple source areas, the number of wells installed to fulfill the "one well upgradient/two well downgradient" requirement for each source should be minimized. For example, if two distinct source areas exist but one source clearly is located downgradient of the second, then adequate assessment might be achieved by installing a single well upgradient of both source areas and a reduced number of wells downgradient of each area. Justification for the distribution of the additional wells should be clearly explained in the report.

When the additional monitoring wells have been installed, the responsible party must measure the elevations of the water table in each well to calculate the hydraulic gradient and to determine groundwater flow direction. The responsible party must collect a groundwater sample from each monitoring well and analyze the sample in accordance with the methods and procedures specified in Section 4.0. If free product is determined to be present in a monitoring well, the responsible party should <u>not</u> collect a groundwater sample but instead should measure the thickness of free product in the monitoring well using either an oil-water interface probe or product paste. The responsible party should record the assessment and any recovery information in the LSA Report.

Soil samples should not be collected during the installation of Phase II LSA monitoring wells.

2.4.B Receptor Information

During implementation of the LSA, the responsible party must collect information on potential receptors. A receptor map showing all public and private water supply wells, public water supply lines, reservoirs, surface water intakes, surface waters, recharge areas, subsurface structures and designated wellhead protection areas within a 1,500-foot radius of the source area is required. The scale of the map should be 1'' = 400' or larger (e.g., 1'' = 200'). A table (Table B5, in Appendix B) listing the potential receptors must be compiled; these receptors must be keyed to their locations on the receptor map.

1. Water Supply Wells

The responsible party is required to identify <u>all</u> water supply wells (except those that have been properly abandoned in accordance with 15A NCAC 2C) within 1,500 feet of the source area of the release. The responsible party must list the well identification number (or tax map number), well owner and user names, addresses and telephone numbers, use of the well, well depth, type of well (e.g., drilled or bored), well casing depth, well screen interval, distance from the source area of the release, position

relative to the source area (e.g., upgradient or downgradient), and geographic location (latitude/longitude).

In order to ensure reliability in a water supply well survey, the responsible party must perform the following actions:

- determine if each property is connected to public water by locating water meters and calling the city/county water department to inquire about individual property water connections;
- walk all properties within a minimum 500-foot radius of the source area of the release to locate water supply wells;
- distribute to all property occupants/managers, within a minimum 500-foot radius of the source area of the release a "Request for Water Supply Well Information" form (See Appendix A); and
- identify all water supply wells within the remaining 1,000 feet of the 1,500-foot radius of the source area of the release.

A more detailed survey may be required by the Regional Office based on site-specific conditions.

2. Public Water Supplies

The responsible party must determine availability of public water supply to all properties within a 1,500-foot radius of the source area of the release. In addition, the responsible party must locate the nearest public water supply lines, provide the distances from properties with impacts or potential impacts to these lines, and provide information on the source(s) of the public water supply.

3. Surface Water

The responsible party must identify all surface water features within a 1,500-foot radius of the source area of the release. These features include, but are not limited to, wetlands, ponds, lakes, intermittent and perennial streams, rivers and ditches.

4. Wellhead Protection Areas

The responsible party must indicate whether or not the UST release source area is located within an approved wellhead protection area. Wellhead protection areas are defined in 42 USC 300h-7(e). A list of approved wellhead protection plans, each of which may include several wellhead protection areas with one or more community wells, and an ArcIMS Viewer on which the locations of wellhead protection areas (and permitted UST facilities) can be shown are maintained by NC DENR, Division of Water Resources, Public Water Supply (PWS) Section. The list and the ArcIMS Viewer can be accessed on the PWS Section web page at http://www.ncwater.org/pws, under "Source Water Assessment and Protection", by selecting "Source Water Protection"/ "Wellhead Protection Program", and then, under "WHP Program Info", selecting (1) "Approved WHP Plans" (list) and (2) "View WHP Areas" (map). The responsible party must list the identified wellhead protection and extent of the wellhead protection area on the potential receptor map. Finally, the responsible party must append a copy of the map generated using ArcIMS Viewer showing: 1) the UST facility, 2) the wellhead protection area (if applicable) to document the performance of the wellhead protection area investigation.

If the release is located within a wellhead protection area, the responsible party must also provide the name and address of the well owner, the well construction specifications (including screened intervals), and information on the pumping rate and pumping schedule.

5. Deep Aquifers in the Coastal Plain Physiographic Region

This criterion pertains only 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 http://nc-maps.store.yahoo.net.

In the Coastal Plain physiographic region of North Carolina, deep aquifers are recharged by percolating surficial groundwater and by infiltrating stream water and rainwater. In many areas, this process involves long time frames due to the very slow vertical movement of water. However, certain areas of the Coastal Plain are known to have bedrock aquifers near the land surface that lie beneath discontinuous confining layers or beneath no confining layers at all. These conditions can allow early unobstructed movement of contamination from a shallow aquifer to a deeper aquifer. In many cases, the deeper aquifers are being used or could be used as a source for drinking water.

The responsible party must establish whether the source area of a release is located in an area where there is recharge to a deep aquifer. The responsible party should make this determination based on a review of the scientific literature that discusses the regional hydrogeology, well construction records, and lithologic logs for deep wells in the area. The responsible party should also consult with regional office personnel in making this determination. If the source area of the release is located in an area where there is recharge to a deep aquifer, the responsible party must identify and describe the underlying deep aquifer and must obtain the following information:

- = 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,
- = the difference in groundwater head between the surficial aquifer and the deeper aquifer, and
- the local and regional use of the deep aquifer, including the drawdown resulting from major pumping conditions.

The North Carolina Division of Water Resources maintains a source for this information at http://www.ncwater.org/About_DWR/GWMS .

Another source of information on the hydrogeology of the Coastal Plain is the USGS Professional Paper 1404-I, *Hydrogeologic Framework of the North Carolina Coastal Plain*, 1996. It is available from the U.S. Geological Survey at <u>http://store.usgs.gov</u>.

6. Subsurface Structures

The responsible party must locate all subsurface structures present on and adjacent to the site. These structures include, but are not limited to, sewers, utility lines, conduits, basements, septic tanks, leach fields, confined spaces and floor and storm drains. The responsible party must also assess the threat of explosion that may result from the accumulation of vapors in confined spaces, as well as all other threats to public health, public safety and the environment. The subsurface structure locations on or adjacent to the site must be presented on a larger scale receptor map.

2.4.C Land Use Survey

The responsible party must gather, evaluate, and present information on land use and on activities involving possible human exposure to contamination that could occur at the site and in the area within a

1,500-foot radius of the source area of the release. Examples of such land use and activities include, but are not limited to, an office, a manufacturing operation, a residence, a store, a school, gardening or farming, recreation, or undeveloped land. This evaluation must consider land use and activities which may not be occurring at the time of evaluation, but which are consistent with the current or projected future use of the site and area surrounding the site.

When performing a land use survey, it is necessary that the responsible party make the following determinations:

- whether or not children and/or adults live at, work at, or visit the site;
- the potential for exposure to the contaminated soil (e.g., Is the contaminated soil capped by pavement or a building? Is access to the site reliably restricted?);
- the distance from the source area to the nearest residence (primary or secondary), school, daycare center, hospital, park recreation area, church, nursing home or other place of public assembly;
- the zoning status of the site and the area within a 1,500-foot radius of the source area of the release; and
- the projected future use of the site and surrounding properties by consulting with the local county or municipal planning office, zoning board or utility commission.

The Department will use the land use survey to determine the land use classification of the site (residential or industrial/commercial).

2.4.D Identification of Property Owners and Occupants

The responsible party must identify all property owners and occupants of properties within or contiguous to the area containing contamination. The responsible party must also identify all property owners and occupants of properties within or contiguous to the area where the contamination is expected to migrate. The responsible party must provide the names and addresses of the owners and occupants.

2.5 Assignment of Land Use and Risk Classification

Based on a review of the LSA Report, the Department will assign a land use classification to the site. It will also classify the release as high, intermediate or low risk and notify the responsible party of the risk classification.

2.5.A Land Use Classification (15A NCAC 2L .0408(1))

In accordance with 15A NCAC 2L .0408(1), the Department will assign a land use classification (residential or industrial/commercial) to a site. The rule states that "a site is presumed residential, but may be classified as industrial/commercial if the Department determines based on site-specific information that exposure to the soil contamination is limited in time due to the use of the site and does not involve exposure to children" and that site "means both the property upon which the discharge or release has occurred and any property upon which soil has been affected by the discharge or release". Thus, the Department will assign land use classifications to the property upon which the release has occurred and to any other property where the release caused soil to become contaminated.

In assigning a land use classification, the Department will assume that a property is residential. The responsible party may request an industrial/commercial classification by submitting site-specific information sufficient to demonstrate that people will not be exposed to the contaminated soil for long periods of time and that children will not be exposed at all. If this can be shown, the site may be classified as industrial/commercial. The Department is not required to reclassify a site as industrial/commercial land use designation. These factors include the current and potential future use of land surrounding the contaminated property, and any other information available to assess the potential for human exposure to contamination. The LSA Report data will be used to assign an initial land use classification. If additional information becomes available that might change the land use classification after the responsible party submits the LSA Report, the responsible party must forward the information to the appropriate regional office.

2.5.B Risk Classifications [15A NCAC 2L .0406]

Simultaneously to assigning a land use classification, the Department will assign an initial risk classification to each site. The criteria used to determine the risk posed by a release are listed below. If criteria for more than one risk classification apply, the highest applicable risk classification will be assigned. Risk classification of a release is an on-going process. If new information concerning the potential exposure of receptors or if site conditions change, the Department may review the risk classification. Each responsible party has a continuing obligation to notify the Department of any changes that might affect the assigned level of risk, where the change is known or should be known by the responsible party (15A NCAC 2L .0407).

NOTE: 15A NCAC 2L .0407 states that "The Department may reclassify the risk posed by a release if warranted by further information concerning the potential exposure of receptors to the discharge or release or upon receipt of new information concerning changed conditions at the site. After initial classification of the discharge or release, the Department may require limited assessment, interim corrective action, or other actions which the Department believes will result in a lower risk classification. It is a continuing obligation of any responsible party to notify the Department of any changes that might affect the level of risk assigned to a discharge or release by the Department if the change is known or should be known by the responsible party. Such changes shall include, but shall not be limited to, changes in zoning of real property, use of real property or the use of groundwater that has been contaminated or is expected to be contaminated by the discharge or release, if such change could cause the Department to reclassify the risk."

1. High Risk

A high-risk classification means that any of the following apply.

- a) A water supply well, including one used for non-drinking purposes, has been contaminated by the release.
- **b**) A water supply well used for drinking water is located within 1,000 feet of the source area of a confirmed release.
- c) A water supply well not used for drinking water is located within 250 feet of the source area of a confirmed release.
- **d**) The groundwater within 500 feet of the source area of a confirmed release has the potential for future use in that there is no source of water supply other than the groundwater.
- e) The vapors from the release pose a serious threat of explosion due to accumulation of the vapors in a confined space.
- f) The release poses an imminent danger to public health, public safety or the environment.

2. Intermediate Risk

An intermediate risk classification indicates that the high-risk criteria do not apply and that one or more of the following criteria do apply.

- a) Surface water is located within 500 feet of the source area of a confirmed release and the maximum groundwater contaminant concentration exceeds the applicable surface water quality standards in 15A NCAC 2B .0200 or US EPA National Criteria by a factor of 10.
- **b)** In the Coastal Plain physiographic region as designated on a map entitled *Geologic Map of North Carolina* published by the Department in 1985, the source area of a confirmed release is located in an area in which there is recharge to an unconfined or semi-confined deeper aquifer which the Department determines is being used or may be used as a source of drinking water.
- **NOTE:** If the deeper aquifer is impacted by the release, the deeper aquifer must be remediated to the groundwater quality standards and interim standards contained in 15A NCAC 2L .0202.
- c) The source area of a confirmed release is within a designated wellhead protection area, as defined in 42 USC 300h-7(e).
- **d**) The levels of groundwater contamination for any contaminant (except ethylene dibromide, benzene and the aliphatic and aromatic carbon fraction classes) exceed 50 percent of the solubility of the contaminant at 25 degrees Celsius or 1,000 times the groundwater quality standard or interim standard established in 15A NCAC 2L .0202, whichever is lower. *[These levels have been termed Gross Contamination Levels (GCLs).]*
- e) The levels of groundwater contamination for ethylene dibromide or benzene exceed 1,000 times the federal drinking water standard set out in 40 CFR 141. [These levels have also been termed Gross Contamination Levels (GCLs).]

NOTE: Where free product is present, a site will be assigned a risk classification of intermediate, at a minimum. Although groundwater quality standards have been established for the aliphatic and aromatic carbon fraction classes, 15A NCAC 2L.0400 excludes these constituents from the GCLs set under the intermediate risk criteria and cleanup goals. No GCL levels for aliphatic and aromatic carbon fraction classes have been established. Therefore, these constituents will not be considered in classifying risk.

3. Low Risk

A low risk classification means that the risk posed by a release does not meet any of the high or intermediate risk criteria or, based on site-specific information received by the Department, the release does not pose a significant risk.

2.6 Site Assessment

For all sites, the responsible party must document the vertical and horizontal extent of soil contamination when performing a complete assessment of the soil at the site. Depending on the site's risk classification, the results of the soil assessment will be reported either in a Comprehensive Site Assessment Report (high/intermediate risk) or in a Soil Assessment Report (low risk).

2.6.A Comprehensive Site Assessment Report (15A NCAC 2L .0408) for High/Intermediate Risk Sites

A comprehensive site assessment must be performed by the responsible party for releases that the Department classifies as high or intermediate risk to human health and the environment, based on a review of the LSA Report. The primary objectives of the comprehensive site assessment are to characterize the full extent of contamination resulting from a release, determine the chemical and physical characteristics of the contaminants, investigate the geology and hydrogeology of the site including all factors relating to contaminant transport, and examine risk to potential receptors and exposure pathways. In characterizing the extent of contamination, the responsible party must define and document the vertical and horizontal extent of both soil and groundwater contamination.

If a release is classified as high or intermediate risk, but groundwater is not contaminated, the responsible party should only conduct and report assessment and other required investigations related to the soil contamination.

The results of the comprehensive site assessment must be submitted in a CSA Report to the appropriate regional office within 90 days of the date of the notice requesting the comprehensive site assessment. The CSA Report must follow the format presented in Appendix A, Report 5. Guidelines for conducting comprehensive site assessment and completing a CSA Report are presented below.

1. High Risk Release Remediation Goals

For a high-risk release, the responsible party must perform a comprehensive site assessment and submit a CSA Report documenting the results. For a release which the Department determines to be high risk, soil contamination must be remediated to concentrations levels equal to or less than the lowest MSCCs, and groundwater contamination must be remediated to levels equal to or less than the groundwater quality standards in 15A NCAC 2L .0202 (2L Standards).

NOTE: If the Department reclassifies the risk of a high risk release to low risk following review of the CSA Report, the responsible party must submit a Soil Cleanup Plan proposing appropriate remediation strategies for cleanup of the contaminated soil.

2. Intermediate Risk Release Remediation Goals

For an intermediate risk release, a responsible party must perform a comprehensive site assessment and submit a CSA Report documenting the results. For a release which the Department determines to be intermediate risk, soil contamination must be remediated to concentration levels equal to or less than the lowest MSCCs, and groundwater contamination must be remediated to concentration levels equal to or less than the 2L Standards or to alternate standards as established by rule in 15A NCAC 2L .0406 before the Department can reclassify the risk to low and approve No Further Action status. If the release is located in a wellhead protection area in which a well is threatened or an area of recharge in which a well taps an aquifer which is used as a source of drinking water, groundwater contamination must be

remediated to levels equal to or less than the 2L Standards before risk is reduced to low. However, if the release is not located in a wellhead protection area, the groundwater contamination may be remediated to the following alternate standard levels to achieve risk reduction:

- a) levels equal to or less than the Gross Contaminant Levels (GCLs) established in 15A NCAC 2L .0406, and
- **b**) levels equal to or less than the surface water quality standards established under 15A NCAC 2B .0200 and by national criteria.

NOTE: If the Department reclassifies the risk of an intermediate risk release to low risk following review of the CSA Report, the responsible party must submit a Soil Cleanup Plan proposing appropriate remediation strategies for cleanup of the contaminated soil

3. CSA Reporting Requirements

Requirements for CSA and the subsequent CSA Report include but may not be limited to the following items:

- a) update of site history, source determination, and potential receptor information provided in the LSA Report. (The responsible party must provide a history of the UST/AST systems and releases at the site using the Tables B-1 UST/AST System and Other Release Information and B-2 UST/AST Owner/Operator and Other Responsible Party Information provided in Appendix B. These tables must describe the location, use, and all owners and operators of all current and previous UST and AST systems at the site. The responsible party must describe all sources of petroleum non-UST releases (spills, AST system releases) and all sources of UST releases on the site.);
- b) collection of soil and groundwater samples in order to delineate the horizontal and vertical extent of contamination. (Samples must be collected and analyzed in accordance with methods and procedures specified in Section 4. Comparison of the sample results must be made to the applicable cleanup standards.);
- c) determination of the extent and thickness of free product, if present;
- d) copies of public notice (Refer to Section 2.9 for more information.);
- e) hydrogeologic investigation which should include:
 - 1) complete characterization of the site geology based on the information obtained during the advancement of soil borings and construction of monitoring wells;
 - 2) collection of groundwater elevation data and calculation of hydraulic gradient and determination of groundwater flow direction;
 - 3) performance of aquifer slug tests (or an aquifer pump test if approved by the regional office) to provide a calculation of hydraulic conductivity, transmissivity, and linear groundwater velocity (See Appendix D.); and
 - 4) determination of rate of contaminant transport and the potential for contaminants to affect receptors.

4. Evaluation of Potential for Contamination to Impact Receptors

The responsible party must evaluate the potential for contaminants in soil and groundwater to affect receptors including but not be limited to:

- water supply wells;
- subsurface features;

- groundwater in wellhead protection areas; and
- groundwater in areas of recharge to deep unconfined or semi-confined aquifers.

If a receptor is determined to be at risk from soil or groundwater contamination from a release, the responsible party must evaluate all actions to reduce the risk-level of the site. Such actions may include the re-evaluation of site specific conditions relative to a receptor (e.g., supply wells that are located upgradient of a source), abandonment of water supply wells, and the extension of public water supply lines.

If the risk of the site is classified as intermediate, groundwater modeling may be required to evaluate potential of groundwater contamination to impact receptors. If the source area of an intermediate risk release is located within 500 feet of a surface water body, within a designated wellhead protection area or within an area of recharge to a deeper Coastal Plain aquifer, the responsible party must evaluate whether or not groundwater contamination will violate the following intermediate risk criteria:

- surface water standards and criteria;
- groundwater quality standards and interim standards at a location no closer than one year time of travel upgradient of a well within a designated wellhead protection area; and
- groundwater quality standards and interim standards in a deep Coastal Plain aquifer that is or could be used as a source for drinking water.

The responsible party should perform predictive calculations and/or modeling, or use empirical site monitoring data and/or knowledge of the timing of the release to determine contaminant transport rates. Modeling/calculations must be based on <u>site-specific conditions</u>. If modeling/calculation indicates that any of the above standards might be exceeded, the responsible party must propose a cleanup level that will prevent such an exceedance.

Sites with uniform groundwater flow conditions should use analytical transport models (usually onedimensional). Sites having complex flow conditions (e.g., multi-aquifer system) where uniform groundwater flow cannot be assumed may require multi-layer numerical models. Before performing a numerical model, the responsible party should discuss site conditions with the regional office personnel to evaluate whether or not the modeling effort is warranted. The modeling results should always be compared and calibrated with empirical (monitoring) data obtained from the site. Site-specific data should be incorporated into the models whenever possible.

When selecting a model, the user should consider the model's performance history and applicability to the site. The model should have been field tested by a number of workers and should be well documented in the literature. Users should select a model with inherent assumptions that are appropriate for the site conditions. All assumptions and estimated values, including biodegradation rates, must be conservative (i.e., predict reasonable worst-case scenarios) and thoroughly documented. At a minimum, a user must provide the following information when submitting modeling results:

- name, version and developer of the model;
- \blacksquare the type of site for which the model is applicable;
- the critical conceptual assumptions and estimates of input values;
- \blacksquare the calibration procedures;
- = the range of values used and the results of sensitivity analyses on critical data inputs; and
- = a graphical representation and narrative explanation of the modeling results.

Sites characterized by migration of contamination through a surficial unconsolidated aquifer toward

surface water should use simple predictive calculations and/or modeling and/or analytical transport models to evaluate potential for a surface water standard exceedance and to establish a groundwater cleanup level. Analytical transport models, simple predictive calculations for estimating retardation factors and contaminant transport rates, should be obtained from the literature.

A surface water body may have several different classifications depending on its use and the type of aquatic life present. Each classification has a set of surface water quality standards or criteria. The surface water standards and the criteria for each classification must be reviewed. The most stringent of the standards and the criteria assigned to the surface water should be used in identifying a possible surface water violation. North Carolina surface water classifications and standards (15A NCAC 2B) and US EPA National Criteria are listed by the Division of Water Resources in the NC and EPA Criteria Table at http://portal.ncdenr.org/web/wq/ps/csu. If a standard cannot be found for a particular contaminant, the responsible party should call the DWR's Water Quality Standards Coordinator at (919) 807-6416 for more information.

Sampling a surface water body to demonstrate that surface water standards have not been violated will <u>not</u> be acceptable unless the responsible party can also demonstrate that the maximum groundwater contamination concentrations at the site are discharging to surface water at the time of sampling. If this demonstration can be made, surface water samples should be obtained from the discharge area, as well as upstream and downstream of the discharge area.

2.6.B Soil Assessment Report [15A NCAC 2L .0408] for Low Risk Sites

A soil assessment must be performed and presented in a Soil Assessment Report (SAR) by the responsible party for releases that the Department classifies as a low risk to human health and the environment, based on a review of the LSA Report. The objective in performing this soil assessment is to characterize the extent of soil contamination resulting from a low risk petroleum UST system release. The responsible party must document both the vertical and horizontal extent of soil contamination that exceeds the applicable MSCCs.

A Soil Assessment Report (SAR) is composed of two distinct phases: soil assessment and corrective action. Guidelines for performing the soil assessment and preparing the assessment phase of the SAR are presented below; the corrective action phase is presented in 2.7.B. Corrective Action for Low Risk Sites (SAR). Specific reporting requirements for the SAR are provided in Appendix A, Report 6.

1. Low Risk Remediation Goals

For a low risk release, a responsible party must perform a soil assessment and submit a SAR documenting the results. For a release that the Department determines to be low risk, soil contamination must be delineated and remediated to either the residential MSCCs or the industrial/commercial MSCCs, dependant on the land use classification. For example, if the land use at a site has been classified as industrial/commercial, the responsible party will only be required to delineate and remediate soil to the industrial/commercial MSCCs before the Department can approve No Further Action status.

2. Investigative Activities (SAR)

The activities required in the soil investigation portion of the SAR include (but may not be limited to) the following:

a) update the site history, source determination, and potential receptor information provided in the LSA Report. (The responsible party must provide a history of the UST/AST systems and

releases at the site using the Tables B-1 UST/AST System and Other Release Information and B-2 UST/AST Owner/Operator and Other Responsible Party Information provided in Appendix B. The location and use and all owners and operators of all current and previous UST and AST systems at the site must be provided. The responsible party must reconfirm the sources of release, including any on-site non-petroleum and non-UST sources of contamination.);

- b) collect soil samples in the vadose zone to delineate horizontal and vertical extent of contamination. (Samples must be collected and analyzed in accordance with methods and procedures specified in Section 4. Comparison of sample results must be made to the appropriate cleanup standards);
- c) characterize the geology at the site based on the samples collected from the boring in the vadose zone;
- d) update the potential receptor and land use information provided in the LSA Report; and
- e) evaluate the options for remediation of soil contamination. (See 2.7.B. Corrective Action for Low Risk Sites.)

3. Groundwater Assessment

For petroleum UST releases classified as low risk, no further action is required to assess or remediate groundwater.

4. Evaluation and Selection of an Option for Soil Remediation

The Soil Assessment Report (SAR) must provide a detailed proposal for remediating contaminated soil. An evaluation of remedial options must be included in this report describing the feasibility, limitations, and costs from initial implementation until the conditions for No Further Action status are reached for each option. The SAR must present the basis for selecting the proposed remedy (See Appendix A, Report 6). The proposal must include detailed specifications of the proposed remedy, a plan for post-remediation sampling, a detailed cost estimate (based on bids), and a schedule of actions to be performed by the RP from SAR approval until site closure. For a low risk site the SAR should satisfy corrective action plan requirements. Approval of the SAR is required prior to implementation of the remedial plan.

2.7 Corrective Actions

2.7.A Corrective Actions for High and Intermediate Risk Sites

1. Pre CAP Monitoring

If more than six months elapse between approval of the CSA and implementation of the Corrective Action Plan (CAP), then the Department may direct the responsible party to perform pre-CAP monitoring of groundwater in monitoring and/or water supply wells, of surface waters, of petroleum vapors, and/or of free product. Pre-CAP monitoring may be determined necessary for the following purposes:

- a) to provide an updated evaluation of risk to water supply well users;
- **b**) to develop a current picture of contaminant plume geometry and extent in order to facilitate remedial system design;
- c) to establish the level of contaminant concentration at a site immediately prior to startup of remedial system; and
- d) to provide empirical data on which to evaluate the progress of natural attenuation.

The Department will determine the frequency and scope of pre-CAP monitoring on a site-specific basis. The responsible party should submit a plan for pre-CAP monitoring to the Department for approval, perform the monitoring event, and submit a pre-CAP Monitoring Report (which should be prepared using the Monitoring Report format presented in Appendix A) to the appropriate regional office by the end of the month following the monitoring event.

2. Corrective Action Plan

a) Basis for requirement

Pursuant to 15A NCAC 2L .0407, the responsible party must propose actions to cleanup or to mitigate the impact of soil and groundwater contamination at a high or an intermediate risk site. The responsible party must prepare and submit a Corrective Action Plan (CAP) when the Department determines, on review of the CSA Report, that the risk of the site is still high or intermediate. The responsible party is allowed 90-days from the date of the notice approving the CSA Report to submit the CAP.

b) Purpose and Scope

The purpose of the CAP is to propose a plan to remediate soil and groundwater contamination, if present. However, if the contamination present at the site is limited to either soil or groundwater, then the CAP should address only the contamination that is present. The format for the CAP is presented in Appendix A, Report 7. The responsible party must provide the information described in the report format, completing, as appropriate, sections relating to soil contamination, groundwater contamination, and/or free product, and must organize and present this information in the manner stipulated by the format. The regional office incident manager, on review of the CAP, may request information additional to that provided in the CAP or supplemental to that specified by the report format. The incident manager may deny approval of the CAP if any of the elements specified have not been included or have not been adequately addressed. The incident manager will not approve the CAP until he/she determines that the report is complete. Questions regarding technical aspects of site assessment or corrective action should be directed to the appropriate regional office or central office.

c) <u>Factors</u>

The corrective actions proposed in the CAP must be designed to adequately protect human health, insure safety, and protect the environment. Specifically, the CAP must consider the following elements:

- physical and chemical characteristics of the regulated substance;
- toxicity of the regulated substance;
- persistence of the regulated substance;
- potential for migration of the regulated substance;
- hydrogeological characteristics of the facility and surrounding area;
- proximity, quality, current and future uses of surface water and groundwater;
- potential effects of residual contamination on nearby surface water and groundwater; and
- risk of exposure to organisms.

d) Soil Remediation Goals for High and Intermediate Risk Sites

The responsible party must remediate soil contamination at high and intermediate risk sites to concentration levels which are equal to or less than the lowest Maximum Soil Contaminant Concentrations (MSCCs), i.e., the lowest of the soil to groundwater MSCCs or the residential MSCCs, before the Department can reduce the risk to low and approve No Further Action status. Pursuant to 15A NCAC 2L .0407, soil must be remediated to the applicable MSCCs or as closely thereto as economically or technologically feasible. Economical and technological feasibility will only be considered in cases where traditional remediation technologies cannot be used or where treatment or removal of contaminated soil will jeopardize the integrity of a substantial structure. Pavement, dispensers, canopies, decks, patios, or HVAC units are not considered substantial structures. The soil cleanup requirements apply to the entire unsaturated soil column exclusive of the smear zone. Cleanup of soil contamination within the smear zone may be allowed, if technologically and economically feasible at a site, with approval of the incident manager.

e) Development of Maximum Soil Contaminant Concentrations (See Table 1.)

In accordance with 15A NCAC 2L .0411, three categories of risk-based cleanup levels, the Maximum Soil Contaminant Concentrations (MSCCs), have been established: soil-to-groundwater MSCCs, residential MSCCs, and industrial/commercial MSCCs. The soil-to-groundwater MSCCs have been determined to be protective of groundwater impacted by contaminants leaching from soil. The residential MSCCs have been determined to be protective of the health of children and adult residents who may be exposed to contaminated soil. The industrial/commercial MSCCs 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 equations used by the Department to calculate the soil-to-groundwater, residential and industrial/commercial MSCCs are provided in Appendix F. To develop the residential and industrial/commercial MSCCs, non-cancer and cancer risk-based ingestion concentrations.

f) Evaluation of Soil Remediation

The effectiveness and progress of soil remediation should be evaluated by soil sampling as scheduled in the CAP or as directed by the Department and should be reported in routine monitoring reports. The requirements for the reporting of soil remediation monitoring are presented in the Monitoring Report format provided in Appendix A, Report 9.

g) Groundwater Remediation Goals for High and Intermediate Risk Sites

The responsible party must remediate groundwater contamination at high-risk sites to restore the groundwater quality to concentration levels that are equal to or less than the standards established by 15A NCAC 2L .0202. For intermediate risk sites, the responsible party must restore groundwater quality to alternate concentration levels that are protective of surface water, wellhead protection areas, and deeper Coastal Plain aquifers that are or could be used as a source for drinking water. The responsible party must demonstrate that groundwater has been remediated to alternate levels that are sufficient to prevent a violation of the following standards:

- surface water standards (including National Criteria per the US EPA) and the criteria contained in 15A NCAC 2B (For Class C Waters, the applicable standard is the more stringent of the Freshwater (or Saltwater) or Human Health; and for WS Waters, the applicable standard is the most stringent of the Freshwater, WS, or Human Health standards for a pollutant.);
- groundwater quality standards and interim standards contained in 15A NCAC 2L .0202 for locations no closer than one-year travel time upgradient of a well within a designated wellhead protection area; and
- groundwater quality standards and interim standards contained in 15A NCAC 2L .0202 for a deep Coastal Plain aquifer that is, or could be, used as a source of drinking water.

If the groundwater will not violate any of the above standards, the responsible party must only remediate the groundwater contamination to the Gross Contamination Levels (GCLs). The GCLs are presented in Table 2, and are defined (in 15A NCAC 2L .0406) as follows:

- Levels of groundwater contamination for any contaminant except ethylene dibromide, benzene and aliphatic and aromatic carbon fraction classes that exceed 50 percent of the solubility of the contaminant at 25 degrees Celsius or 1,000 times the groundwater quality standard or interim standard established in 15A NCAC 2L .0202, whichever is lower; and
- Levels of groundwater contamination for ethylene dibromide and benzene that exceed 1,000 times the federal drinking water standard set out in 40 CFR 141.

h) Evaluation of Groundwater Remediation

The effectiveness and progress of groundwater remediation should be evaluated by groundwater monitoring as scheduled in the CAP or as directed by the Department and should be reported in routine monitoring reports. The requirements for the reporting of groundwater remediation monitoring are presented in the Monitoring Report format presented in Appendix A, Report 9.

i) <u>Corrective Action Reporting Requirements</u> (See CAP format in Appendix A, Report 7.)

The required elements of the CAP include, but may not be limited to the following items:

 update of site history, source determination, land use, and potential receptor information provided in the CSA Report. (The responsible party must provide a history of the UST systems at the site using the Tables B-1 UST/AST System and Other Release Information and B-2 UST/AST Owner/Operator and Other Responsible Party Information provided in Appendix B. The location and use and all owners and operators of all current and previous UST and AST systems at the site must be provided. The responsible party must reconfirm the sources of release, including any on-site non-petroleum and non-UST sources of contamination.);

- 2) recapitulation and update of assessment information presented in the CSA and pre- CAP monitoring reports;
- 3) comparison of soil and groundwater contaminant concentrations and free product thickness to applicable cleanup goals;
- 4) purpose and objective of this specific CAP (e.g. to remove free product, cleanup soil to lowest MSCCs, and/or remediate groundwater to below 2L standards or to mitigate effect of impacts to soil, groundwater and/or human health and the environment);
- 5) summary of initial remedial actions taken to date (e.g. excavation at UST closure, free product recovery);
- 6) comprehensive evaluation of remedial options. The responsible party must evaluate risk reduction mechanisms (e.g. connecting water supply well users to alternate water sources) and excavation plus a minimum of two other, viable remedial actions as options for remediating soil contamination. The responsible party must evaluate risk reduction mechanisms and natural attenuation plus a minimum of two other, viable remedial options for remediating groundwater at a site, unless fewer viable options can be determined for the site. Each remedial option for groundwater may include one or more technologies or processes, concurrently or sequentially, which may also serve as soil remedial actions. For example, an evaluation of remedial options for a high-risk site with soil and groundwater contamination might compare the following options:
 - risk reduction and excavation for soil remediation (required);
 - risk reduction and natural attenuation for groundwater remediation (required);
 - five years of SVE/air sparge limited to the immediate source area of the plume followed by ten years of natural attenuation of groundwater; and
 - excavation of contaminated soil, followed by three years of air sparge to remediate groundwater to 2L standards, (followed by 2 years of monitoring);
 - partial excavation of contaminated soil, followed by five years of SVE/air sparge to remediate soil and groundwater to soil-to-groundwater MSCCs/2L standards (followed by 2 years of monitoring);
 - excavation of contaminated soil, followed by chemical injections to remediate groundwater to 2L standards (followed by 2 years monitoring)

The scope of each option must include all methods, procedures, or processes to be utilized, concurrently or sequentially, to clean up all types of contamination at the site. The evaluation of each option must consider:

- nature of contamination;
- \blacksquare a description of the method or process;
- discussion of feasibility and effectiveness, based on pilot tests or other relevant parameters;
- actual and projected costs; and
- a detailed, well-substantiated schedule for all activities from CAP approval to attainment of cleanup goals.
- 7) description and basis for selection of the remedial or mitigation option determined to be the most effective and cost efficient mechanism to treat contamination at a site; and
- 8) copies of public notices (Notice is required if CAP proposes remediation by natural
attenuation or cleanup of groundwater to alternate standards. Refer to Section 2.9 for more information.).

j) Approval and Implementation

A responsible party must receive approval of any CAP prior to implementation of that CAP. Permits and agreements necessary for CAP implementation must be obtained; pilot tests must be performed and evaluated; public notices must be sent and receipt documented; and schedule and cost analysis (inclusive of bidding process results) completed or the CAP will not be approved. If STF reimbursement is desired, any innovative technology selected for remediation must, following preliminary approval of the CAP by the incident manager, be referred to the UST Section's Innovative Technology Committee for review and approval. A list of approved technologies can be found UST Section web site at http://portal.ncdenr.org/web/wm/ust.

The responsible party must implement the CAP upon approval by the Department in strict accordance with the schedule approved for the selected remedial option.

When remedial goals have been achieved, the responsible party must submit a report documenting that soil and groundwater are cleaned up and request No Further Action status as described in Section 2.8.

2.7.B Corrective Actions for Low Risk Sites

1. Soil remediation plan from the Soil Assessment Report (SAR)

A Soil Assessment Report (SAR) is composed of two distinct phases: soil assessment and corrective action. Guidelines for performing the soil assessment and preparing the assessment phase of the SAR are presented in 2.6.B, Soil Assessment Reportfor Low Risk Sites; and the corrective action phase is presented below. Specific reporting requirements for the SAR are provided in Appendix A, Report 6.

a) **Basis for Requirement**

Pursuant to 15A NCAC 2L .0407, the responsible party must propose actions to cleanup or to mitigate the impact of soil contamination at a low risk site. The responsible party must prepare and submit a soil remediation plan when the Department determines, on review of the LSA, that the risk of the site is low. This soil remediation plan is the concluding part of the SAR. The responsible party is allowed 90-days to submit the SAR from the date of the notice requesting the SAR.

b) <u>Purpose and Scope</u>

The purpose of the soil remediation plan in the SAR is to propose a plan to cleanup soil contamination. The soil remediation plan report format (Soil Assessment Report) is presented in Appendix A. The responsible party must provide information relating to soil contamination described in the report format and must organize and present this information in the manner stipulated by the format. The regional office incident manager, on review of the soil remediation plan, may request information additional to or supplemental to that specified by the report format. The incident manager may deny approval of the Soil Assessment Report's soil remediation plan if any of the elements specified have not been included or have not been adequately addressed. The incident manager will not approve the SAR until he/she determines that the report is complete. Questions regarding technical aspects of site assessment or corrective action should be directed to the appropriate regional office or central office.

c) <u>Factors</u>

The remediation plan proposed in the SAR must be designed to adequately protect human health, insure safety, and protect the environment. Specifically, the remediation plan must consider the following elements:

- physical and chemical characteristics of the regulated substance;
- persistence of the regulated substance;
- potential for migration of the regulated substance
- hydrogeological characteristics of the facility and surrounding area;
- proximity, quality, current and future uses of surface water and groundwater;
- potential effects of residual soil contamination on nearby surface water and groundwater; and
- risk of exposure to organisms.

d) Soil Remediation Goals for Low Risk Sites

The responsible party must remediate soil contamination at low risk sites to concentration levels which are equal to or less than the applicable Maximum Soil Contaminant Concentrations (MSCCs), i.e., the residential MSCCs or the industrial/commercial MSCCs, before the Department can approve No Further Action status. Pursuant to 15A NCAC 2L .0408, soil must be remediated to the applicable MSCCs or as closely thereto as economically or technologically feasible. Economical and technological feasibility will only be considered in cases where traditional remediation technologies cannot be used or where treatment or removal of contaminated soil will jeopardize the integrity of a substantial structure. Pavement, dispensers, canopies, decks, patios, or HVAC units are not considered substantial structures. The soil cleanup requirements apply to the entire unsaturated soil column exclusive of the smear zone.

e) <u>Soil Remediation Plan Reporting Requirements</u> (See Soil Assessment Report format in Appendix A.)

The required elements of the soil remediation plan include, but may not be limited to the following:

- update of site history, source determination, land use, and potential receptor information provided in the LSA Report. (The responsible party must provide a history of the site using the Tables B-1 Site History – UST/AST System and Other Release Information and B-2 UST Site History - UST/AST Owner/Operator and Other Responsible Party Information provided in Appendix B. The location and use and all owners and operators of all current and previous UST and AST systems as well as other releases at the site must be provided. The responsible party must reconfirm the sources of release, including any on-site non-petroleum and non-UST sources of contamination.);
- 2) recapitulation and update of soil assessment information presented in the IAA and the LSA Reports;
- 3) comparison of cumulative soil assessment results (soil contaminant concentrations) to applicable cleanup goals;
- 4) purpose and objective of the soil remediation plan (e.g. to cleanup all contaminated soil to residential or industrial/commercial MSCCs, as applicable, or to remediate only the contaminated soil for which cleanup is economically and technologically feasible);

- 5) summary of initial remedial actions taken to date (e.g. removal of UST, excavation at UST closure);
- 6) comprehensive evaluation of remedial options. At least three remedial options must be evaluated. Excavation must be considered as a remedial option. For low risk cleanup, natural attenuation of soil cannot be considered as an option. For example, for a low-risk site with soil contamination in exceedance of the residential MSCCs, the options presented for evaluation might include:
 - excavation of all contaminated soil and removal of soil for treatment offsite (required option);
 - excavation of all contaminated soil which it is technologically and economically feasible to remove and placement of a restriction (NRP) in the property deed to limit access to the remaining soil contaminated in exceedance of residential MSCCs;
 - five years of SVE with monitoring to cleanup all contaminated soil plus one year of confirmation monitoring.

The scope of each option must include all methods, procedures, or processes to be utilized, concurrently or sequentially, to clean up all types of contamination at the site. The evaluation of each option must consider:

- nature of contamination;
- \blacksquare a description of the method or process;
- risk from soil contamination to potential receptors (e.g. downgradient wells, surface water, or indoor air);
- \blacksquare costs, and
- a detailed, well substantiated schedule for all activities from soil remediation plan approval to attainment of cleanup goals.
- 7) description and basis for selection of the remedial or mitigation option determined to be the most effective and cost efficient mechanism to treat contamination at a site.
- 8) copies of public notice (Notice is required only if soil contamination in exceedance of soil to groundwater MSCCs will remain at site or if groundwater contamination exceeds the 2L standards. Refer to Section 2H for more information.).

f) Approval and Implementation of Soil Remediation Plan

A responsible party must receive approval of any soil remediation plan prior to implementation of that soil remediation plan. Permits and agreements necessary for soil remediation plan implementation must be obtained; pilot tests must be performed and evaluated; public notices must be sent and receipt documented; and schedule and cost analysis (inclusive of bidding process results) completed, or the soil remediation plan will not be approved. If STF reimbursement is desired, any innovative technology selected for remediation must, following preliminary approval of the soil remediation plan by the incident manager, be referred to the UST Section's Innovative Technology Committee for review and approval. A list of approved technologies can be found on the UST Section web site at http://portal.ncdenr.org/web/wm/ust.

The responsible party must implement the soil remediation plan upon approval by the Department in strict accordance with the schedule approved for the selected remedial option.

2.7 Corrective Actions 2.7.B Low Risk Sites

g) <u>Request for No Further Action</u>

When remedial goals have been achieved, the responsible party must submit a report, the Soil Cleanup Report/Site Closure Request, which documents that soil contamination is remediated to goals and which requests No Further Action status (See Section 2.8 for site closure actions.).

2. Soil Cleanup Plan

a) **Basis for Requirement**

Pursuant to 15A NCAC 2L .0407, the responsible party must propose actions to cleanup or to mitigate the impact of soil contamination at a low risk site. The responsible party must prepare and submit a Soil Cleanup Plan (SCP) when the Department determines, on review of the CSA for a high or intermediate risk site, that the risk of the site must be reduced to low. The responsible party is allowed 60-days to submit the SCP from the date of the notice requesting the SCP.

b) <u>Purpose and Scope</u>

The purpose of the SCP is to propose a plan to cleanup soil contamination. The format for the SCP is presented in Appendix A, Report 8. The responsible party must provide information relating to soil contamination described in the report format and must organize and present this information in the manner stipulated by the format. The regional office incident manager, on review of the SCP, may request information additional to or supplemental to that specified by the report format. The incident manager may deny approval of the SCP if any of the elements specified have not been included or have not been adequately addressed. The incident manager will not approve the SCP until he/she determines that the report is complete. Questions regarding technical aspects of site assessment or corrective action should be directed to the appropriate regional office or central office.

c) <u>Factors</u>

The remediation plan proposed in the SCP must be designed to adequately protect human health, insure safety, and protect the environment. Specifically, the remediation plan must consider the following elements:

- physical and chemical characteristics of the regulated substance;
- persistence of the regulated substance;
- potential for migration of the regulated substance;
- hydrogeological characteristics of the facility and surrounding area;
- proximity, quality, current and future uses of surface water and groundwater;
- potential effects of residual soil contamination on nearby surface water and groundwater; and
- risk of exposure to organisms.

d) Soil Remediation Goals for Low Risk Sites

The responsible party must remediate soil contamination at low risk sites to concentration levels which are equal to or less than the applicable Maximum Soil Contaminant Concentrations (MSCCs), i.e., the residential MSCCs or the industrial/commercial MSCCs, before the Department can approve No Further Action status. Pursuant to 15A NCAC 2L .0408, soil must be remediated to the

applicable MSCCs or as closely thereto as economically or technologically feasible. Economical and technological feasibility will only be considered in cases where traditional remediation technologies cannot be used, or where treatment or removal of contaminated soil will jeopardize the integrity of a substantial structure. Pavement, dispensers, canopies, decks, patios, or HVAC units are not considered substantial structures. The soil cleanup requirements apply to the entire unsaturated soil column exclusive of the smear zone. Cleanup of soil contamination within the smear zone may be allowed if technologically and economically feasible at the site, with approval of the incident manager.

e) <u>SCP Reporting Requirements.</u> (See SCP format in Appendix A).

The required elements of the SCP include, but may not be limited to the following items:

- update of site history, source determination, land use, and potential receptor information provided in the CSA Report. (The responsible party must provide a history of the site using the Tables B-1 UST/AST System and Other Release Information and B-2 UST/AST Owner/Operator and Other Responsible Party Information provided in Appendix B. The location and use and all owners and operators of all current and previous UST and AST systems at the site must be provided. The responsible party must reconfirm the sources of release, including any on-site non-petroleum and non-UST sources of contamination.);
- 2) recapitulation and update of soil assessment information presented in the CSA Report;
- 3) comparison of cumulative soil assessment results (soil contaminant concentrations) to applicable cleanup goals;
- 4) purpose and objective of the SCP (e.g. to clean up all contaminated soil to residential or industrial/commercial MSCCs, as applicable, or to remediate only the contaminated soil for which cleanup is economically and technologically feasible);
- 5) summary of initial remedial actions taken to date (e.g. removal of UST, excavation at UST closure);
- 6) comprehensive evaluation of remedial options. At least three remedial options must be evaluated. Excavation must be considered as a remedial option. For low risk cleanup, natural attenuation of soil cannot be considered as an option. For example, for a low-risk site with soil contamination in exceedance of the residential MSCCs, the options presented for evaluation might include:
 - excavation of all contaminated soil and removal of soil for treatment offsite (required option);
 - excavation of all contaminated soil which it is technologically and economically feasible to remove and placement of a restriction (NRP) in the property deed to limit access to the remaining soil contaminated in exceedance of residential MSCCs;
 - five years of SVE with monitoring to cleanup all contaminated soil plus one year of confirmation monitoring.

The scope of each option must include all methods, procedures, or processes to be utilized, concurrently or sequentially, to clean up all types of contamination at the site. The evaluation of each option must consider:

- nature of contamination;
- a description of the method or process;

- risk from soil contamination to potential receptors (e.g. downgradient wells, surface water, or indoor air);
- \blacksquare costs; and
- a detailed, well substantiated schedule for all activities from SCP approval to attainment of cleanup goals.
- 7) description and basis for selection of the remedial or mitigation option determined to be the most effective and cost efficient mechanism to treat contamination at a site; and
- 8) copies of public notice (Notice is required only if soil contamination in exceedance of soil to groundwater MSCCs will remain at site or if groundwater contamination exceeds the 2L standards. Refer to Section 2.9 for more information.)

f) Approval and Implementation of SCP

A responsible party must receive approval of any SCP prior to implementation of that SCP. Permits and agreements necessary for SCP implementation must be obtained; pilot tests must be performed and evaluated; public notices must be sent and receipt documented; and schedule and cost analysis completed, or the SCP will not be approved. If STF reimbursement is desired, any innovative technology selected for remediation must, following preliminary approval of the SCP by the incident manager, be referred to the UST Section's Innovative Technology Committee for review and approval. A list of approved technologies can be found on the UST Section web site at http://portal.ncdenr.org/web/wm/ust.

The responsible party must implement the SCP upon approval by the Department in strict accordance with the schedule approved for the selected remedial option.

g) <u>Request for No Further Action</u>

When remedial goals have been achieved, the responsible party must submit a report, the Soil Cleanup Report/Site Closure Request, which documents that soil contamination is remediated to goals and which requests No Further Action status (See Section 2.8 for Closure Actions).

2.8 Site Closure

Site closure is the final act of the regulatory process related to a release. Appropriate documentation must be submitted to the Department in support of a petition for site closure.

2.8.A High- or Intermediate-Risk Site Closure [15A NCAC 2L .0407]

For a site that was a high or intermediate risk site and has been remediated to low risk, the responsible party must provide proof that the release has been remediated to appropriate levels and request a No Further Action determination. Site Closure Report (SCR) containing the necessary information will be requested by the Department.

1. Site Closure Report

a) **Basis for requirement**

Pursuant to 15A NCAC 2L .0407, the responsible party must submit a SCR for a high or an intermediate risk site when monitoring of soil and groundwater indicates that the contamination has been remediated to appropriate standard concentration levels. The responsible party is allowed 30-days from the date of the notice requesting the SCR to submit the SCR.

b) **<u>Purpose, Scope, and Goals</u>**

The purpose of the SCR is to demonstrate that soil and groundwater cleanup has been achieved. The format for the SCR is presented in Appendix A, Report 13. The responsible party must provide information relating to soil and groundwater contamination described in the format and present the information in the manner specified in the format. The responsible party must show that the soil contamination has been remediated to the lower of the soil to groundwater or residential MSCCs and that the groundwater has been remediated to 2L or approved alternate standards. The number of groundwater sampling events that are needed to demonstrate that groundwater quality has been remediated to the required cleanup level is site-specific and will be determined by the local regional office. The responsible party should properly abandon any monitoring wells or injection wells used to investigate or remediate the incident in accordance with 15A NCAC 2C .0113 and .0214.

c) SCR Reporting Requirements

The activities required in the SCR include but may not be limited to the following items:

- update of site history, source determination, and potential receptor information provided in the CSA Report. (The responsible party must provide a history of the UST systems at the site using the Tables B-1 UST/AST System and Other Release Information and B-2 UST/AST Owner/Operator and Other Responsible Party Information provided in Appendix B. The location and use and all owners and operators of all current and previous UST and AST systems at the site must be provided. The responsible party must reconfirm the sources of release, including any on-site non-petroleum and non-UST sources of contamination.);
- 2) recapitulation and update of assessment information presented in the CSA and all monitoring reports (Briefly describe historical soil and groundwater monitoring at the site, concluding with a discussion of the sampling performed to document the cleanup.);

- 3) comparison of historical and final assessment and monitoring levels for soil and groundwater contaminant concentrations and free product thickness to applicable cleanup goals;
- 4) description of all remedial methods employed, risk reduction procedures implemented, and/ or natural processes allowed to cleanup the soil and groundwater at the site.;
- 5) request for No Further Action status, including basis for request; and
- 6) copies of public notices (Notice is required if CAP proposes remediation by natural attenuation or cleanup of groundwater to alternate standards. Refer to Section 2.9 for more information.)

2.8.B Low-Risk Site Closure [15A NCAC 2L .0408]

For a site that was low risk, the responsible party must provide proof that the release has been remediated to appropriate levels and request a No Further Action determination. A Soil Cleanup Report with Site Closure Request containing the necessary information will be requested by the Department.

1. Soil Cleanup Report with Site Closure Request (SCR/SCR)

a) **Basis for requirement.**

Pursuant to 15A NCAC 2L .0408, the responsible party must submit a SCR/SCR for a low risk site when monitoring of soil indicates that the contamination has been remediated to appropriate standard concentration levels. The responsible party is allowed 30-days from the date of the notice requesting the SCR/SCR to submit the SCR/SCR.

b) <u>Purpose, Scope and Goals</u>

The purpose of the SCR/SCR is to demonstrate that soil cleanup has been achieved. The format for the SCR/SCR is presented in Appendix A. The responsible party must provide information relating to soil contamination as described in the format and present the information in the manner specified in the format. The responsible party must show that the soil contamination has been remediated to the lower of the soil to groundwater or residential MSCCs.

c) Soil Cleanup Report with Site Closure Request Reporting Requirements

The activities required in the SCR/SCR include but may not be limited to the following items:

- update of site history, source determination and potential receptor information provided in the CSA Report. (The responsible party must provide a history of the UST systems at the site using the Tables B-1 UST/AST System and Other Release Information and B-2 UST/AST Owner/Operator and Other Responsible Party Information provided in Appendix B. The location, use, and all owners an operators of all current and previous UST and AST systems at the site must be provided. The responsible party must reconfirm the sources of release, including any on-site non-petroleum and non-UST sources of contamination.);
- 2) recapitulation and update of assessment information presented in the SAR and/or CSA Reports. (Describe the soil sampling to document cleanup.);
- 3) comparison of historical and final assessment and monitoring levels for soil and groundwater contaminant concentrations and free product thickness to applicable cleanup goals;
- 4) Brief description of all remedial methods employed or risk reduction procedures implemented to cleanup soil at the site.
- 5) request No Further Action status, including basis for request;

6) copies of public notices ((Notice is required only if soil contamination in exceedance of soil to groundwater MSCCs will remain at site or if groundwater contamination exceeds the 2L standards. Refer to Section 2.9 for more information.).

2.8.C No Further Action

When the Department has reviewed and approved the Soil Cleanup Report or the Soil Cleanup Report with Site Closure Request confirming that the soil and groundwater have been cleaned up, the Department will issue a Notice of No Further Action (**NFA**) letter stating that no further action is required.

No Further Action status is conditional on the filing of public notice and Notice of Residual Petroleum, if either notice is required.

2.8.D Continuing Obligations for the Responsible Party

Pursuant to 15A NCAC 2L .0407 the responsible party must notify the Department of any changes in site conditions that might affect the level of risk assigned to a release after receipt of a No Further Action determination.

Such changes may include but, are not limited to, changes in zoning of the property, changes in use of the property (e.g., conversion of a service station or convenience store to a residence/school/recreation area/daycare center, etc.) or changes in the use of the affected, or potentially affected groundwater (e.g., installation of an irrigation well within 250 feet of the source area of the release).

If the Department later determines that a release poses an unacceptable or potentially unacceptable risk to human health or the environment, the determination of No Further Action will no longer apply.

If a permit was issued by the Division of Water Resources (DWR), the responsible party should request rescission of the permit within thirty days of receiving the Notice of No Further Action letter. The DWR can be contacted at (919) 807-6300.

2.9 Public Notice Requirements and Format

2.9.A Public Notice for Comprehensive Site Assessment

Pursuant to 15A NCAC 2L .0114, the responsible party must provide a summary of the CSA Report for high and intermediate risk releases to the local health director and the chief administrative officer of the political jurisdiction in which the contamination occurs. This report must include a map of the contaminant plume with the location of all monitoring wells identified, the frequency of monitoring, a table of the constituents exceeding the groundwater quality standards and interim standards, and any actions taken to mitigate threats to human health. This summary report must be submitted by certified mail to the parties specified above no later than five working days after the CSA Report is submitted to the Department.

2.9.B Public Notice for Corrective Action

Pursuant to 15A NCAC 2L .0409(a), public notice is required for corrective action when:

- the responsible party submits a CAP which proposes remediation by <u>natural attenuation</u>, or by a combination of active treatment and remediation by natural attenuation;
- the responsible party submits a CAP which proposes to cleanup groundwater contamination to an <u>alternate standard</u> (i.e., a standard other than the groundwater standard or interim standard established in 15A NCAC 2L .0202); or
- the responsible party submits a SAR or Soil Cleanup Plan (for low risk sites); which proposes to cleanup soil contamination to an <u>alternate standard</u> (i.e., a standard other than the soil-to-groundwater or the residential Maximum Soil Contaminant Concentration (MSCC), whichever is lower).

For these proposed remedies, the responsible party must notify the following people:

- \blacksquare the local health director;
- the chief administrative officer (Mayor, Chairman of the County Commissioners, County Manager, City Manager, or other official of equal or similar position) of each political jurisdiction in which the contamination occurs;
- all property owners and occupants residing within or contiguous to the area containing contamination; and
- all property owners and occupants residing within or contiguous to the area where the contamination is expected to migrate.

Public notice must be sent by certified mail. The notice must describe the nature of the selected remedy and the justification for implementing the chosen remedy.

If it proves impractical to provide notice by certified mail to the occupants of apartment buildings, condominiums, office buildings, trailer parks, etc., the responsible party may give notice by posting the public notice in a prominent place where the building occupants are most likely to see it.

Approval of the CAP, SAR, or Soil Cleanup Plan will be postponed for a period of thirty (30) days so that the Department may consider comments submitted by interested parties. All comments received within this time frame will be considered when approving the CAP, SAR, or Soil Cleanup Plan. A public meeting may be held if the Department finds a significant degree of public interest in the proposed activities. Within **30 days** of submitting the CAP, SAR, or Soil Cleanup Plan, the responsible party must provide the appropriate regional office with **proof of receipt of the public notice** or of refusal by the addressee

to accept delivery of the notice. If a notice is posted, the responsible party must provide the regional office with a description of the manner in which the notice was posted.

Formats for public notice for corrective action are provided in Appendix A, Report 15 and Report 16.

2.9.C Public Notice Following NFA Notification

After the Department has issued a Notice of No Further Action letter to the responsible party stating that no further action is required, the responsible party must provide public notice in accordance with 15A NCAC 2L .0409(b) if the following conditions exist:

- groundwater has not been restored to the standards, or interim standards established under 15A NCAC 2L .0202; and/or
- soil has not been remediated to the lower of the soil-to-groundwater or the residential Maximum Soil Contaminant Concentration (MSCC)s.

Pursuant to 15A NCAC 2L .0409(b), the responsible party must provide a copy of the Notice of No Further Action letter to the following individuals within 30 days of receiving the letter:

- \blacksquare the local health director;
- the chief administrative officer (Mayor, Chairman of the County Commissioners, County Manager, City Manager, or other official of equal or similar position) of each political jurisdiction in which the contamination occurs;
- all property owners and occupants residing within or contiguous to the area containing contamination; and
- all property owners and occupants residing within or contiguous to the area where the contamination is expected to migrate.

The Notice of No Further Action letter is considered the public notice. Therefore, a copy of the Notice of No Further Action letter must be provided to the above referenced parties by certified mail. An explanatory cover letter or other document, which contains an explanation indicating that the referenced property has been granted a No Further Action determination with soil and/or groundwater contamination levels above either the soil-to-groundwater or residential soil levels or the 15A NCAC 2L standards for groundwater, should be included with the public notice. The cover document should provide a contact (either the responsible party or the consultant) to answer questions concerning the referenced property.

Within 60 days of receiving the Notice of No Further Action letter, the responsible party must provide the appropriate regional office with proof of receipt of the copy of the notice or of refusal by the addressee to accept delivery of the copy of the notice. If notice is posted, the responsible party must provide the regional office with a description of the manner in which the notice was posted.

2.10 Notice of Residual Petroleum and Land Use Restrictions

North Carolina General Statute (NCGS) 143B-279.9 and 143B-279.11 require a Notice of Residual Petroleum (NRP) to be filed with the Register of Deeds in the county where the release is located when a release from a petroleum underground storage tank has not been remediated to below "unrestricted use standards." The NRP is required prior to conveyance of a contaminated property or, for suitable low risk sites, prior to receiving a Notice of No Further Action. "Unrestricted use standards" for groundwater are the groundwater quality standards and interim standards contained in 15A NCAC 2L .0202, and "unrestricted use standards" for soil are the residential MSCCs established in 15A NCAC 2L .0411.

The NRP must be prepared in accordance with the instructions and format (See Appendix E or the UST Section web site at <u>http://portal.ncdenr.org/web/wm/ust</u>.). The NRP must contain a legal description of the property containing the source of contamination and legal descriptions of any other properties which are contaminated by the release and are owned (or controlled) by the person who owns or controls the contaminated property. The NRP must also include appropriate land use restrictions for these properties. In addition, the NRP must identify all other properties (adjacent, adjoining, downgradient, etc.) on which contamination is known to exist at the time the NRP is prepared.

The NRP must be sent to the appropriate regional office of the UST Section within 30 days of the date of receipt of a letter requesting its submittal or prior to a property transaction, for approval and notarization. The approved and notarized NRP must then be filed with the Register of Deeds, and a certified copy of the filed NRP must be submitted to the regional office within 30 days of its return.

3.0 Non-Petroleum UST Remedial Actions

3.1 Applicability of Regulatory Requirements

This section provides guidance relevant to releases from non-petroleum UST systems, from assessment of contamination through remediation. Non-petroleum releases can be subdivided into releases from regulated (under 15A NCAC 2N) UST systems (e.g. hazardous substance USTs) and releases from non-regulated UST systems (e.g. vegetable USTs).

Regulated non-petroleum (hazardous substance) UST releases are subject to the initial response and abatement requirements of both 15A NCAC 2N .0700 and 15A NCAC 2L .0106. **Non-regulated non-petroleum UST releases** are subject to the initial response and abatement requirements of 15A NCAC 2L .0106. Consequently, for both kinds of non-petroleum releases, the responsible parties must take immediate action to terminate and control the release, mitigate any hazards resulting from exposure to the pollutants or from fire, explosion, or vapors; determine and remove, treat, or control primary and secondary pollution sources; and notify the Department of the release. The *Guidelines for Site Checks, Tank Closure, and Initial Response and Abatement for UST Releases* present guidance on initial response and abatement actions.

Regulated non-petroleum (hazardous substance) UST releases are subject to the corrective action requirements of both 15A NCAC 2N .0700 and 15A NCAC 2L .0106. Consequently, the responsible party is required to perform assessment and submit a 45-Day Report and a Comprehensive Site Assessment (CSA) Report and to submit and implement a Corrective Action Plan to address contamination.

Non-regulated non-petroleum UST releases (e.g., alcohol, vegetable oil, or propylene glycol UST releases) are subject, if the substance released is not naturally occurring (or is naturally occurring but exceeds the naturally occurring standard), to comply with the assessment and corrective action requirements of 15A NCAC 2L 0106. Consequently, the responsible party is required to perform assessment and submit a CSA Report and to submit and implement a CAP to address contamination. More detailed guidance for action at **non-regulated non-petroleum UST releases** is not provided as such guidance is contaminant specific. The responsible party should contact the Corrective Action Branch of the UST Section for specific guidance at (919) 707-8171. Some **non-regulated non-petroleum UST releases** (e.g., hazardous waste UST releases) do not fall under the regulatory authority of the UST Section; Appendix G provides a list of the appropriate agencies to contact.

The assessment and corrective actions required for **regulated non-petroleum (hazardous substance) UST releases** and for **non-regulated non-petroleum UST releases**, which are described in Sections 3.2 – 3.10, are similar. A single flowchart summarizing the regulatory requirement for both regulated and non-regulated non-petroleum UST releases is presented in Figure 3.

The most stringent cleanup levels apply to non-petroleum releases (even if commingled with a petroleum UST release). Therefore, groundwater contaminated by non-petroleum releases must be cleaned up to the groundwater quality standards in 15A NCAC 2L 0202, and soil must be cleaned up to levels protective of groundwater quality, the soil-to-groundwater MSCCs.

The following sections (Section 3.2 - 3.10) describe the procedures that the responsible party must follow for **regulated non-petroleum (hazardous substance) UST releases** and for **non-regulated non-petroleum UST release**. These procedures include release confirmation and abatement procedures, initial site characterization procedures, soil and groundwater assessment procedures, soil and groundwater cleanup procedures, and site closure procedures. A flowchart summarizing the process is provided in Figure 3.

3.2 Review of Initial Response and Abatement Actions

Refer to *Guidelines for Site Checks, Tank Closure and Initial Response and Abatement for UST Releases* for full guidance.

Once evidence of a release is discovered, a responsible party must take immediate action to prevent any further release of product from the UST system, identify and mitigate any fire, explosion, or vapor hazards, and remove any free product. The responsible party must notify the Department of a confirmed release within 24 hours of discovery, providing the information required to complete the 24-Hour Release and UST Leak Reporting Form (UST Form 62). The responsible party must submit the information to the appropriate UST Section regional office of the Department by telephone, fax, electronic mail, or other means. The information required for the 24-Hour Release and UST Leak Reporting Form includes the nature, location, and time of the release and a description of the initial response action.

If water supply wells are contaminated with release constituents above levels determined to be safe for human consumption, the responsible party must also provide affected parties with an alternate source of water.

Within 20 days of release confirmation, the responsible party must provide information concerning the details of initial site actions, including the results of sampling performed to confirm that a release occurred, steps taken to prevent further release, actions performed to mitigate hazards from exposure to pollutants and hazards from fire, explosion, or vapors; and a description of any further investigative or remedial actions. This information should be submitted in the 20-Day Report format. (*The 20-Day Report is required for regulated USTs and stipulated for non-regulated USTs to facilitate successful investigation*).

NOTES:

1) Any detectable amount of a contaminant is considered to be a release and must be reported.

2) Human consumption includes, but is not limited to, the following uses: drinking, bathing, showering, cooking, dishwashing, laundering, and oral hygiene. Water used in toilets and sinks is also considered human consumption.

Figure 3 Flowchart of Requirements for Regulated Non-Petroleum and Non-Regulated Non-Petroleum UST Releases

Discovery of a release (See the *Guidelines for Site Checks, Tank Closure, and Initial Response* and Abatement for UST Releases for details.

Take immediate steps to mitigate exposure and hazards associated with the release. Notify Department of release (using the **24 Hour Release and UST Leak Reporting Form** (UST-61). Submit initial progress report. (using the **20 Day Report** format).



3.3 Free Product Recovery and Reporting

The responsible party must investigate to determine the possible presence of free product and, if free product is discovered, begin free product removal within 14 days of discovery (*as required by 15A NCAC 2N* .0705 for regulated USTs and stipulated by the Department for non-regulated USTs).

The responsible party must submit Free Product Recovery Reports as directed by the Department and in the required format (See Appendix A, Report 2). (*FPR Reports are required by rule for regulated USTs and stipulated by the Department for non-regulated USTs to facilitate successful investigation.*) In place of a separate report, free product recovery reporting should be included in the 20-Day Report, 45-Day Report or Initial Site Assessment Report, Limited Site Assessment Report, Comprehensive Site Assessment Report, Corrective Action Plan, and Monitoring Reports, if applicable. Although free product recovery is a corrective Action Plan. Performance of free product recovery should not delay other required actions or preparation and submittal of other reports or plans; free product recovery and other required response, abatement, assessment, cleanup, and reporting activities should be performed simultaneously.

Following the initial free product recovery event and 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. The responsible party then must submit the results of this investigation to the appropriate regional office of the UST Section in a FP Recovery System Specification Report (See Appendix A, Report 3). This report should summarize and evaluate the results of the investigation, evaluate several possible active free product recovery system options (e.g., excavation, SVE, MMPE, AFVR), and propose a free product recovery plan which incorporates the most appropriate recovery system option. The free product removal plan should be designed to minimize the spread of contamination and treat, discharge, and dispose of free product in compliance with all applicable regulations. The objectives of the plan should be to halt migration and to remove free product to the maximum extent practicable, usually to a thickness of less than 0.01 foot. The report should conclude with a schedule for the free product recovery plan which includes implementation, attainment of free product recovery progress milestones, and submittal of reports.

The responsible party must implement the free product recovery plan immediately upon approval and continue to execute the plan, simultaneously with all other required abatement, assessment, cleanup, and reporting activities, until free product has been removed or until the plan is superseded by the Corrective Action Plan.

The responsible party is required to handle flammable product safely and competently in order to prevent fire or explosion.

3.4 Initial Site Characterization

For regulated non-petroleum UST releases, within 45 days of release confirmation the responsible party must submit the site characterization information necessary to for the Department to assign a priority ranking to the release site (Section 3.5). The information required in the 45-Day Report includes the reporting of any site check and/or UST closure activities and related assessment for regulated non-petroleum (hazardous substance) UST releases; determination of the source and nature of the release; confirmation of groundwater contamination; location of water supply wells, wellhead protection areas, and surface water; potential land use; and any other investigative or remedial activities undertaken (e.g., free product investigation and recovery, soil excavation, and post-excavation assessment). This information should be submitted in the 45-Day Report (Appendix A, Report 1).

If free product is present, its removal must be initiated, and a Free Product Recovery Report (Appendix A, Report 2) must be submitted within 45 days of release confirmation, for regulated USTs. However, the Free Product Recovery Report may be incorporated within the 45-Day Report.

For non-regulated non-petroleum UST releases, it is recommended that the responsible party submit an Initial Site Assessment Report (using the format presented in Appendix A of the *Guidelines for Initial Response and Abatement, Assessment, and Corrective Action for Non-UST Releases of Petroleum)* in order to present the results of post-excavation soil sampling and any groundwater assessment.

Free Product Recovery Reports are stipulated for non-regulated USTs to facilitate successful investigation but may be incorporated within the Initial Site Assessment Report.

3.5 Site Priority Ranking

Following submittal of the 45-Day Report, Initial Site Assessment Report, or other satisfactory documentation, the Department will assign a site priority ranking to an incident site based on the threat or potential threat that the release poses to human health and the environment. Incident sites are ranked high, intermediate or low. Once the ranking has been assigned, the responsible party should indicate the site priority ranking on the cover page of all subsequent reports. The site priority ranking criteria are listed below. If the criteria for more than one site priority ranking category apply, the the incident will be assigned the highest applicable rank.

3.5.A High Priority

The criteria for high priority ranking are:

- 1. a water supply well, including one used for non-drinking purposes, has been contaminated by the release;
- **2**. a water supply well used for drinking water is located within 1,000 feet of the source area of a confirmed release;
- **3**. a water supply well not used for drinking water is located within 250 feet of the source area of a confirmed release;
- 4. the groundwater within 500 feet of the source area of a confirmed release has the potential for future use in that there is no source of water supply other than the groundwater;
- 5. the vapors from the release poses a serious threat of explosion due to accumulation of the vapors in a confined space; or
- 6. the release poses an imminent danger to public health, public safety, or the environment.

3.5.B Intermediate Priority

The criteria for a intermediate risk are:

- 1. surface water is located within 500 feet of the source area of a confirmed release and the maximum groundwater contaminant concentration exceeds the applicable surface water quality standards and criteria found in 15A NCAC 2B .0200 and US EPA National Criteria by a factor of 10;
- 2. in the Coastal Plain physiographic region as designated on a map entitled "Geologic Map of North Carolina" published by the Department in 1985, the source area of a release is located in an area in which there is recharge to an unconfined or semi-confined deeper aquifer which the Department determines is being used or may be used as a source for drinking water;
- **3.** the source area of a confirmed release is located within a designated wellhead protection area, as defined in 42 USC 300h-7(e);
- 4. the levels of groundwater contamination for any contaminant except ethylene dibromide, benzene, and aliphatic and aromatic carbon fraction classes exceed 50 percent of the solubility of the contaminant at 25 degrees Celsius or 1,000 times the groundwater quality standard or interim standard established in 15A NCAC 2L .0202, whichever is lower; or
- 5. the levels of groundwater contamination for ethylene dibromide and benzene exceed 1,000 times the federal drinking water standard set out in 40 CFR 141.

3.5.C Low Priority

A low priority ranking means that the threat posed by the release does not meet any of the high or intermediate priority ranking criteria, or that based on site-specific information received by the Department the release is shown to pose no significant threat.

3.6 Assessment

If the 45-Day Report (or Initial Assessment Report) indicates that, despite initial abatement actions, soil contamination has not been cleaned up to the soil-to-groundwater MSCCs and/or groundwater contamination has not been cleaned up to the groundwater quality standards in 15A NCAC 2L 0202, the responsible party must perform a comprehensive site assessment and submit a Comprehensive Site Assessment (CSA) Report.

3.6.A Comprehensive Site Assessment Report

The primary objectives of the comprehensive site assessment are to characterize the full extent of contamination resulting from the release, determine the chemical and physical characteristics of the contaminants, investigate the geology and hydrogeology of the site including all factors relating to contaminant transport, and examine risk to potential receptors and exposure pathways. In characterizing the extent of contamination, the responsible party must define and document the vertical and horizontal extent of both soil and groundwater contaminant and site-specific conditions. If soil contamination is present at or near bedrock or the water table or if groundwater contamination is known to be present, the responsible party must install groundwater monitoring wells in accordance with 15A NCAC 2C .0100. The responsible party must install one monitoring wells in order to determine the direction of groundwater flow and must install deeper wells to define the shape of the plume and delineate the vertical extent of the plume. The regional office may require additional monitoring wells.

The CSA Report must be submitted to the appropriate regional office within 90 days of the date of the notice requesting the comprehensive site assessment. The CSA Report must follow the format presented in Appendix A, Report 5. Guidelines for conducting comprehensive site assessment and completing a CSA Report are presented below.

1. Remediation Goals

Soil contamination must be delineated and remediated to concentration levels equal to or less than the soil-to-groundwater MSCCs, and groundwater contamination must be remediated to concentration levels equal to or less than the groundwater quality standards in 15A NCAC 2L .0202.

2. CSA Reporting Requirements

Requirements for CSA and the subsequent CSA Report include but may not be limited to the following items:

- a) update of site history, source determination, and potential receptor information provided in the 45-Day Report (or Initial Site Assessment Report). (The responsible party must provide a history of the UST systems at the site using the Tables B-1 UST/AST System and Other Release Information and B-2 UST/AST Owner/Operator and Other Responsible Party Information provided in Appendix B. The location and use and all owners and operators of all current and previous UST and AST systems at the site must be provided. The responsible party must describe all sources of release on the site, including UST and non-UST sources of non-petroleum or petroleum contamination.);
- **b**) collection of soil and groundwater samples in order to delineate the horizontal and vertical extent of contamination. (Samples must be collected and analyzed in accordance with methods and

procedures specified in Section 4. Comparison of the sample results must be made to the applicable cleanup standards);

- c) determination of the extent and thickness of free product, if present;
- d) copies of public notice (Refer to Section 3.9.A. for more information.);
- e) hydrogeologic investigation which should include:
 - 1) complete characterization of the site geology based on the information obtained during the advancement of soil borings and construction of monitoring wells;
 - 2) collection of groundwater elevation data and calculation of hydraulic gradient and determination of groundwater flow direction;
 - 3) performance of aquifer slug tests (or an aquifer pump test if approved by the regional office), to provide a calculation of hydraulic conductivity, transmissivity, and linear groundwater velocity (See Appendix D.); and
 - 4) determination of rate of contaminant transport and the potential for contaminants to affect receptors.

3. Evaluation of Potential for Contamination to Impact Receptors.

The responsible party must evaluate the potential for contaminants in soil and groundwater to affect receptors including but not be limited to:

- water supply wells;
- subsurface features;
- building interiors
- surface water bodies;
- groundwater in wellhead protection areas; and
- groundwater in areas of recharge to deep unconfined or semi-confined aquifers.

If a receptor is determined to be at risk from soil or groundwater contamination from a release, the responsible party must evaluate all actions to reduce the risk of the site. Such actions might include the re-evaluation of site specific conditions relative to a receptor (supply wells that are upgradient), abandonment of water supply wells, and the extension of public water supply lines.

A discussion of the use of groundwater modeling to evaluate potential for contamination of receptors and a brief description of the applicable surface water standards are presented in Section 2.6.A.4.

3.7 Corrective Action

If the CSA Report indicates that soil contamination and/or groundwater persists, the responsible party must submit a Corrective Action Plan (CAP). The plan must propose and evaluate actions to clean up soil and groundwater contamination. When the most effective remedial options for soil and groundwater have been selected and the CAP has been approved, the responsible party must implement the CAP according to an approved schedule. Periodic groundwater monitoring will be required to evaluate changes in groundwater contaminant concentration during the remediation process, to monitor plume migration, and to determine the effectiveness of the corrective action.

3.7.A Corrective Action for All Non-Petroleum UST Release Sites

1. Pre-CAP Monitoring

If more than six months elapse between approval of the CSA and implementation of the Corrective Action Plan (CAP), then the Department may direct the responsible party to perform pre-CAP monitoring of groundwater in monitoring and/or water supply wells, of surface waters, of petroleum vapors, and/or of free product. Pre-CAP monitoring may be determined necessary for the following purposes:

- a) to provide an updated evaluation of risk to potential receptors;
- b) to develop a current picture of contaminant plume geometry and extent in order to facilitate remedial system design;
- c) to establish the level of contaminant concentration at a site immediately prior to startup of remedial system; and
- d) to provide empirical data on which to evaluate the progress of natural attenuation.

The Department will determine the frequency and scope of pre-CAP monitoring on a site-specific basis. The responsible party should submit a plan for pre-CAP monitoring to the Department for approval, perform the monitoring event, and submit a pre-CAP Monitoring Report (which should be prepared using the Monitoring Report format presented in Appendix A) to the appropriate regional office by the end of the month following the month of the monitoring event.

2. Corrective Action Plan

a) **Basis for Requirement**

Pursuant to 15A NCAC 2N.0700 and 15A NCAC 2L .0106 for regulated non-petroleum (hazardous waste) UST releases and pursuant to 15A NCAC 2L .0106 for non-regulated non-petroleum UST releases, the responsible party must propose actions to cleanup or to mitigate the impact of soil and groundwater contamination. The responsible party is allowed 60-days from the date of the notice approving the CSA Report to submit a CAP that presents and evaluates the proposed corrective actions.

As the corrective actions for all non-petroleum UST releases are regulated under 15A NCAC 2L. 0106, the responsible party must propose and implement a CAP pursuant to Paragraph .0106(j), which requires use of the "best available technology for restoration of groundwater quality to the level of the standards, except as provided in Paragraphs (k), (l), and (m)...". So the responsible party must submit and implement a "j-CAP", which proposes to use active remediation technology continuously until groundwater contamination is reduced to levels equal to or less than the standards established in 15A NCAC 2L.0202, *unless* he/she instead chooses to request the Department to approve an alternative corrective action plan described in Paragraphs .0106(k) or .0106(l).

The responsible party is strongly advised to carefully consider the rigorous requirements and the inflexibility of the alternative CAPs and to propose a CAP under NCAC 2L .0106(j). The requirements for the alternative CAPs are presented in detail later in this section to facilitate full understanding of the difficulties involved firstly in meeting the stringent requirements for approval and then in continuing to meet them throughout implementation (e.g., if a CAP under .0106(k) or (l) is approved but later, during implementation, contaminated soil or FP is discovered or the plume migration model is found to be faulty and a receptor to be at risk, then another CAP, under 2L .0106(j), using active technology to address the soil or FP, will be required.) The formula for a CAP under 2L .0106(j), although strictly described as a plan for implementation of several different technologies (including excavation) simultaneously or sequentially to the point where each no longer functions to provide further cost-effective or technically-efficient cleanup and also to allow necessary periods of system shutdown to monitor for rebound or attenuation of contaminants.

Pursuant to 15A NCAC 2L .0106(f), all free product and contaminated soil should have been removed, treated, or controlled during the initial abatement or assessment. However, if soil contamination persists at levels that could leach into groundwater, then soil remediation must be proposed in the CAP.

b) Purpose and Scope

The purpose of the CAP is to propose a plan to remediate soil and groundwater contamination, if present. However, if the contamination present at the site is limited to either soil or groundwater, then the CAP should address only the contamination that is present. The format for the CAP is presented in Appendix A, Report 7. The responsible party must provide the information described in the report format, completing, as appropriate, sections relating to soil contamination, groundwater contamination and/or free product and must organize and present this information in the manner stipulated by the format. The regional office incident manager, on review of the CAP, may request information additional to that provided in the CAP or supplemental to that specified by the report format. The incident manager may deny approval of the CAP if any of the elements specified have not been included or have not been adequately addressed. The incident manager will not approve the CAP until he/she determines that the report is complete. Questions regarding technical aspects of site assessment or corrective action should be directed to the appropriate regional office or central office.

c) <u>Factors</u>

The corrective actions proposed in the CAP must be designed to adequately protect human health, insure safety and protect the environment. Specifically, the CAP must consider the following elements:

- physical and chemical characteristics of the regulated substance
- toxicity of the regulated substance
- persistence of the regulated substance
- potential for migration of the regulated substance
- hydrogeological characteristics of the facility and surrounding area
- proximity, quality, current and future uses of surface water and groundwater
- potential effects of residual contamination on nearby surface water and groundwater
- \equiv risk of exposure to organisms

d) Soil Remediation Goals

The responsible party must remediate soil contamination to concentration levels that are equal to or less than the soil-to-groundwater MSCCs). Soil must be remediated to the applicable MSCCs or as closely thereto as economically or technologically feasible. Economic and technological feasibility will only be considered in cases where traditional remediation technologies cannot be used or where treatment or removal of contaminated soil will jeopardize the integrity of a substantial structure. Pavement, canopies, decks, patios, or HVAC units are not considered substantial structures. The soil cleanup requirements apply to the entire unsaturated soil column exclusive of the smear zone.

Final determination of soil contamination must be made by the laboratory analytical methods presented in Table 6. MSCCs for some non-petroleum contaminants are listed in Table 1. If a contaminant does not have a published MSCC, the responsible party should contact the UST Central Office Corrective Action Branch at (919) 707-8171 to request establishment of a cleanup level.

e) <u>Development of Maximum Soil Contaminant Concentrations (See Table 1.)</u>

The soil-to-groundwater MSCCs have been determined to be protective of groundwater impacted by contaminants leaching from soil. The equations used by the Department to calculate the soil-to-groundwater MSCCs are provided in Appendix F.

f) Evaluation of Soil Remediation

The effectiveness and progress of soil remediation should be evaluated by soil sampling as scheduled in the CAP or as directed by the Department and should be reported in routine monitoring reports. The requirements for the reporting of soil remediation monitoring are presented in the Monitoring Report format presented in Appendix A, Report 9.

g) Groundwater Remediation Goals

For all releases the responsible party is required to restore groundwater quality to concentration levels that are equal to or less than the standards established by 15A NCAC 2L .0202 before being granted No Further Action status. For the majority of releases, the groundwater contamination must be <u>remediated</u>, using one or more technologies, to these standard levels. However, for some releases, if stringent requirements are met (Refer to Corrective Action Reporting Requirements under Item h.), the contamination may be allowed to naturally attenuate to the standard levels or to be remediated actively to alternate concentration levels and then allowed to attenuate to the standard levels.

- 1) Goals for a .0106(j) CAP. For the CAP required pursuant to 15A NCAC 2L .0106(j), the goals of active remediation of groundwater are concentration levels that are equal to or less than the standards in 15A NCAC 2L .0202. The goals of active remediation under Paragraph .0106(j) are also the final cleanup goals that must be attained for the site to be eligible for No Further Action (NFA) status.
- 2) Goals for a .0106((k) CAP or for a .0106(m) Termination Plan. For the alternative CAP and termination plan allowed pursuant to Paragraph .0106(k) and Paragraph .0106(m), respectively, the goals of active remediation are not equivalent to the final cleanup goals which must be reached for a site to be eligible for No Further Action status.

For the "k-CAP", groundwater contamination must be cleaned up using remediation technology but only to concentration levels determined to be acceptable at the specific site. After the active remediation goals have been attained at the site, the remediation system is shutdown, and the remaining groundwater contamination is allowed to degrade and attenuate naturally to the levels of the standards in 15A NC AC 2L .0202, which are the final goals for No Further Action status.

The .0106(m) termination plan is a request from the responsible party for approval to terminate operation of remediation technology that is currently in use at the site. The primary justification for termination is that continuation of remedial action will not result in significant reduction of contaminant concentration levels. If termination is approved, the active remediation system is shutdown, and the remaining groundwater contamination is allowed to degrade and attenuate naturally to the levels of the standards in 15A NCAC 2L .0202, which are the final goals for No Further Action status.

- **3) Goals for a .0106(l) CAP.** For a CAP requested by a responsible party pursuant to Paragraph .0106(l), groundwater contamination is allowed to degrade and attenuate naturally to the standards in 15A NCAC 2L .0202, which are the final goals for No Further Action status.
- **4) Final Remediation Goals.** Following the implementation of all .0106 CAPs and of the .0106(m) termination plan, the responsible party must monitor groundwater routinely until he/she can demonstrate that groundwater contamination has been reduced to levels equal to or less than the standards in 15A NCAC 2L .0202 and thus become eligible for No Further Action status.

The Department requires, at a minimum, four consecutive quarters of data from groundwater monitoring, following discontinuation of remedial action, which document no contamination above the 15A NCAC 2L standards or interim standards to establish that final cleanup goals have been attained. Determination of groundwater contamination must be made by the laboratory analytical methods presented in Table 7.

h) Evaluation of Groundwater Remediation

The effectiveness and progress of groundwater remediation should be evaluated by groundwater monitoring as scheduled in the CAP or as directed by the Department and should be reported in routine monitoring reports. The requirements for the reporting of groundwater remediation monitoring are presented in the Monitoring Report format presented in Appendix A, Report 9.

i) <u>Corrective Action Reporting Requirements</u> (See CAP format in Appendix A, Report 7)

The required elements of all corrective action plans and the corrective action termination plan include, but may not be limited to the following items:

 update of site history, source determination, land use, and potential receptor information provided in the CSA Report. (The responsible party must provide a history of the UST systems at the site using the Tables B-1 UST/AST System and Other Release Information and B-2 UST/AST Owner/Operator and Other Responsible Party Information provided in Appendix B. The location and use and all owners and operators of all current and previous UST and AST systems at the site must be provided. The responsible party must describe all sources of release on the site, including UST and non-UST sources of non-petroleum or petroleum contamination.);

- recapitulation and update of assessment information presented in the CSA and pre-CAP Monitoring Reports;
- 3) comparison of soil and groundwater contaminant concentrations and free product thickness to cleanup goals;
- 4) purpose and objective of this specific CAP (e.g., to remove free product, cleanup soil to the soil-to-groundwater MSCCs, and/or remediate groundwater to below 2L standards);
- 5) summary of initial remedial actions taken to date (e.g. excavation at UST closure, free product recovery);
- 6) comprehensive evaluation of remedial options. The responsible party must evaluate excavation plus a minimum of two other viable remedial actions as options for remediating soil; and the responsible party must evaluate a minimum of three viable remedial options (each of which may include one or more technologies or processes, concurrently or sequentially, which may also serve as soil remedial actions) for remediating groundwater at a site, unless fewer viable options can be determined for the site. For example, an evaluation of remedial options for a site with soil and groundwater contamination might compare the following options:
 - (a) excavation of contaminated soil, followed by three years of air sparge to remediate groundwater to 2L standards, (followed by 2 years of monitoring);
 - (b) partial excavation of contaminated soil, followed by five years of SVE/air sparge to remediate soil and groundwater to soil-to-groundwater MSCCs/2L standards (followed by 2 years of monitoring);
 - (c) excavation of contaminated soil, followed by chemical injections to remediate groundwater to 2L standards (followed by 2 years monitoring); or
 - (d) 20 years of monitored natural attenuation of soil and groundwater contamination (For option (d) to be viable, the site must meet the requirements for a .0106(l) CAP).

The scope of each option must include all technologies or processes to be utilized, concurrently or sequentially, to clean up all types of contamination at the site. The evaluation of each option must consider:

- (a) nature of contamination;
- (b) a description of the method or process;
- (c) discussion of feasibility and effectiveness, based on pilot tests or other relevant parameters;
- (d) projected costs; and
- (e) a detailed, well-substantiated schedule for all activities from CAP approval to attainment of cleanup goals.
- 7) description and basis for selection of the remedial option determined to be the most effective and cost efficient mechanism to treat contamination at a site; and
- 8) copies of public notices (Notice is required if CAP proposes remediation by natural attenuation or cleanup of groundwater to alternate standards. Refer to Section 3.9.B for more information.).

Additional requirements specific to alternative CAPS and the CAP termination plan are described in detail in 15A NCAC 2L, Paragraphs .0106(k), (l), and (m). However, a summary of these requirements is presented below.

For all the alternative CAPS and the termination plan, the responsible party must present the technical basis for the request and must demonstrate:

- 1) that the contaminants have not and will not migrate onto adjacent properties (or that alternative water supplies are available or that the owners of the adjacent properties give written consent to the plan);
- that if the groundwater contaminant plumes are expected to intercept surface water, the surface water quality standards in 15A NCAC 2B .0200 and US EPA National Criteria will not be violated; and
- 3) that public notice of the CAP or CAP termination request is provided in accordance with 15A NCAC 2L .0114(b) and (c), as further described in Section 3.9.B.
- For CAPs requested pursuant to Paragraph .0106(k), the responsible party also must demonstrate:
- 1) that all sources of free product and soil contamination have been removed, treated, or controlled;
- 2) that time and direction of contaminant travel can be predicted with reasonable certainty (Directions related to predictive calculations and/or modeling are presented in Section 2.6.A.4.);
- 3) that the groundwater standards in 15A NCAC 2L .0202 will be met at a location no closer than one year's predicted travel time upgradient of an existing or foreseeable receptor or at a physical barrier to groundwater migration (Directions related to predictive calculations and/or modeling are presented in Section 2.6.A.4.);
- 4) that a groundwater monitoring program will be implemented which can monitor further degradation or attenuation to the standards in 15A NCAC 2L .0202; and
- 5) that prior to CAP submittal, a Notice of Contaminated Site (NCS), with land use restrictions approved by the Department, has been filed by each owner of property contaminated by the release in the appropriate county's register of deeds office to indicate that a plan has been approved which does not require active remediation to the standards in 15A NCAC 2L .0202.

In practice, it is very difficult to demonstrate adequately that the groundwater standards will be met at a satisfactory location upgradient of a receptor, as required in item (3), or to obtain the requisite NCS from all property owners, so that a CAP under Paragraph .0106(k) is rarely utilized. However, in the implementation of the remedial technology(ies) selected for an ordinary CAP under .0106(j), the technology(ies) may be temporarily shutdown to evaluate potential for rebound and natural attenuation for extended periods, without having to comply with all of the requirements of a CAP under .0106(k).

For CAPs requested pursuant to Paragraph .0106(1), the responsible party also must demonstrate:

- 1) that all sources of free product and soil contamination have been removed, treated, or controlled;
- 2) that the contamination has the capacity to degrade or attenuate under the site specific conditions;
- that time and direction of contaminant travel can be predicted with reasonable certainty (Directions related to predictive calculations and/or modeling are presented in Section 2.6.A.4.);
- 4) that contaminant migration will not result in any violation of the groundwater quality standards at any existing or foreseeable receptor;

- 5) that a groundwater monitoring plan will be implemented which can (a) monitor degradation and attenuation of contaminants within and downgradient of the plume and (b) detect contaminants prior to their reaching an existing or foreseeable receptor at least one year's predicted travel time upgradient of the receptor (and no greater than the distance the groundwater is predicted to travel in 5 years) (Directions related to predictive calculations and/or modeling are presented in Section 2.6.A.4.); and
- 6) that all necessary access agreements needed to monior groundwater have been or can be obtained.

For CAP termination plans requested pursuant to Paragraph .0106(m), the responsible party must include:

- 1) a discussion of the current CAP;
- 2) an evaluation of alternative technologies which could further reduce contaminant levels;
- 3) effects on groundwater users if the remediation implemented according to the current CAP were to be terminated;
- 4) a satisfactory demonstration that continuation of active remediation would not result in a significant reduction in the contaminant levels (including showing that the asymptotic slope of the curve of decontamination is less than 1:40);
- 5) a monitoring program which is sufficient to track degradation and attenuation of contaminants at a location of at least one year's predicted travel time upgradient of any existing or foreseeable receptor; and
- 6) evidence that prior to termination plan submittal, a Notice of Contaminated Site (NCS), with land use restrictions approved by the Department, has been filed by each owner of property contaminated by the release in the appropriate county's register of deeds office to indicate that a plan has been approved which does not require active remediation to the standards in 15A NCAC 2L .0202.

In practice, it is very difficult to demonstrate that implementation of alternate remedial technologies, evaluated as required in item (2), would not further reduce contaminanant levels or to obtain the requisite NCS from all property owners, so that termination plans under Paragraph .0106(m) are rarely utilized. However, in the implementation of the remedial technology(ies) selected for an ordinary CAP under .0106(j), the technology(ies) may be temporarily shutdown to evaluate potential for rebound and natural attenuation for extended periodswithout having to comply with all of the requirements of a CAP termination plan under .0106(m).

j) Approval and Implementation

A responsible party must receive approval of any CAP prior to implementation of that CAP. Permits and agreements necessary for CAP implementation must be obtained; pilot tests must be performed and evaluated; public notices must be sent and receipt documented; and schedule and cost analysis completed or the CAP will not be approved.

The responsible party must implement the CAP upon approval by the Department in strict accordance with the schedule approved for the selected remedial option.

If results from periodic monitoring of soil and groundwater contamination and remediation system monitoring indicate that a remedial technology implemented in accordance with an approved CAP is not working effectively so that a significant change or major enhancement of or a replacement to this existing remedial technology is required, then a System Enhancement Recommendation Report (format presented in Appendix A, Report 10) or a New Technology Cleanup Plan (format presented in Appendix A, Report 11) should be submitted.

When groundwater quality has been restored to concentration levels that are equal to or less than the standards established by 15A NCAC 2L .0202, the responsible party must submit a report documenting that soil and groundwater are cleaned up and request No Further Action (NFA) as described in Section 3.8, Site Closure.

3.8 Site Closure

Closure of incident sites may be approved by the appropriate regional office when documentation (Follow the **Site Closure Report** format presented in Appendix A, Report 13.) is provided that indicates that no soil and/or groundwater is contaminated in excess of the appropriate cleanup goals.

NOTE: If a DWR permit was issued for the site in relation to the remedial action, the responsible party should request rescission of the permit within thirty days of receiving the No Further Action letter. The responsible party should contact the appropriate section of DWR for rescission of NPDES, Underground Injection Control, and non-discharge permits. DWR contact information is listed at http://portal.ncdenr.org/web/wq.

3.9 Public Notice

3.9.A Public Notice Requirements for Comprehensive Site Assessment Pursuant to 15A NCAC 2L .0106(c)

In accordance with 15A NCAC 2L .0106(c), a responsible party who conducted or controlled a nonpermitted, non-agricultural activity that caused an increase in the concentration of a substance in groundwater in excess of the groundwater quality standards and interim standards must, under 15A NCAC 2L .0114(a), provide a summary of the CSA Report to the local Health Director and the chief administrative officer of the political jurisdiction in which the groundwater contamination occurs. This report must include a map of the contaminant plume with the location of all monitoring wells identified, the frequency of monitoring, a table of the constituents exceeding the groundwater quality standards and interim standards, and any actions taken to mitigate threats to human health. This summary report must be submitted by certified mail to the parties above no later than five working days after submittal of the CSA Report to the Department.

3.9.B Public Notice Requirements for Corrective Action Pursuant to 15A NCAC 2L .0106(k), (l) or (m)

In accordance with 15A NCAC 2L .0114(b) and (c), a responsible party who submits a CAP proposing active remediation combined with natural attenuation or monitoring, or a CAP proposing only natural attenuation or monitoring in accordance with 15A NCAC 2L .0106 (k), (l) or (m), must provide notice. Notice should be given to the local Health Director and the chief administrative officer of the political jurisdiction in which the contaminant plume occurs and all property owners and occupants within or contiguous to the area above the contaminant plume. The notice must describe the nature and purpose of the CAP and the reasons supporting it. The format of the notification letter is provided in Appendix A, Report 17.

Notification must be made by certified mail at the same time the CAP is submitted to the Department. A list of individuals that were notified, along with copies of the notification letters and certified mail receipts (receipts retained by the sender after mailing), must be included with the CAP. Signed return receipts must be submitted to the UST Section, even if they are received at a later date. The signed receipts should be clearly labeled with the site name, incident number, and county. Approval of a CAP will be postponed until thirty (30) days after these materials are received so that the DWM may consider comments submitted by interested persons. A public meeting may be held if there is a significant degree of public interest in the proposed activities. Within 30 days of receipt of CAP approval, the responsible party must notify the parties above of the Department's decision. Re-notification will be required if subsequent CAPs or CAP addendum are submitted that substantially change proposed site actions.

3.10 Notice of Contaminated Site and Land Use Restrictions

North Carolina General Statute (NCGS) 143B-279.9 and 143B-279.10 require a Notice of Contaminated Site (NCS) to be filed with the Register of Deeds in the county where a release from a non-UST petroleum release (or a non-petroleum UST) has occurred when that release is not to be remediated to below "unrestricted use standards", i.e., when the responsible party proposes a **CAP** under 2L.0106(k) or a plan to terminate active remediation under 2L .0106(m) which will not require cleanup to the level of the groundwater quality standards contained in 15A NCAC 2L .0202. A NCS sets out restrictions on the current and future use of real property contaminated by the release in order to protect public health, the environment, or users of the property. Such land-use restrictions may be placed on the properties contaminated by a non-UST petroleum release (or non-petroleum UST release site) if the following conditions are met:

- 1. the owners of properties contaminated by the release agree with the restrictions;
- 2. the Department approves the restrictions;
- 3. the responsible party implements an approved active remediation plan containing a NCS which lists the land-use restrictions and complies with the other requirements of G.S. 143B-279.10.

The NCS is not equivalent to the Notice of Residual Petroleum (NRP) used at low-risk petroleum UST releases sites to facilitate site closure; it cannot be used to facilitate no further action at a non-UST petroleum release (or non-petroleum UST release) site. The use of the NCS is limited specifically to its required function at the corrective action stage.

When a responsible party proposes a **CAP** under 2L .0106(k) or a **CAP** termination plan under 2L .0106(m), neither of which require that active remediation of groundwater continue until the levels of the standards in 15A NCAC 2L .0202 are reached, he/she must include documentation in the report which shows that a NCS has been filed by the owner(s) of contaminated property(ies) in the appropriate county's Register of Deeds office. (Note: Contaminated soil and free product must have been removed or controlled pursuant to NCAC 2L .0106(f) prior to submittal of the **CAP** so that only groundwater contamination is an issue.)

To obtain approval for the **CAP** under 2L .0106(k) or the **CAP** termination plan under 2L .0106 (m), the RP must insure that the following sequence of actions, which requires the voluntary participation of the owner(s) of property(ies) contaminated by the release, is performed prior to the submittal of the k-**CAP** or mplan to the UST Section:

- 1. the responsible party must submit a list of land-use restrictions to the Department for approval and for modification or addition of restrictions, if necessary;
- 2. the responsible party then must request each site owner having soil and/or groundwater contamination on or under their property to:
 - (a) submit a NCS for their property (inclusive of multiple plots or parcels) which lists the approved land-use restrictions (item#1) to the Department for the UST Section regional supervisor to examine for accuracy and completeness and then to sign with notarization;
 - (b) file at the appropriate county's Register of Deeds office; and
 - (c) provide the responsible party with proof of filing (book and page number of the NCS) and a copy of the filed NCS to include in the **CAP**; and
- 3. the responsible party next must incorporate the copy of the filed NCS (with the list of land-use restrictions) in the **CAP** and submit the k-**CAP** (or m-plan) to the Department for review.

If these actions are not performed as described, then the **CAP** under 2L .0106(k) or the termination plan under 2L .0106(m) cannot be approved by the Department, and the responsible party instead will have to prepare and submit a **CAP** under 2L .0106(j) which requires remediation of soil and/or groundwater to unrestricted standards or, if appropriate, a **CAP** under 2L .0106(l), which allows natural attenuation to unrestricted standards.

If the actions are performed satisfactorily and the **CAP** under 2L.0106(k) or **CAP** termination plan under 2L.0106(m) is approved by the Department, then each contaminated property becomes subject to the restrictions in the NCS, and each property owner becomes subject to the following requirements:

- 1. The property owner (or other person responsible for the property) must enforce the approved land-use restrictions.
- 2. When a site subject to land-use restrictions is sold, leased, conveyed, or transferred, the deed must contain in the description section a statement that the site is contaminated and a reference (book and page number) to the recordation of the NCS.

The UST Section's Central Office Corrective Action Branch may be contacted at (919) 707-8171 for specific guidance related to preparing and filing a NCS, land-use restrictions, or deed recordation.

4.0 Sampling and Analysis Guidance for Release Response, Assessment and Corrective Action

This section presents guidance on field screening, sampling, and laboratory analysis for the assessment and corrective action stages. Analysis of soil and groundwater samples collected in order to investigate, assess, and monitor the concentration of contaminants related to the release must be performed using approved analytical methods to provide reliable results. If proper sampling and Quality Assurance/ Quality Control (QA/QC) protocols are not followed, the DWM will not accept the analytical results.

Laboratories used must be NC DWRcertified to run the approved laboratory analytical methods. The NC DWR Laboratory Certification Program maintains a list of certified commercial laboratories. The list includes laboratory contact information and the analytical methods that each laboratory is certified to perform. The list is available from the NC DWR Chemistry Laboratory at 4405 Reedy Creek Road, Raleigh, NC 27607 or by calling (919) 733-3908. The Laboratory Certification Program has a list of laboratory contact information on their web page at http://portal.ncdenr.org/web/wq/lab. Tables 8 and 9 present the collection requirements for the specified analytical methods; however, the selected laboratory should be consulted for their specific requirements prior to sample collection.

Sample collection and analysis are discussed fully in the Guidelines for Sampling.

4.1 Use and Limitations of Field Screening

To establish the extent of contamination, soil and groundwater must be sampled and analyzed. Successful delineation of soil and groundwater contamination usually requires an iterative approach, in which intensive sampling with subsequent qualitative or semi-quantitative analysis using fieldbased technology to locate and identify contamination is followed up by more rigorous quantitative analysis of a smaller set of samples by approved laboratory methods. Acceptable field-analytical methods include visual and olfactory observations and the use of a portable photoionization detector (PID), a flame ionization detector (FID), or an ultraviolet fluorescence (UVF) instrument. When selected and utilized correctly, the field-based screening method should function to minimize the area and quantity of soil subjected to removal or treatment and/or to facilitate optimal placement of groundwater monitoring wells, thus minimizing and improving the quality and cost-effectiveness of assessment actions. Unfortunately, data obtained by most field-screening methods cannot be relied upon to indicate the presence, nature, and extent of contamination due to lack of specificity, accuracy, reproducibility, quality assurance/quality control, etc. For example, the use of a carefully calibrated PID unit for screening is acceptable only for qualitative assessment of soil for fresh gasoline. The use of a carefully calibrated FID unit for screening is acceptable only for qualitative assessment of soil for fresh gasoline or diesel and not for degraded or heavier fuels. The utilization of a semi-quantitative field technology, such as UVF, which allows on-site confirmation of the presence and lateral and vertical extent of soil and groundwater contamination for a wide range of specific petroleum products (i.e., not only gasoline and diesel, but also degraded fuels and waste oil), is preferable.

Field-screening data should be evaluated to determine where a minimal number of final soil or groundwater samples should be collected (or which previously collected, split samples should be selected) for analysis in the laboratory. Final determination of soil and groundwater contamination must be made by the laboratory analytical methods as specified in Tables 3 through 7.

4.2 Sampling and Analysis for Different Phases of Release Response, Assessment and Corrective Action

This section presents the specifications for collection and analysis of samples during assessment and correction action, beginning with an overview of sampling during release response. The quantities, locations, and methods of collection and analysis are specified for sampling during each phase of action.

Tables 3 through 7 present the current approved analytical requirements for all phases of action. All analysis methods used must be acceptable to the US EPA and approved by the UST Section of the DWM of DENR.

The appropriate number and location of samples and the appropriate analytical methods may vary from those specified by this guidance at some sites. At these sites, the licensed geologist or professional engineer should modify sampling or analysis accordingly; however, variations from the strict specifications for sampling and analysis presented in this document must be acceptable to the UST Section. The general directive is to collect the most informative but cost-efficient combination of samples to be analyzed by fieldbased screening methods and by approved analytical laboratory methods so that the number of samples analyzed by the latter is minimized. If the results of previous analyses indicate that an individual constituent is not present at a site, then analysis of that constituent may no longer be required and the scope of the analytical method may be reduced if approved by the appropriate regional office..

4.2.A Review of Initial Response and Abatement Sampling.

More detailed sampling guidance for this initial investigation phase is presented in the *Guidelines for Site Checks, Tank Closure, and Initial Response and Abatement for UST Releases.*

1. 24-Hour Release and UST Leak Reporting Form

This report informs the Department of the discovery of a release. The discovery of a release can involve actual observation of a release or evidence that a release has occurred. Evidence of a release can consist of various signs of soil or groundwater contamination (e.g., staining, odor, product sheen, or sampling results) and is supported by the proximity of the contamination to a UST system or by confirmed compliance failure.

If the responsible party elects to collect and analyze soil and or groundwater samples to confirm contamination at this stage, field-based qualitative or semi-quantitative analytical methods should be used to screen for contamination, but final sampling and analysis to confirm contamination should be conducted using the approved analytical methods for soil samples from preliminary investigations which are listed in Table 3 and/ or the approved analytical methods for groundwater samples which are listed in Table 5. Submittal of this report (by telephone, electronic mail, or other means) is required within 24 hours of discovery of release and must not be delayed in order to include analytical results.

2. 20-Day Report

The function of this report is to indicate the progress of initial response and abatement. This report is required for petroleum and regulated (hazardous substances) UST releases; it is requested for non-petroleum non-regulated UST releases to facilitate direction of the investigation. This report should include any results from initial soil or groundwater sampling and any free product assessment and removal data that are available within 20 days of confirmation of a release. However, submittal of the report is **required** within 20 days of confirmation of release and must not be delayed for sample results.

Approved analytical methods for soil samples from preliminary investigations and over-excavations are listed in Table 3. Approved analytical methods for groundwater samples are listed in Table 5.

3. Initial Abatement Action Report (for petroleum UST releases only)

The function of this report is to present the results of the initial response and abatement actions, including all analytical data produced in the preliminary stages of assessment and following overexcavation of contaminated soil. Approved analytical methods for soil samples from preliminary investigations and over-excavations are listed in Table 3. Approved analytical methods for groundwater samples are listed in Table 5. Submittal of the report is required within 90 days of discovery of release.

For non-regulated non-petroleum UST releases, the equivalent report is the **Initial Site Assessment Report** (See Appendix A of the *Guidelines for Initial Response and Abatement, Assessment, and Corrective Action for Non-UST Releases of Petroleum*). Submittal of this report for non-regulated nonpetroleum UST releases is recommended to facilitate direction of the investigation but not required. Approved analytical methods for soil samples from preliminary investigations and over-excavations are listed in Table 6. Approved analytical methods for groundwater samples are listed in Table 7.

4.2.B Assessment Reporting

1. 45- Day Report (for regulated non-petroleum UST releases only)

The function of this report is to present site assessment and characterization information. This report is required for regulated non-petroleum (hazardous substances) UST releases. Sampling and analysis are site specific for non-petroleum releases so the investigator should contact the incident manager for guidance. Approved analytical methods for soil samples are listed in Table 6. Approved analytical methods for groundwater samples are listed in Table 7. Submittal of this report is required within 45 days of confirmation of release unless the Division has approved an alternate submittal date.

2. Limited Site Assessment (for petroleum UST releases only)

The function of this report is to present the information necessary for the Department to classify the risk level of the release. It presents an assessment of the nature and maximum concentration of the release contaminants in soil and groundwater and provides an evaluation of the risk to potential receptors. Approved analytical methods for soil samples required in the LSA are specified in Table 4. Approved analytical methods for groundwater samples are listed in Table 5. The report should include the results from preceding investigations and from the following samples or measurement:

- a) Groundwater samples collected from each source area monitoring well or if free product is present in the well, the measurement (in feet) of free product;
- **b**) Soil samples collected during construction of the monitoring well installed in the source area of each release at the following locations:
 - 1) immediately below the surface (or the bottom of excavation) in the source area;
 - 2) immediately above the water table;
 - 3) at <u>five</u> feet intervals vertically from immediately below the surface (or the bottom of excavation) until the water table (or bedrock) is encountered, *if the water table is encountered at a depth of less than or equal to 25 feet;* **or**

4.2 Sampling and Analysis for Different Phases of Release Response, Assessment and Corrective Action

at <u>ten</u> foot intervals vertically from immediately below the surface (or the bottom of excavation) until the water table (or bedrock) is encountered, *if the water table is encountered at a depth of greater than 25 feet;*

(The samples should be collected from locations suspected of the highest levels of contamination. **Clean backfill should not be sampled.**)

c) For high-risk, regulated UST sites where any constituent in the sample from the source area monitoring well results well exceeds the 2L standards by a factor of ten, groundwater samples collected from three additional monitoring wells (one well located upgradient and two wells downgradient of the source area). (If no metals are determined in the source area well, metal analyses are not required from the additional monitoring wells.

Submittal of the LSA Report is required within 120 days of the date of the discovery of the release.

3. Comprehensive Site Assessment

The principal function of this report is to delineate soil and groundwater contamination to the applicable standard limits (i.e., to the lower of the soil-to-groundwater or residential MSCCs for soil and to the Title 15A 2L groundwater quality standards for groundwater). In addition, the report should indicate the locations of highest contaminant concentrations in soil and groundwater. Although intensive preliminary delineation of soil contamination should be accomplished using field-based semi-quantitative analytical methods, final delineation of the vertical and horizontal extent of soil contamination should be confirmed for a minimal number of samples by the approved quantitative methods stipulated in Tables 4 or 6 for the comprehensive site assessment. (See Section 4.1.)

Preliminary delineation of groundwater contamination should be accomplished prior to installation of permanent monitoring wells using field-based semi-quantitative analytical methods to achieve the optimal placement and construction of a minimal number of monitoring wells, but final delineation of the vertical and horizontal extent of contamination should be confirmed from the permanent monitoring wells by the approved quantitative methods for groundwater monitoring specified in Tables 5 or 7. (See Section 4.1.)

Additional analytical methods may be required, with the approval of the incident manager, to provide information relevant to natural attenuation or modeling. Submittal of this report is required within 90 days of the date of the notice requesting the CSA.

4. Soil Assessment Report (for low risk petroleum UST releases only)

The function of this report is to delineate soil contamination to the applicable standard limits (to the residential or the industrial/commercial MSCCs). Although initial delineation of soil contamination should be accomplished using screening methods, final delineation of the vertical and horizontal extent of soil contamination should be determined by the methods stipulated in Table 4 for the Soil Assessment Report. Submittal of this report is required within 90 days of the date of the notice requesting the SAR.

4.2.C Remediation Reporting

1. Corrective Action Plan

This plan describes proposed actions to cleanup soil and groundwater contamination caused by a release. The plan must include a sampling and analysis plan to monitor the progress of remedial action or natural attenuation; must provide a detailed schedule for all remedial activities to be performed until site closure requirements are met; and must set performance milestones. Approved analytical methods for
4.2 Sampling and Analysis for Different Phases of Release Response, Assessment and Corrective Action

periodic soil monitoring are specified in Tables 4 or 6. Approved analytical methods for groundwater monitoring are specified in Tables 5 or 7. Submittal of this report is required within 90 days of the date of the notice requesting the CAP.

2. Soil Cleanup Plan (for low risk petroleum UST releases only)

This plan describes proposed actions to cleanup soil contamination caused by a release. The plan must contain a soil sampling and analysis plan to monitor any remedial activity proposed and a detailed schedule for all remedial activities to be performed until site closure requirements are met. Approved analytical methods for soil assessment are specified in Table 4. Submittal of this report is required within 60 days of the date of the notice requesting the SCP.

3. Monitoring Reports

These reports present periodic sampling and analysis results for groundwater and soil (when applicable). Plume migration, corrective action effectiveness, water table changes, contaminant concentration changes are some of the items that should be addressed in Monitoring Reports. For the initial monitoring event, samples should undergo full analyses. For the periodic monitoring which follows, analysis may be limited, with the approval of the Department, to key constituents which are indicative of the progress of remediation and to the risk to human health and the environment. For a final monitoring event, samples again should undergo full analyses (equivalent to a final site closure sample set). Approved analytical methods for periodic soil monitoring are specified in Tables 4 or 6. Approved analytical methods for groundwater monitoring are listed in Tables 5 or 7. Submittal of this report is required by the end of the month following the month of the monitoring event.

4. System Enhancement Recommendation Report

This report, which is used to propose a significant change or major enhancement to an existing remedial technology, must be based on results from periodic monitoring of soil and groundwater contamination and on remediation system monitoring. Approved analytical methods for periodic soil monitoring are specified in Tables 4 or 6. Approved analytical methods for groundwater monitoring are listed in Table 5 or 7. Submittal date of this report is set by the Department.

5. New Technology Cleanup Plan

This plan, which is used to propose replacement of existing remedial technology with a new technology, must be based on results from periodic monitoring of soil and groundwater contamination and on remediation system monitoring. Approved analytical methods for periodic soil monitoring are specified in Tables 4 or 6. Approved analytical methods for groundwater monitoring are listed in Tables 5 or 7. Submittal date of this plan is set by the Department.

4.2.D Site Closure Reporting

All samples for closure confirmation must be analyzed by the approved methods in order to demonstrate that the site is at acceptable risk levels or has been remediated to other appropriate levels.

1. Site Closure Report (for high and intermediate risk petroleum UST releases and non-petroleum UST releases)

4.2 Sampling and Analysis for Different Phases of Release Response, Assessment and Corrective Action

For high and intermediate risk petroleum UST releases, this final report documents that the soil and groundwater have been remediated to applicable soil and groundwater cleanup levels (to the lower of the soil-to-groundwater or residential MSCCs for soil and to the Title 15A 2L groundwater quality standards for groundwater) and requests a No Further Action determination from the Department. Approved analytical methods for final site closure soil sampling are specified in Table 4. Approved analytical methods for groundwater monitoring are listed in Table 5

For non-petroleum UST releases, this report documents that the soil and groundwater have been remediated to applicable soil and groundwater cleanup levels (to the soil-to-groundwater MSCCs for soil and to the Title 15A 2L groundwater quality standards for groundwater) and requests a No Further Action determination from the Department. Approved analytical methods for final site closure soil sampling are specified in Table 6. Approved analytical methods for groundwater monitoring are listed in Table 7.

Submittal date of this report is set by the Department.

2. Soil Cleanup Report with Site Closure Request (for low risk petroleum UST releases only)

This report documents that the soil has been remediated to applicable soil cleanup levels (to the residential or the industrial/commercial MSCCs) and requests a No Further Action determination from the Department. Approved analytical methods for final site closure soil sampling are specified in Table 4. This report must be received by the regional office by 1) the date specified in the SAR schedule or 2) within 60 days of the date of the notice requesting the SCR/SCR.

4.3 Reference for Collection, Transport and Analysis of Samples: "UST Section Guidelines for Sampling"

Soil and groundwater samples required for UST assessment and corrective action must be collected, transported, and analyzed in accordance with the *Guidelines for Sampling*, current version, which is available in electronic format from the UST Section's web page at <u>http://portal.ncdenr.org/web/wm/ust</u>. (See also Tables 1-11.)

5.0 Water Supply Wells

If a release from a UST system has occurred, water supply wells (residential and public water supply wells) should be sampled by the responsible party to ensure that groundwater used for human consumption is not contaminated. Refer to the *Guidelines for Sampling* for sampling and analysis procedures and methods.

The responsible party must not use a water supply well as a substitute for a monitoring well for contaminant plume monitoring.

5.1 Sampling of Water Supply Wells

If a release from a UST system has occurred, the responsible party must first sample the wells which are closest to the source within a 500 foot radius. If the closest wells are impacted by the release, then the next closest wells should be sampled and so forth until contamination is no longer found.

If the sample results indicate the presence of contaminants (at or above the detection limit), the responsible party must immediately send the results to the UST Section regional supervisor, the well owner, and all well users in order to mitigate the hazard of exposure to contaminants. The responsible party should send the results to the water supply well owner and all users even if analysis shows no contamination. The Department will evaluate the health risk of the water supply by comparing the contaminant concentration levels to acceptable concentration levels and will make a recommendation for safe use of the water supply to the water supply well owner and all users.

If analysis of samples indicates contamination, subsequent samples should be collected at the frequency advised by the Department.

5.2 **Provision of Alternate Water**

Alternate water must be provided by the responsible party to the users of water supply wells contaminated by releases of petroleum or non-petroleum (including hazardous substances and waste) UST systems.

Pursuant to 15A NCAC 2L .0106(b), any person conducting or controlling an activity which results in the discharge of a waste or hazardous substance or oil to the groundwaters of the State, or in proximity thereto, shall take immediate action to terminate and control the discharge, mitigate any hazards resulting from exposure to the pollutants, and notify the Department of the discharge. This action includes providing alternate water to households with contaminated water supplies. The responsible party must supply alternate water, if the Department, on evaluation of the health risk of the water supply, determines that water from the well is not safe for specific uses. Depending on the level of contamination present, bottled water, a point-of-entry carbon filtration system, connection to municipal water supplies, or other alternatives may be required. The responsible party should coordinate the provision of alternate water with the appropriate regional office.

If a permanent water supply cannot be provided immediately, a temporary source of alternate water must be supplied.

If the responsible party does not immediately provide alternate water to the well owners, the UST Section must be notified. For petroleum UST releases, the UST Section staff then may initiate the process of supplying alternate water for each affected household. The State must recover costs expended for such activities from the person(s) identified as the responsible party.

6.0 Disposal of Contaminated Soil and Groundwater

6.1 Disposal of Contaminated Soil

Pursuant to 15A NCAC 2T .1502(4), soil is contaminated if analytical results from samples collected during the assessment or from the stockpile show the presence of contaminants at concentrations above the method detection limit (MDL). Once contaminated soil is excavated, it is considered a waste and must be properly disposed of, even if the contaminant concentrations are below applicable 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 Environment and Natural Resources. If the responsible party intends that excavated petroleum contaminated soil is to be treated on site, a soil permit issued by the DWM is required. 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.

6.1.A Temporary Storage or Limited Land Application of Petroleum Contaminated Soil

- 1. Temporary Storage. *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:
 - a) there is a health-based emergency, fire or explosion hazard; or
 - **b**) 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.

2. Limited Land Application. 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 need be issued.

NOTE: Applications for soil permits for petroleum contaminated soil originating from UST releases should be submitted to the UST Section regional office.

6.1.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 the 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.

6.0 Disposal of Contaminated Soil and Groundwater

6.1 Disposal of Contaminated Soil

However, if the drill cuttings/mud has been contaminated by hazardous waste constituents, the DWM, Hazardous Waste Section, tel. (919) 707-8200, must be contacted to determine the regulatory status of the contaminated material.

The flow diagram in Figure 4 presents detailed guidance for the proper disposal of drill cuttings and mud.





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.

³ If 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.

6.2 Disposal of Groundwater

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 NCDENR, 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.

6.2.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 onsite or off-site permit.

The kinds of state permits required for the most commonly used types of groundwater remediation methods are described in Appendix C, Table C-1. In addition, 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, Required Permits.

The disposal by pumping and hauling of condensate and groundwater drawn from the ground by the operation of vapor extraction systems is deemed permitted under 15A NCAC 2T .0203, Disposal of Industrial Wastewater, as discussed in Section 6.2.C.

6.2.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 (but not including dewatering activities) is deemed permitted under 15A NCAC 2T .0113 [Waste Not Discharged to Surface Waters – General Requirements – Permitting by Regulation], in accordance with NC General Statute 143-215.1(b). Thus, no individual or general permit must be issued by NC DENR, 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 5, Disposal of Groundwater, presents detailed guidance for the proper disposal of groundwater from well purging or well construction.

6.2.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 DENR, DWR, for the operation of "pump and haul" disposal systems

6.0 Disposal of Contaminated Soil and Groundwater 6.2 Disposal of Groundwater

for aquifer test water and vapor extraction water, provided that the system does not result in violations of groundwater or surface water standards, that there is no direct discharge to surface waters, that all criteria required for the specific system are met, that the appropriate regional office of the DWR is notified, and that the other criteria of Paragraph .0203 are met. The wastewater must be containerized and transported to a permissible disposal facility.

However, if this wastewater may be contaminated by hazardous waste constituents, the contaminated water should be stored on the site in sealed containers, analyzed to confirm that it is hazardous waste and 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.

6.2.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.



(Exclusive of Aquifer Test Water and Vapor Extraction System Water)



7.0 References

American Public Health Association, American Water Works Association and Water Pollution Control Federation. 1992. *Methods for Determining Organic Compounds in Drinking Water*. Standard Methods for the Examination of Water and Wastewater. U.S. EPA publication number EPA-600/4-79-020 or the most recent edition.

Arizona Department of Health Services. Information Update #52. *EPA 5035 Implementation*. November 1998. Available on the Internet at http://www.hs.state.az.us/lab/license/updates/.

International Air Transport Association. *Dangerous Goods Regulations*. Issued annually. Available on the Internet at http://www.iata.org/cargo/dg/index.htm.

P.K.M. van der Heijde and M.S. Beljin. *SOLUTE*. Distributed by International Ground Water Modeling Center (IGWMC), Colorado School of Mines, Golden, Colorado.

Massachusetts Department of Environmental Protection. *Method for the Determination of Extractable Petroleum Hydrocarbons*. January 1998. Available on the Internet at http://www.state.ma.us/dep/bwsc/vph_eph.htm.

Massachusetts Department of Environmental Protection. *Method for the Determination of Volatile Petroleum Hydrocarbons*. January 1998. Available on the Internet at http://www.state.ma.us/dep/bwsc/vph_eph.htm.

Massachusetts Department of Environmental Protection. *Preservation Techniques for Volatile Organic Compound (VOC) Soil Sample Analyses*. Available on the Internet at http://www.state.ma.us/dep/bwsc/vph_eph.htm.

McAllister, P.M. and C.Y. Chiang. 1994. A practical approach to evaluating natural attenuation of contaminants. Groundwater Monitoring Review. Spring 1994. Pp. 161-173.

NCDENR. 1996. *G3CTM Groundwater Contaminant Transport Model*. North Carolina Department of Environment and Natural Resources, Division of Water Resources, Raleigh, North Carolina. http://www.enr.state.nc.us/files/docs.htm

Newell, C.J., R.K. McLeod, and J.R. Gonzales. 1996. *BIOSCREEN Intrinsic Remediation System Decision Support System, Version 1.2.* Air Force Center for Environmental Excellence, Technology Transfer Division, Brooks Air Force Base, San Antonio, Texas. http://www.epa.gov/ada/csmos/models/bioscrn.html

Wiedemeir, T.H., J.T. Wilson, D.H. Kampbell, R.N. Miller and J.E. Hansen. 1995. *Technical Protocol for Implementing Intrinsic Remediation with Long-Term Monitoring for Natural Attenuation of Fuel Contamination Dissolved in Groundwater*. Air Force Center for Environmental Excellence, Technology Transfer Division, Brooks Air Force Base, San Antonio, Texas. http://www.afcee.brooks.af.mil/products/techtrans/monitorednaturalattenuation/moreinfo.asp

U.S. EPA. *Test Methods for Evaluating Solid Wastes: Physical/Chemical Methods*. U.S. EPA publication number SW-846. Third Edition, June 1997. Available on the Internet at http://www.epa.gov/epaoswer/hazwaste/test/sw846.htm.

U.S. EPA. 1999. *Test Procedures for the Analyses of Pollutants under the Clean Water Act*. Federal Register Vol. 49, No. 209, 40 CFR Part 136, October 26, 1984 or the most recent edition.

U.S. EPA 500 Series - Methods for the Determination of Organic Compounds in Drinking Water, U.S. EPA - 600/4-88/039.

U.S. EPA 600 Series -Federal Register, latest EPA approval edition of 40 CFR Part 136. Copies available from: Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954, telephone (202) 512-1800.

U.S. EPA Office of Solid Waste. Memorandum. *Clarification Regarding Use of SW-846 Methods*. August 1998.

Std. Methods 6000 Series *-Standard Methods for the Examination of Water and Wastewater*, American Public Health Association, American Water Works Association and Water Pollution Control Federation, 18th Edition, 1992 or latest EPA-approved edition.

Yeh, G.T., et al. 1993. *AT123D*, version 1.22. Oak Ridge National Laboratories, Oak Ridge, Tennessee. Distributed by Pennsylvania State University, University Park, Pennsylvania. **NOTE**: *This software is available for sale at various internet sites*.