

Title 10 – DEPARTMENT OF NATURAL RESOURCES
Division 20 – Clean Water Commission
Chapter 10 – Underground Storage Tanks – Technical Regulations

PROPOSED RULE

PURPOSE: This rule presents requirements for conducting site investigations to characterize contamination resulting from releases from petroleum storage tank systems.

10 CSR 20-10.076 Site Characterization and Data Requirements

(1) Remediating parties shall perform site characterization to obtain data and information for a site in order to assess risks posed by the release and chemicals of concern in environmental media and to support corrective action in accordance with this rule. The remediating party shall develop a detailed technical work plan that shall be submitted to and approved by the department prior to initiating site characterization.

(2) Definitions. The following definitions apply to terms used in this rule.

(A) “Soil horizon” means a layer of soil having distinct characteristics and varying from adjacent layers.

(3) To adequately characterize a site to determine risks, the remediating party shall collect relevant data and information for the following categories. This information shall be included in the site characterization report. If any categories of data are not included, the site characterization report shall document the reason(s) for the omission.

(A) Chronology of site events;

(B) Description and magnitude of the spill or release;

(C) General site information and physical setting;

(D) Existing activity and use limitations;

(E) Current and future land use and receptor information;

(F) Analysis of current and reasonably anticipated future groundwater use;

(G) Vadose zone soil characteristics including determination of soil type;

(H) Characteristics of saturated zones;

(I) Surface water body characteristics;

(J) Distribution of chemicals of concern in soil;

(K) As applicable, distribution of chemicals of concern in bedrock;

(L) Distribution of chemicals of concern in groundwater;

(M) Distribution and characteristics of light non-aqueous phase liquid (LNAPL);
and

(N) Information about corrective action measures or risk management activities that have been conducted and are planned.

(4) Additional data and information necessary to develop a corrective action plan, design a remediation system or complete a risk assessment may be required at a site and shall be determined by the department on a site-specific basis.

(5) Chronology of site events. The remediating party shall compile a comprehensive chronology of events regarding the spill or release, spill or release response activities, site investigations, monitoring events, system removal activities, and remediation activities that may have occurred at the site in order to develop a clear understanding of historic site activities influencing site conditions and current and potential future risk. The chronology specifically shall include information regarding the following events as appropriate:

(A) Tank installations, removals, and upgrades;

(B) Amounts of contaminated soil excavated, how the excavated soil was managed, and when the excavations occurred;

(C) Monitoring well drilling, sampling and gauging;

(D) As applicable, the date or dates on which LNAPL was discovered and the location or locations at which it was discovered;

(E) Soil sample collection and analysis, including when and where samples were collected and how and when they were analyzed; and

(F) Interim corrective actions or remedial activities, including purpose, scope, and dates of all such activities.

(6) Nature, magnitude and location of spill or release. The remediating party shall collect as much of the following information as is available for each spill or release that has occurred at the source property:

(A) Based on the chronology, the remediating party shall review the operational history of the source property to determine the location, date, and magnitude of any and all spills or releases that may have occurred at the site.

1. At sites where the date of the spill(s) or release(s) is not known with certainty, the date of each spill or release shall be assumed to have been prior to 1980, unless site information demonstrates otherwise.

2. At sites where the exact location of the spill(s) or release(s) is not known with certainty, the likely location and extent of each spill or release in soil and groundwater shall be determined from soil and groundwater sampling, field screening and visual observations.

(B) The remediating party shall determine or estimate the magnitude of the spill(s) or release(s) based on available information, such as inventory records or other operational information, where possible.

(C) The remediating party shall identify the type or types of petroleum spilled or released at the site where possible.

(7) Chemicals of concern. Soil and groundwater samples from a site shall be analyzed for the chemicals of concern indicated in 10 CSR 20-10.075 Table 1 based on knowledge of

the type or types of petroleum spilled or released at the site. Soil and groundwater samples shall be analyzed for chemicals of concern using analytical methods specified by the department or alternative analytical methods approved by the department.

(A) If the spill or release can be identified as consisting of one or more specific types of petroleum based on spill or release reports, product analysis, or location of impacts, only the chemicals of concern for that type of petroleum need be included in the initial laboratory analysis. If the type of petroleum cannot be conclusively identified based on these methods, chemicals of concern corresponding to all types of petroleum known or suspected to have been stored at the property where the spill or release occurred shall be included in the initial analysis. The chemicals of concern for the site can be identified based on the initial laboratory results and the list of analytes for which samples are analyzed in subsequent sampling rounds may be modified accordingly with approval of the department.

(B) For spills or releases other than gasoline or where the type of petroleum is not known, samples with detectable levels of total petroleum hydrocarbon-diesel range organics or total petroleum hydrocarbon-oil range organics shall also be analyzed for the polycyclic aromatic hydrocarbons listed in 10 CSR 20-10.075 Table 1.

1. Unless otherwise directed by the department, the remediating party shall analyze surface and subsurface soil and groundwater samples for the polycyclic aromatic hydrocarbons other than naphthalene from a minimum of twenty five percent (25%), and not less than two (2), of samples from each media and each soil zone that contain the highest concentrations of total petroleum hydrocarbon-diesel range organics or total petroleum hydrocarbon-oil range organics

(C) Ethanol and methanol. Groundwater samples need only be analyzed for ethanol and methanol when the domestic groundwater use pathway is complete and if there is a reasonable probability that petroleum containing ethanol or methanol was spilled or released. Soil samples need not be analyzed for ethanol and methanol.

(D) If laboratory analytical data from previously collected samples do not include all suspected chemicals of concern at a site, the department may require additional sampling to evaluate the chemicals of concern that were not included.

(8) General site information. The remediating party shall collect and evaluate available information relevant to the site, including location information, ground surface conditions, location(s) of utilities on and adjacent to the site, soil types and geologic setting, regional hydrogeology and aquifer characteristics, surface water characteristics and groundwater use at all properties within the site. The remediating party shall also prepare site maps. This information shall be included in the site characterization report.

(A) Site maps. The remediating party shall prepare a site area map and a detailed site map. The maps shall be made to scale, with a bar scale, and a north arrow.

1. The site area map shall be prepared using United States geological survey seven and one-half (7.5) minute topographic maps as a base. The site location should be centered on the topographic map with the site's location clearly marked. Contour lines and all other features on the topographic map shall be legible upon delivery to the department.

2. The detailed map of the site shall be prepared to legibly depict site features and all boundaries of properties within the site. Multiple maps showing these features may be prepared, as appropriate. The site map shall show the layout of past and current source property features including, but not limited to, underground storage tanks, above ground storage tanks, piping, dispenser islands, sumps, paved and unpaved areas, utilities (above and below ground), canopies, and buildings. At a minimum, the map shall show the locations of the following:

- A. Source property monitoring wells, including those that have been abandoned, lost or destroyed;
- B. Public and private water wells on and near the site;
- C. Above and below ground utilities;
- D. Soil borings;
- E. Any soil vapor extraction wells and other remediation system components and features;
- F. Soil excavation areas; and
- G. The point and area of release.

(B) Ground surface conditions. The remediating party shall evaluate ground surface conditions at the site, including general topography, direction in which the surface is sloping and relevant topographic site features related to surface drainage. The portion of each property within the site that is paved, unpaved, or landscaped shall be determined. The type, extent, and general condition of the pavement shall be described and for unpaved or landscaped areas, the nature and condition of the surface shall be described.

(C) Location of utilities. The remediating party shall identify and locate underground utility lines and conduits on and near the site including, but not limited to, phone lines, water lines, sanitary sewers, storm sewers, and natural gas lines. The remediating party shall prepare a thorough assessment of the potential for preferential flow of LNAPL, impacted groundwater, and vapors through any utility trenches or conduits. If water lines are present, the remediating party shall determine the materials of construction of the main lines and service lines and the joints and gaskets of both.

(D) Regional hydrogeology and aquifer characteristics. The remediating party shall review available information and compile new information to determine regional hydrogeology, soil types and aquifer characteristics. This information shall be used to determine the type and depth of aquifers in the area, whether the aquifers are confined, semi-confined, or unconfined, and obtain general aquifer characteristics, including yield and total dissolved solids.

(E) Surface water and karst features. The remediating party shall identify seeps, springs and other karst features and all surface water bodies within five hundred (500) feet of the outer edge of the area of release, unless a different distance is required by the department based on site conditions. In karst areas, the department may require

that the minimum search area radius be increased. The seeps, springs and other karst features and all surface water bodies identified at a site shall be identified on the site area map and, if appropriate, included on the detailed site map.

1. If a surface water body is identified and investigations determine that it may be or is impacted by contamination arising at the site, the remediating party shall collect information regarding the type, flow rate, flow direction, depth, width, and use of the surface water body.

(F) Groundwater use. The remediating party shall identify any existing wells located on or near the site and determine whether a water well is or was located on the source property in accordance with section (9)(C) of this rule.

1. If an existing or former water well is identified on the source property, well construction details shall be obtained to the extent such are available. At a minimum, the total depth of the well, casing and screen intervals, materials of construction, and past and current use shall be determined.
2. For all wells identified on or near the site, the total depth of each well, casing and screen (if present) intervals, materials of construction, and past and current use shall be determined.
3. If a well is identified on the source property that is not currently used or likely to be used in the future, it shall be abandoned in accordance with department requirements, unless it is to be used as part of site characterization or risk management activities at the site.

(9) Land use and receptors. The remediating party shall conduct a land use and receptor survey covering a radius of five hundred (500) feet from the outer perimeter of the area of release, unless a different distance is required by the department based on site conditions. The results of the land use and receptor survey shall be used to identify current land use, location(s) and type(s) of receptors, routes of exposure, and the presence of any activity and use limitations pertaining to one or more properties within the site.

(A) Current land use. The remediating party shall conduct a visual inspection survey to unambiguously determine current land use of properties within the site. The survey shall clearly identify the use characteristics of each property, such as schools, hospitals, apartments, single-family homes, buildings with basements, day care centers, churches, nursing homes, and types of businesses. The survey shall also identify ecological and sensitive areas such as surface water bodies, parks, recreational areas, wildlife sanctuaries, wetlands, karst features, and agricultural areas.

1. The results of the survey shall be accurately documented on a land use map drawn to scale or approximate scale with a north arrow and the use and boundaries of each parcel shall be identified.

(B) Future land use. The remediating party shall evaluate potential future land use for properties by obtaining such information as is practically available, including local ordinances and restrictions that affect land use or the presence of any other activity and use limitations pertaining to one or more properties.

1. The department will make final decisions with respect to the reasonably anticipated future land use of all properties within a site in accordance with 10 CSR 20-10.075(9)(A). When future land use cannot be reasonably predicted, the department will consider future land use to be residential.

(C) Water well survey. The remediating party shall conduct a water well survey to locate all public water supply wells within an approximately one (1) mile radius of the outside edge of the area of release and all private water wells within an approximately quarter (0.25) mile radius of the outside edge of the area of release, unless a different distance is required by the department based on site conditions. Wells within the area of release shall also be identified. In areas where private wells are likely to be present, the department may require that the remediating party conduct a door-to-door survey of businesses and residences. Wells within the survey boundaries shall be evaluated to determine well characteristics including age, depth to water and total well depth, water use, screen interval, construction, depth of casing, and mode of operation.

(D) Ecological receptors and habitats. The remediating party shall use the screening process in 10 CSR 20-10.075(17) to determine the presence of ecological receptors or habitats that require characterization. If the screening process indicates the presence of one or more ecological receptors or habitats, the remediating party shall consult with the department regarding characterization requirements for the site.

(10) Vadose zone characterization. The remediating party shall characterize soil and other geological media in the vadose zone to determine the thickness of the vadose zone and depth to groundwater, the nature and distribution of soil types and soil horizons, and relevant characteristics of soils and other geological media.

(A) Soil borings and probes shall be advanced to the water table or, if groundwater is not encountered and contamination is not observed, to a depth of not less than twenty (20) feet below ground surface, unless refusal is encountered at a shallower depth.

1. Unless a permanent monitoring well is installed, all boreholes and probes greater than ten (10) feet in depth shall be abandoned in accordance with 10 CSR 23-4.080(6). Boreholes and probes less than 10 feet in depth shall be plugged by returning uncontaminated native material or grout into the hole from which it was removed.

(B) Soil borings and probes shall be continuously sampled and logged in accordance with methods approved by the department.

(C) The depth to groundwater shall be determined from boring logs and water levels in monitoring wells at the site. The vertical range of water table fluctuations shall be determined and available water level data shall be evaluated to determine whether the water level variations are seasonal or represent a consistent upward or downward regional trend.

1. At sites with seasonal water table fluctuations, the average depth to groundwater and the average thickness of the vadose zone will be used as determined by soil chemical of concern distribution data and water level

measurements obtained on at least a quarterly basis over at least one year. Other information may be used to supplement the distribution and measurement data.

2. At sites with a consistent upward or downward water level trend, the most recent data shall be used to estimate the depth to groundwater.

(11) Vadose zone soil type determination. The remediating party shall determine a vadose zone soil type or types for the site that is or are representative of and applicable to the entire horizontal and vertical extent of vadose zone soils at the site for use in the tier one risk assessment. The number and distribution of soil samples used in the determination shall be sufficient to account for soil heterogeneity to ensure that all relevant soil types at a site are accurately identified.

(A) Sampling locations for soil type determination. Soil borings or probes shall be advanced to a depth at least ten (10) feet below the vertical extent of soil contamination or, if groundwater contamination is present, to the top of the saturated zone. Sampling locations may be outside the area of petroleum contamination if the soil types at the sampling locations are representative of the area of contamination. Each boring or probe shall be comprehensively logged at intervals sufficient to identify all soil horizons and a soil sample shall be collected from each horizon identified for identification of soil type. The department may require the advancement of borings or probes into the saturated zone to ensure accurate identification of all soil types at a given site.

(B) The soil type(s) for soil samples collected from the site shall be identified by grain size analysis conducted using methods approved by the department. The results shall be plotted on the United States department of agriculture soil textural classification chart.

(C) The vadose zone soil type(s) shall be determined based on the following groups of United States department of agriculture soil textural classes:

1. Type one. Type one soils consist of sandy soils and include sand, sandy loam and loamy sand.
2. Type two. Type two soils consist of silty soils and include silt, loam, silt loam, silty clay loam, sandy clay loam and clay loam.
3. Type three. Type three soils consist of clayey soils and include clay, silty clay and sandy clay.

(D) At sites where more than one soil type exists in approximately the same amounts, the most conservative of the soil type groups shall be used in the tier one risk assessment. For this purpose, soil type one shall be the most conservative and soil type three shall be the least conservative.

(E) At sites where vadose zone soil cannot be accurately assigned to one or more of the soil type groups, or where the department determines that the vadose zone is comprised of significant volumes of non-soil fill materials (e.g., sand, gravel, rock, concrete, bricks, metal, asphalt, etc.), soil type one shall be used in the tier one risk assessment. However, if the department determines that soil type one is not representative of the vadose zone at the site, the department may direct the

remediating party to evaluate soil properties site-specifically under tier two in accordance with 10 CSR 20-10.077(10) and 10 CSR 20-10.078(3).

(F) Previously characterized sites. For sites where site characterization activities were complete prior to March 1, 2005, the remediating party may determine the vadose zone soil type(s) using existing site characterization data without grain size analyses provided that the existing site characterization data is sufficient to allow the remediating party to accurately determine soil type. The department may determine that the existing site characterization data is not adequate to support the determination and require additional soil type characterization, including the collection of soil samples for grain size analysis.

(G) The remediating party shall submit a report that documents the vadose zone soil type determination for approval by the department. The report may be submitted independently, as an appendix or attachment to the site characterization report, or as an appendix or attachment to the tier one or tier two risk assessment report as appropriate.

(12) Vadose zone soil characteristics. The remediating party may determine site-specific values for soil properties including, but not limited to, dry bulk density, porosity, volumetric water content, and fractional organic carbon content, and use these values in a tier two or tier three risk assessment.

(A) The remediating party shall determine site-specific values for soil properties based on data collected at the site. Samples and data for soil properties shall be obtained using field procedures, sampling protocols and laboratory methods specified by the department or alternative procedures, protocols or methods approved by the department.

(B) The remediating party shall collect samples from the site from sufficient locations and in sufficient number to adequately account for soil heterogeneity and sample locations shall be distributed to account for both vertical and horizontal variations in soil properties.

(C) In the event that site-specific values for the soil properties cannot be determined because of sampling limitations, the remediating party shall use either the default values for the properties established by the department or appropriate literature values that can be justified as representative of site conditions with the approval of the department.

(13) Saturated zone characteristics. As appropriate in consideration of site conditions and spill or release characteristics, the remediating party shall characterize the saturated zone to determine information relevant to transport and fate of chemicals of concern including, but not limited to, hydraulic conductivity, hydraulic gradients, saturated zone soil properties, and the type and rate of biodegradation. The remediating party may quantify these properties and characteristics for use in a tier two or tier three risk assessment. The remediating party shall collect samples from, and conduct testing at, sufficient locations and in sufficient number to adequately account for heterogeneity. Sample and testing locations shall be distributed to account for both vertical and horizontal variations in saturated zone properties and characteristics. Saturated zone

characteristics shall be determined based on field procedures, sampling and testing protocols, and lab methods specified by the department or alternative procedures, protocols, or methods approved by the department. Literature values may be used to quantify saturated zone properties and characteristics with the approval of the department.

(A) Hydraulic conductivity. The remediating party shall estimate hydraulic conductivity based on aquifer tests, grain size distribution or literature values corresponding to the type of soil in the saturated zone. If a literature value is used, the remediating party shall determine an appropriate hydraulic conductivity value or values based on all predominant soil types composing the saturated zone and provide adequate reference and justification for the value or values selected.

(B) Hydraulic gradients. The remediating party shall determine hydraulic gradients based on measured water levels in monitoring wells at the site. A water level contour map shall be prepared based on water level data from monitoring wells screened in the same interval or hydrologic unit. For sites where wells are screened in multiple groundwater zones, a contour map for each zone shall be developed. For sites that have seasonal variation in hydraulic gradients or predominant flow direction, the average hydraulic gradient for each season and each flow direction shall be determined.

(14) Delineation criteria. All chemicals of concern in all environmental media at a site shall be delineated to the default target levels, or other risk-based target levels for residential exposure if approved by the department. If the default target level or other risk-based target level for a chemical of concern is less than the required reporting limit, the detection limit shall be used as the delineation criterion. For laboratory analytical data to be accepted by the department, the laboratory detection limits shall not exceed the required reporting limits for any soil or water samples except in situations where the target levels for all chemicals of concern exceed the required reporting limits, in which cases, detection limits must not exceed the target levels.

(15) Degree and extent of contamination. The remediating party shall collect soil and groundwater data to determine:

(A) Potential exposure pathways to human and ecological receptors under current and reasonably anticipated future conditions;

(B) The extent of impacts above the default target levels or risk-based target levels for the identified exposure pathways; and

(C) Exposure domains for each complete exposure pathway and associated maximum or representative concentrations for chemicals of concern.

(16) Distribution of chemicals of concern in soil. The remediating party shall collect an adequate number of soil samples from surface and subsurface soils, including fill material, to meet the objectives listed in sections (14) and (15) of this rule.

(A) All soil sampling for chemicals of concern shall comply with the following provisions.

1. Soil samples from soil borings or probes shall be collected for field screening at each 2 ft or 5 ft interval, as appropriate.
2. Soil samples for laboratory analysis shall be collected in accordance with methods approved by the department. All soil samples shall be adequately preserved according to the requirements of the laboratory analyses and extracted within the holding times of each particular analytical method.
3. A chain of custody form must be completed for and accompany all samples. A copy of a completed chain of custody must be submitted with all laboratory analytical reports.

A. For samples requiring preservation by refrigeration, the chain of custody form for the samples shall indicate the temperature at which the samples were received by the laboratory. The department may reject data for samples received by the laboratory at temperatures above 6°C (+/- 2°C) or for which the temperature upon receipt at the laboratory is not recorded on the chain of custody

4. Adequate quality assurance and quality control procedures shall be utilized to ensure sample quality and integrity. Quality assurance and quality control samples shall include surrogate and spike recovery and trip blanks. Samples shall not be cross-contaminated by drilling fluid or by the drilling and sampling procedures. All sampling equipment must be decontaminated utilizing United States environmental protection agency and standard industry protocols.

(B) Soil borings or probes shall be located so as to define, and characterize concentrations of chemicals of concern in, the area of release at the site. Each soil boring or probe shall be continuously field screened and advanced until field screening at two consecutive sampling intervals indicates chemicals of concern are at or below background levels.

1. At least one soil boring or probe shall be located at the point of release or, if the point of release cannot be determined, near the center of the release area and at least one soil sample from surface soil shall be collected from the location or locations for laboratory analysis of chemicals of concern unless the release is known to have occurred below a depth of three (3) feet below ground surface. Samples of soil below a depth of three (3) feet shall be collected at the point of release as described at section (16)(C)2, 3, and 4 of this rule.

(C) Soil samples for laboratory analysis shall be collected from each soil boring or probe in the area of release based on the following criteria:

1. One soil sample shall be collected from surface soil if field screening indicates the presence of contamination.
2. At least one soil sample shall be collected for the interval between three (3) feet below ground surface and the water table from the sample interval where field screening indicates the highest level of contamination.
3. One soil sample shall be collected at the interface of the vadose and saturated zones.

4. One soil sample shall be collected below the water table from the interval where field screening indicates the highest level of contamination.

(D) Soil samples for laboratory analysis shall be collected from each soil boring or probe outside the area of release based on the following criteria:

1. At least one soil sample shall be collected for the interval between three (3) feet below ground surface and the water table if field screening indicates the presence of contamination. The soil sample or samples shall be collected from the sample interval or intervals where field screening indicates the highest level or levels of contamination.
2. One soil sample shall be collected at the interface of the vadose and saturated zones.
3. At least one soil sample shall be collected below the water table from the interval where field screening indicates the highest level of contamination.

(E) At least one soil sample shall be collected at the bedrock interface in soil borings or probes where bedrock is encountered before reaching the water table.

(17) Distribution of chemicals of concern in groundwater. The remediating party shall collect an adequate number of groundwater samples to meet the objectives listed in sections (14) and (15) of this rule and (C) of this section. An adequate number of monitoring wells shall be installed at the site to delineate the horizontal and vertical extent of the groundwater solute plume and determine the direction of groundwater flow at the site. The remediating party may use temporary sampling points to screen for groundwater contamination and to assist in determining the optimal location of permanent monitoring wells. Chemicals of concern concentration data from temporary groundwater sampling points shall not be used in the risk assessments described in 10 CSR 20-10.078 except with the permission of the department.

(A) Monitoring wells must be installed in accordance with state rules and the following requirements:

1. Monitoring well placement and design shall consider the concentrations of chemicals of concern in the source area and the occurrence of LNAPL at the site.
2. Monitoring well casing and screen materials shall be properly selected. The top of the screened interval shall be set at no less than two (2) feet, and preferably five (5) feet, above the water table, unless the water table is within three (3) feet of the ground surface. If the water table varies over time by more than two (2) feet, the screened interval shall be set sufficiently above the water table so that it intersects the water table at all times.
3. Monitoring wells shall be properly developed and gauged after installation.
4. A survey shall be conducted to establish monitoring well locations and elevations. Based on the groundwater elevations, groundwater flow direction and gradient shall be determined and plotted on a map of the site.

(B) All groundwater sampling for chemicals of concern shall comply with the following provisions.

1. Monitoring wells shall be purged an adequate number of well volumes prior to collecting a sample. The use of no-purge or low purge sampling techniques requires the prior approval of the department.
2. Groundwater samples for laboratory analysis shall be collected and analyzed in accordance with the methods approved by the department. Samples shall be adequately preserved according to the requirements of the laboratory analyses and extracted within the holding times of each particular analysis. Water samples to be analyzed for the fuel oxygenates listed in 10 CSR 20-10.075 Table 1 shall be preserved with tri-sodium phosphate dodecahydrate unless the analyzing laboratory purges samples at a temperature less than 80 degrees Celsius, in which case the samples may be acid-preserved.
3. A chain of custody form shall be completed for and accompany all samples. A copy of a completed chain of custody shall be submitted with all laboratory analytical reports.

A. For samples requiring preservation by refrigeration, the chain of custody form for the samples shall indicate the temperature at which the samples were received by the laboratory. The department may reject data for samples received by the laboratory at temperatures above 6°C (+/- 2°C) or for which the temperature upon receipt at the laboratory is not recorded on the chain of custody.

4. Adequate quality assurance and quality control procedures shall be utilized to ensure sample quality and integrity. Quality assurance and quality control samples shall include surrogate, spike recovery, field blanks, and trip blanks. All sampling equipment shall be decontaminated using US EPA and industry standard protocols.

(C) Solute plume behavior. The remediating party shall conduct groundwater monitoring on a quarterly basis for a minimum of two years or, with the written approval of the department, for a different period of time and on a basis other than quarterly, and for a period of time sufficient to document that the areal extent of and concentrations for chemicals of concern in the groundwater solute plume are not increasing. The remediating party shall evaluate groundwater monitoring data using appropriate methodologies including, but not limited to, plots and maps of concentration data for chemicals of concern, statistical methods, and mass balance calculations, approved by the department.

(18) Light non-aqueous phase liquid (LNAPL). If LNAPL is encountered in soil or groundwater at a site, the remediating party shall take appropriate actions to mitigate acute risks and hazards in accordance with 10 CSR 20-10.071 and develop a work plan for characterization of the LNAPL. The remediating party shall submit the work plan to the department for approval prior to implementation. The remediating party shall implement the work plan within forty five (45) days of approval by the department.

(A) The work plan for characterization of LNAPL shall be designed to obtain data to determine the following:

1. Delineate the full vertical and horizontal extent of LNAPL and determine whether and to what extent the LNAPL is migrating;
2. The extent to which LNAPL removal is practicable;
3. Identify the most appropriate LNAPL removal method; and
4. The extent to which LNAPL removal is warranted based on the risks the LNAPL poses to human and ecological receptors.

(B) A sufficient number of investigation points including, but not limited to, probes, soil borings, monitoring wells, and soil gas sampling points shall be installed to ensure full characterization of mobile and immobile fractions of the LNAPL and associated dissolved and vapor-phase concentrations of chemicals of concern.

(C) The distribution of the LNAPL shall be determined and layers or seams of relatively high permeability materials that may act as pathways of LNAPL migration identified.

(D) The remediating party shall conduct LNAPL monitoring on a quarterly basis for a minimum of two years, or, with the written approval of the department, for a different period of time and on a basis other than quarterly, and for a period of time sufficient to document that the areal extent of the LNAPL is not increasing. The remediating party shall evaluate LNAPL and groundwater monitoring data using appropriate methodologies including, but not limited to, plots and maps of LNAPL thickness and concentration data for chemicals of concern, approved by the department. LNAPL thickness shall be evaluated in comparison to water level data.

(E) The remediating party may determine LNAPL physical properties and composition using analytical methods approved by the department to allow site-specific determination of effective solubility and vapor pressure for chemicals of concern.

(19) Surface water and sediment sampling. When a discharge of contaminated groundwater to a surface water body is suspected or known at a site, or when chemicals of concern from a spill or release are suspected or known to have otherwise entered into a surface water body, the department may require that water and sediment samples be collected both at, upstream and downstream of each point of discharge or entry. If one or more discrete discharge or entry points cannot be identified, the point of discharge or entry shall be determined based on data pertaining to groundwater flow direction, the cross-sectional area of the groundwater solute plume, and release or spill characteristics and conditions.

(A) The following information shall be collected for any surface water that is or potentially may be affected by the release or by chemicals of concern at the site:

1. Distance to the surface water body. If the body is impacted, the distance is zero; if the body might be impacted, the distance is measured from the leading edge of the groundwater plume or the down gradient edge of the area of release to the water body;

2. Likely location where COCs from the site would discharge into a surface water body;
 3. Flow direction and depth of any groundwater contamination plume(s) in relation to the water body;
 4. Lake or stream classification as found in 10 CSR 20-7.031, Table G and Table H respectively;
 5. Lake or pond acreage or stream 7Q10 flow rate;
 6. Determination of the beneficial uses of the lake or stream as found in 10 CSR 20-7.031, Table G and Table H respectively; and
 7. Water quality criteria based upon the beneficial uses of the lake or stream as found in 10 CSR 20-7.031, Table A. If a water quality criterion for a COC is not available, contact the department project manager.
- (20) Soil gas sampling. Soil gas sampling shall be performed using a methodology established by the department or other appropriate methodology approved by the department.
- (A) The remediating party shall develop a work plan for soil gas sampling. If the work plan is based on a methodology other than that established by the department, the work plan shall be submitted to the department and the work plan shall not be implemented until approved by the department. The work plan shall include either a copy of the other appropriate methodology on which the work plan is based as an attachment or a clear, detailed reference for the other appropriate methodology.
- (B) The department may require that the remediating party conduct soil gas sampling when the department believes an acute risk from vapor-phase chemicals of concern might exist or develop at a site. The department may require such sampling at any time, including prior to the completion of a risk assessment.
- (21) Laboratory analytical data. Laboratory analysis for chemicals of concern shall be performed using analytical methods required by the department, or alternative analytical methods approved by the department if appropriate.
- (A) Required reporting limits. All laboratory analytical data for chemicals of concern shall meet the minimum required reporting limits established by the department for soil and groundwater samples to the extent practicable, unless the applicable target levels for all chemicals of concern exceed the required reporting limits. Laboratories should achieve reporting limits lower than the required reporting limits where practical. Laboratory analytical reports shall include both the reporting limit and method detection limit for the analytes.
1. Where achieving a reporting limit that is equal to or less than an applicable target level is not possible due to practical constraints of the analytical method or particular sample, the laboratory shall strive to achieve the lowest practical reporting limit.
- (B) A copy of a completed chain of custody shall accompany all laboratory analytical reports. The department will not accept laboratory data that is not accompanied by a

corresponding chain of custody. The laboratory must ensure that the portions of the chain of custody form relevant to the laboratory are completed and the temperature at which samples preserved by refrigeration are received at the laboratory must be noted on the chain of custody.

(C) Laboratory analytical data shall be accompanied by quality assurance and quality control sample results. The following shall be considered in laboratory quality assurance and quality control planning and documentation, if applicable:

1. If the published analytical method used specifies quality assurance and quality control requirements within the method, those requirements shall be met and the quality assurance and quality control data reported with the sample results.
2. At a minimum, quality assurance and quality control samples shall consist of the following items, where applicable:
 - A. Method/instrument blank;
 - B. Extraction/digestion blank;
 - C. Laboratory control samples;
 - D. Duplicates;
 - E. Matrix spikes/matrix spike duplicates; and
 - F. Documentation of appropriate instrument performance data such as internal standard and surrogate recovery.

(22) Access to Adjacent and Nearby Property. The remediating party shall make reasonable attempts to extend investigation onto an adjacent or nearby property to meet delineation criteria in all directions and media if concentrations of one or more chemicals of concern in any media exceed or are likely to exceed delineation criteria at or near one or more of the boundaries of the source property, unless the department determines that such access is not required.

(A) If the remediating party is unable to gain access to an adjacent or nearby property from the owner of the property or the owner's authorized representative, the remediating party shall notify the department and comply with the following provisions.

1. The remediating party shall adequately document all unsuccessful attempts to gain access to adjacent and nearby properties in a manner acceptable to the department. The remediating party shall provide the documentation of unsuccessful attempts to gain access to the department and obtain concurrence from the department that the attempts to gain access were legitimate and reasonable and that further attempts by the remediating party need not be made.
2. In accordance with 10 CSR 20-10.080, the remediating party shall provide written notice of the contamination to the owner or the owner's authorized representative of the adjacent or nearby property to which access has been denied and document such notice to the department.
3. The remediating party shall comply with 10 CSR 20-10.079(3)(D).