

Inactive Hazardous Sites Program

Guidelines for Assessment and Cleanup

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Superfund Section
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1.0 General Information

1.1 Statutory Authority and Jurisdiction

The Inactive Hazardous Sites Program was created by the Inactive Hazardous Sites Response Act of 1987 (N.C.G.S. 130A-310 *et. Seq.*). The program addresses releases to the environment of hazardous substances, as defined in CERCLA/SARA. Those parties responsible under law for the contamination must assess and clean up these sites. Except as noted below, the program's jurisdiction is not limited by facility type or operating status.

The program does not address RCRA permitted or interim status facilities, sites where the Environmental Management Commission, the Commissioner of Agriculture, or the Pesticide Board have assumed jurisdiction, or those cases where contamination results from permitted activities or those activities controlled by permitting regulations. Contact the agency with the relevant permitting authority for further guidance in such cases.

N.C.G.S. 130A-310.9 provides site owners, operators, or responsible parties an opportunity to voluntarily clean up inactive hazardous substance or waste disposal sites with the approval of the division. This voluntary cleanup program is administered by the division's Inactive Hazardous Sites Branch (Branch).

The Branch must dedicate its staff resources toward overseeing assessment and remedial actions at the highest risk sites. At sites deemed lower in risk, a party may still proceed with an approved voluntary cleanup by working through the Branch's privatized oversight program known as the Registered Environmental Consultant (REC) Program. In this program, the remediating party hires an REC to both perform and certify a voluntary cleanup in place of state oversight. Remediating parties wishing to receive approval on a voluntary cleanup need to first notify the Branch. The Branch will request that the remediating party complete a *Site Conditions Questionnaire* with the aid of their environmental consultant (available on our website at <http://portal.ncdenr.org/web/wm/sf/ihs/home>.) The questionnaire will be used to determine if the cleanup should be overseen by an REC or state staff. In either case, to participate in the voluntary cleanup program, the remediating party must sign an Administrative Agreement and pay the fee discussed in Section 1.4.

1.2 Purpose and Intended Use of the Guidelines

These guidelines outline the minimum technical and administrative procedures for all site assessments and site cleanups conducted pursuant to the Inactive Hazardous Sites Response Act of 1987 (N.C.G.S. 130A-310 *et. seq.*). They are provided to assist remediating parties in performing successful remedial actions at sites under the regulatory jurisdiction of the Inactive Hazardous Sites Branch. These guidelines should be used by remediating parties at priority action sites when responding to *Remedial Investigation Request Letters*, *Remedial Investigation Orders*, *Remedial Action Request Letters*, *Remedial Action Orders* and *Administrative Agreements* for voluntary remedial actions. Parties conducting actions under the Inactive Hazardous Sites Branch's Registered Environmental Consultant (REC)

Program should instead refer to the most recent edition of the [REC Program Implementation Guidance](#) designed to provide RECs more details in conducting independent remedial actions.

Due to the wide range of conditions encountered at hazardous substance disposal sites, the guidelines cannot address every conceivable situation. At most sites, the consultant will need to prescribe additional sample collection and analyses based on site-specific conditions. The importance of retaining a qualified and experienced environmental consultant cannot be overemphasized.

Note: To receive Inactive Hazardous Sites Branch approval on voluntary site cleanups, contact the Inactive Hazardous Sites Branch staff to initiate an Administrative Agreement with the Division of Waste Management.

Remediating parties that do not wish to perform an approved voluntary cleanup are not prohibited from performing remedial activities independently. When unrestricted use standards are achieved for all contaminated media, remediating parties can submit a no further action review request in accordance with N.C.G.S. 130A-310.7 (c). Independent cleanups are performed entirely at the remediating party's own risk and without Branch oversight.

1.3 Document Submittal and File Access

Work plans and reports should be submitted in *both* paper and electronic format unless otherwise instructed by Branch staff. Specifications for electronic document submittal can be found at: <http://portal.ncdenr.org/web/wm/sf/ihome>. For electronic documents, please make sure the cover letter and the document are contained in one file. If the document is provided in multiple PDFs due to size, the cover letter should be included in the first segment of the report.

All Branch files are stored electronically in an online document management system (CARA) which can be accessed remotely. Instructions for accessing the Superfund Section CARA Portal can be found at the following website: <http://portal.ncdenr.org/web/wm/sf-file-records>.

1.4 Voluntary Remedial Action Fee

N.C.G.S. 130A-310.9(a) requires that in order to participate in the voluntary cleanup program, the remediating party must pay a fee of \$1,000.00. This fee will be used to help defray the costs of monitoring and enforcing the remedial action program. This fee must be paid to the Division of Waste Management before an Administrative Agreement will be executed.

1.5 No Further Action Letters

After satisfactorily completing a voluntary remedial action (with either REC or state oversight), the remediating party will receive a letter indicating that the work required under the Agreement has been completed and the Agreement is terminated. The site will then be assigned "No Further Action" status in the Inactive Hazardous Sites inventory. This change of inventory status does not preclude any future state action if new evidence of contamination is discovered at a later date.

In accordance with N.C.G.S. 130A-310.7(c), any party wishing to receive a written "No Further Action" determination from the Branch must provide the request in writing. The party requesting the review must pay an associated fee to cover review costs. This requirement applies to all voluntary remedial action sites under the Inactive Hazardous Sites program. Additional information can be found at:

<http://portal.ncdenr.org/web/wm/sf/ihome>.

1.6 Staff Contacts

The Branch's State Directed Cleanup Program is divided into regions. A regional map, contact information for all Branch programs and staff can be found at:

<http://portal.ncdenr.org/web/wm/sf/ihome>.

2.0 Remedial Investigation Work Plans

2.1 Introduction

The Remedial Investigation is generally conducted in at least two phases. The purpose of the first phase (Phase I investigation) is to identify all releases of hazardous substances to the environment, characterize the chemical nature of such releases, and collect sufficient sampling data in order to compile a list of contaminants of concern. Subsequent phases of the investigation are used to delineate the lateral and vertical extent of contamination in each area of concern, to concentrations less than or equal to the unrestricted use remediation goals referenced in Section 4.1 of this document or site-specific natural background levels for metals, if less stringent. Separate work plans are necessary for each phase of the investigation.

The field procedures outlined in the Remedial Investigation Work Plans, specifically those relating to sample collection techniques, sample containers, sample preservation, equipment decontamination and field measurement procedures, should comply with the most current version of the U. S. Environmental Protection Agency (USEPA) Region IV Science And Ecosystem Support Division (SESD) *Field Branches Quality System and Technical Procedures*. This information is available from the USEPA Region IV SESD at: <http://www.epa.gov/region4/sesd/fbqstp/>.

Appendix A of this document provides an outline of the minimum sampling and analytical procedures for the remedial investigation.

2.2 Phase I Remedial Investigation: Identification of Contaminants and Areas of Concern

The Phase I Work Plan should contain the information described below and be presented in the order described.

Site Description

1. Site location information including site street address, latitude and longitude, and identification of owners and use of the site and all surrounding property.
2. A summary of all management practices employed at the site for hazardous wastes and any wastes that may have contained hazardous substances, including a list of types and amounts of waste generated, treatment and storage methods, and ultimate disposition of wastes. Also include a description of the facility's past and current RCRA status; the location and condition of any vessels currently or previously used to store any chemical products, hazardous substances or hazardous wastes; and a summary of the nature of all on-site contaminant releases, including one-time disposals or spills.
3. United States Geological Survey topographic maps sufficient to display topography within a one-mile radius of the site.

4. A site map including scale; north arrow; and locations of property boundaries, buildings, structures, all perennial and non-perennial surface water features, drainage ditches, dense vegetation, known and suspected spill or disposal areas, sumps, septic systems, storm water drains and piping, underground utilities, storage vessels, and existing on-site wells;

- 5.a. An evaluation of all properties that make up the site and all adjacent property for the existence of any of the environmentally sensitive areas listed below. Appendix C provides the contact information for the agencies that should be contacted in order to identify these areas. The information received through these contacts should be outlined in this section of the work plan. In most cases, none of these areas will be present. Knowledge of the presence of these sensitive environments is necessary to determine if any special sampling (such as aquatic toxicity testing) is necessary and whether site remediation may do more harm than good (for example, excavation and destruction of a wetland versus leaving in place residual contamination which will not significantly impact the wetland environment).
 - State Parks
 - Areas Important to Maintenance of Unique Natural Communities
 - Sensitive Areas Identified Under the National Estuary Program
 - Designated State Natural Areas
 - State Seashore, Lakeshore and River Recreational Areas
 - Rare Species (state and federal Threatened and Endangered)
 - Sensitive Aquatic Habitat
 - State Wild and Scenic Rivers
 - National Seashore, Lakeshore and River Recreational Areas
 - National Parks or Monuments
 - Federal Designated Scenic or Wild Rivers
 - Designated and Proposed Federal Wilderness and Natural Areas
 - National Preserves and Forests
 - Federal Land designated for the protection of Natural Ecosystems
 - State-Designated Areas for Protection or Maintenance of Aquatic Life
 - State Preserves and Forests
 - Terrestrial Areas Utilized for Breeding by Large or Dense Aggregations of Animals
 - National or State Wildlife Refuges
 - Marine Sanctuaries
 - National and State Historical Sites
 - Areas Identified Under Coastal Protection Legislation
 - Coastal Barriers or Units of a Coastal Barrier Resources System
 - Spawning Areas Critical for the Maintenance of Fish/Shellfish Species within River, Lake or Coastal Tidal Waters

- Migratory Pathways and Feeding Areas Critical for Maintenance of Anadromous Fish Species within River Reaches or Areas in Lakes or Coastal Tidal Waters in which such Fish Spend Extended Periods of Time
 - State Lands Designated for Wildlife or Game Management
 - Wetlands
- 5.b. An evaluation of the site and all adjacent property areas that likely serve as a natural area attractive to terrestrial ecological receptors.
- 5.c. An evaluation of the site for the existence of any areas of stressed vegetation or stressed wildlife.

Site History

6. A chronological listing of all previous owners and each period of ownership since the property was originally developed from pristine land.
7. Operational history with aerial photographs and Sanborne Fire Insurance maps to support land-use history.
8. Site environmental permit history, including all federal, state, and local environmental permits, past and present, issued to the remediating party or within its custody or control. The remediating party shall provide copies of any such permits upon request.
9. A summary of all previous and ongoing environmental investigations and environmental regulatory involvement with the site. Include copies of all associated reports and laboratory data.

Proposed Methods of Investigation

10. Proposed procedures to characterize site geologic and hydrogeologic conditions and to identify and delineate each contamination source as to each affected environmental medium. Include plans for special assessments, such as a geophysical survey.
11. Proposed methods, locations, depths of, and justification for all sample collection points for all media sampled, including monitoring well locations and anticipated screened intervals (should comply with Appendix A).
12. Proposed field and laboratory procedures for quality assurance/quality control (should comply with Appendix A).
13. Proposed analytical parameters and analytical methods for all samples (should comply with Appendix A).

14. A contact name, address and telephone number for the principal consultant and laboratory. Also, qualifications and certifications of all consultants, laboratories and contractors expected to perform work in relation to this work plan. Any laboratory retained must currently be certified to either analyze applicable certifiable parameters under Title 15A of the North Carolina Administrative Code, Subchapter 2H, Section .0800, or be a contract laboratory under the USEPA Contract Laboratory Program.
15. A description of equipment and personnel decontamination procedures.

Schedule

16. A proposed schedule for site activities and reporting.

Other Information

17. Any other information requested by the Branch or considered relevant by the remediating party.

Note: If groundwater contamination is known to be present, an inventory and map of all wells, springs, and surface water intakes used as sources of water (potable water survey) within a one-half mile radius of the center of the site should also be provided in the Phase I Work Plan. If the site is greater than one hundred (100) acres in size, the inventory and map should cover a one-mile radius from the center of each source area. Depending on site conditions (i.e. type and concentrations of contaminants in groundwater) sampling of some or all wells, springs, and surface water intakes identified in the inventory may be appropriate during the Phase I investigation.

Certification

18. A signed and notarized certification by a representative of the remediating party stating, "I certify that, to the best of my knowledge, after thorough investigation, the information contained in or accompanying this certification is true, accurate, and complete."
19. A signed and notarized certification by the consultant responsible for the day to day remedial activities stating, "I certify that, to the best of my knowledge, after thorough investigation, the information contained in or accompanying this certification is true, accurate, and complete."
20. Any work that would constitute the "practice of engineering" as defined by G.S. 89C shall be performed under the responsible charge of, and signed and sealed by, a professional engineer registered in the state of North Carolina. Any work that would constitute the "public practice of geology" as defined by G.S. 89E shall be performed under the responsible charge of, and signed and sealed by, a geologist licensed in the state of North Carolina.

- Note 1:* Documents submitted electronically must also include appropriate signed and notarized certifications within the electronic document.
- Note 2:* Items 4, 6, 7 and 8 above may not be needed for sites where the area of concern is limited to a small area of soil contamination only.
- Note 3:* The remediating party is responsible for developing appropriate health and safety measures that conform to all applicable federal and state regulations. The goal is to ensure that the health and safety of all persons on and off-site will not be adversely affected by any remedial activity.

2.3 Subsequent Remedial Investigation Phases: Delineation of Extent of Contamination

Upon completion of the Phase I remedial investigation, a list of contaminants of concern for the site should be compiled by the remediating party and the Branch.

The remediating party should use the unrestricted use remediation goals referenced in Section 4.1 of this document or site-specific natural background levels for metals, if less stringent, in order to delineate the extent of contamination. The Branch will determine remediation goals for any contaminants not listed in the tables. Delineation of contamination to unrestricted use levels is necessary in order to determine where land use restrictions might be required if they are part of the selected remedy for the site.

The Phase II Remedial Investigation Work Plan (and any necessary subsequent phases) should include the information described in items 10-20 above, presented in that order.

- Note:* Remediating parties will need to assess structural vapor intrusion potential at any site having volatile organic compounds. For additional information, please see the Branch's vapor intrusion guidance located at <http://portal.ncdenr.org/web/wm/sf/ih/ihsguide>.

3.0 Remedial Investigation Reports

A Remedial Investigation Report should be prepared after each phase of the remedial investigation. These reports should be submitted to the Branch pursuant to the terms of the Agreement, the Remedial Investigation Request Letter or the Remedial Investigation Order.

Remedial investigation reports should be organized in sections corresponding to the following. At minimum, they should include the following elements.

Methods of Investigation

1. A narrative description of how the investigation was conducted, including a discussion of any variances from the approved work plan.
2. A description of groundwater monitoring well design and installation procedures, including drilling methods used, completed drilling logs, "as built" drawings of all monitoring wells, well construction techniques and materials, geologic logs, and copies of all well installation permits.
3. A map, drawn to scale that shows all locations where soil, surface water and sediment were sampled. Also, include all monitoring well locations on the map. In all cases show each location's relation to known disposal areas or other sources of contamination. Monitoring wells should be surveyed to a known benchmark. Soil sample locations should be surveyed to a known benchmark, flagged with a secure marker until after the remedial action is completed, or located using GPS coordinates (in decimal degrees to 5 decimal places). A professional land surveyor must conduct all surveying.
4. A description of all laboratory quality control and quality assurance procedures followed during the remedial investigation.
5. A description of procedures used to manage drill cuttings, purge water and decontamination water.

Site Geology and Hydrogeology

6. A summary of site geologic conditions, including a description of soils and vadose zone characteristics.
7. A description of site hydrogeologic conditions (if groundwater assessment is determined to be necessary), that includes current uses of groundwater, notable aquifer characteristics, a water table elevation contour map with groundwater flow patterns depicted, tabulated groundwater elevation data, and a description of procedures for measuring water levels.

Investigation Results

8. Tabulation of analytical results for all sampling (include sampling dates and soil sampling depths) and copies of all laboratory reports (see data reporting procedures shown in Section A.8). A summary of the nature of any TICs eliminated from future analysis and reporting should be provided in the remedial investigation report, including reasons for discounting the constituent.
9. Soil, groundwater, surface water and sediment contaminant delineation maps and cross sections. Include scale and sampling points with contaminant concentrations.
10. A description of procedures and the results of any special assessments, such as geophysical surveys, immunoassay testing (USEPA SW-846 4000 series methods), soil gas surveys, or test pit excavations.

Notes/Photographs

11. Copies of all field logs and notes, and color copies of site photographs.

Other Information

12. If groundwater contamination exists at the site, an inventory and map of all wells, springs, and surface water intakes used as sources of water (potable water survey) within a one-half mile radius of the center of the site must be provided. If the site is greater than one hundred (100) acres in size, the inventory and map should cover a one-mile radius from the center of each source area.

Note: The potable water survey should be updated approximately every three years or more frequently, depending on site-specific conditions, to evaluate whether any threats to potable water sources exist.

13. Any other information requested by the Branch or considered relevant by the remediating party.

Certification

14. A signed and notarized certification by a representative of the remediating party stating, "I certify that, to the best of my knowledge, after thorough investigation, the information contained in or accompanying this certification is true, accurate, and complete."
15. A signed and notarized certification by the consultant responsible for the day to day remedial activities stating, "I certify that, to the best of my knowledge, after thorough investigation, the information contained in or accompanying this certification is true, accurate, and complete."

16. Any work that would constitute the “practice of engineering” as defined by G.S. 89C shall be performed under the responsible charge of, and signed and sealed by, a professional engineer registered in the state of North Carolina. Any work that would constitute the “public practice of geology” as defined by G.S. 89E shall be performed under the responsible charge of, and signed and sealed by, a geologist licensed in the state of North Carolina.

Note: Documents submitted electronically must also include appropriate signed and notarized certifications within the electronic document.

4.0 Remediation Goals

The Branch establishes remediation goals in a manner consistent with the intent of CERCLA/SARA and the National Contingency Plan (NCP), as required by N.C.G.S. 130A-310.3. The remediation goal tables referenced in this section are periodically updated based on new or revised toxicological data. Remediation goals for soil and vapor intrusion screening levels are typically updated twice per year (during the first and third quarters). Therefore, remediating parties and their environmental consultants should periodically check the remediation goal tables for updates to ensure that the most current information is being used.

4.1 Remediation Goals for Unrestricted Land Use

This section describes the procedures used to establish remediation goals for unrestricted land use for each environmental media. Remediation goals for restricted land use are described in Section 4.2.

4.1.1 Remediation goals for soils

The Branch has two soil remediation goals: a “health-based” remediation goal for total concentrations of contaminants (Section 4.1.1.1), and a “protection of groundwater” remediation goal for leachable concentrations of contaminants (Section 4.1.1.2). The remedial action must attain *both* soil remediation goals.

Note: If sensitive environments or other conditions (see Notes at end of this Section) are present at a site, the Branch may require the adjustment of remediation goals and/or adjustment of the proposed remedial alternative. Decisions will be made based on site-specific conditions.

When developing a Remedial Action Plan (RAP) as discussed in Section 5.0, the remediating party shall attempt to design a remedial action alternative that will attain the goals described in Sections 4.1.1.1 and 4.1.1.2. However, the Branch may adjust remediation goals at the time of remedy selection if warranted. If the preferred remedy (selection governed by the feasibility study included in the RAP) cannot achieve the remediation goals provided, the Branch will re-establish levels based on the lowest concentration that can be achieved at the site given that those levels correspond to less than the maximum cumulative excess cancer risk of 1×10^{-4} and a hazard index of 1.

4.1.1.1 *Health-based soil remediation goals for unrestricted land use*

Preliminary health-based remediation goals are shown in the Inactive Hazardous Sites Branch Preliminary Soil Remediation Goals Table (PSRG Table) located at: <http://portal.ncdenr.org/web/wm/sf/ihs/ihsguide>. These remediation goals have been established using current USEPA risk assessment guidance and are based on a lifetime excess cancer risk of 1×10^{-6} (carcinogens) and a hazard quotient of 0.2 (non-carcinogens). The hazard quotient of 0.2 is used to account for multiple (average of five) non-carcinogens in the same critical effect group. These numbers can

be used as final health-based remediation goals. The Branch can adjust these remediation goals at sites with less than five non-carcinogens in the same critical effect group and for the specific set of carcinogens present. Adjustments can also be made for restricted uses as described in Section 4.2. The Branch must be contacted for contaminants not listed in PSRG Table.

Note 1: Some of the remediation goals shown in the PSRG Table may be more stringent than natural background concentrations, anthropogenic background concentrations or practical quantitation limits. Cleanup to below site-specific natural background concentrations (metals only), site-specific anthropogenic background concentrations (PAHs, PCB and/or Dioxins) or practical quantitation limits (using the analytical methods specified in Section A.7.1.2) is not required.

Note 2: If the site is currently or likely to become agricultural (crops, livestock, etc.), remediation goals will also need to be calculated for this scenario due to the concern for possible uptake of contaminants by plants and livestock.

Note 3: At sites with surface water contamination, remediating parties may need to plan the remedial action to address continuing source areas first. For example, surface water contamination may result from continuing releases from soils. In this case, soil must be remediated to levels that will ensure attainment of surface water remediation goals.

Note 4: If soil contamination is causing or will cause a structural vapor intrusion risk, cleanup levels may be adjusted accordingly.

Note 5: In certain situations, health-based soil remediation goals may be attained through averaging contaminant concentrations. See Appendix E for additional information.

4.1.1.2 Protection of groundwater soil remediation goals

Procedure

In addition to meeting health-based remediation goals for unrestricted use, soils must also meet a protection of groundwater soil remediation goal. Soils that leach organic contaminants in excess of the groundwater remediation goals will require further remediation. Soils that leach metals in excess of the groundwater remediation goals (or natural leachable background concentrations, whichever are less stringent) will also require further remediation. The protection of groundwater soil remediation goals must be determined using one of the following methods unless one of the exceptions at the end of this section applies:

(1) Use the Protection of Groundwater values provided on the Inactive Hazardous Sites Branch PSRG Table located at <http://portal.ncdenr.org/web/wm/sf/ih/s/ihsguide>. If a compound is not listed on the PSRG Table, a value can be calculated using the equation at the end of the PSRG Table.

(2) Compare soil contaminant *total* concentrations (in mg/kg) for both metals and organics to ensure that they do not exceed values of twenty times the corresponding groundwater remediation goals (in mg/l). See Section 4.1.2 for groundwater remediation goals.

(3) Determine the site soil's leachability by conducting the Synthetic Precipitation Leaching Procedure (SPLP) or Toxicity Characterization Leaching Procedure (TCLP) on several site soil samples in the area of concern. If contaminant concentrations in the soil leachate exceed the respective groundwater remediation goals, those soils require remediation.

Note: If another laboratory model is used to determine leachability, the remediating party must demonstrate its scientific validity and that its precision and accuracy are commensurate with its stated use .

(4) A protection of groundwater soil remediation goal can be determined using total and SPLP/TCLP sample results from the site. Several soil samples must be collected from various locations within the area of concern representing higher and lower concentrations. Each of the soil samples should be analyzed for 1) the total soil concentrations (in mg/kg) and 2) the leachate concentrations (in ug/L) using the SPLP or TCLP analysis. The data must be plotted against each other to determine the linear correlation. The target protection of groundwater soil cleanup concentration then becomes the value corresponding to a leachate concentration equivalent to the groundwater remediation goal (set out in Section 4.1.2) for that contaminant.

(5) Use site-specific data for porosity, bulk density, and organic carbon content to refine a value in the PSRG Table using the equation at the end of the PSRG Table. Only the parameters noted should be modified and only site-specific data should be used. All calculations and data must be provided.

Exceptions

At sites that meet either of the following two conditions, the protection of groundwater soil remediation goals do not apply. However, the site must still meet the health-based soil remediation goals.

1. Total metals concentrations (not leachable) in soil (mg/kg) do not exceed the natural background concentrations in the site area.
2. If the site will be remediated to unrestricted use health-based soil remediation goals, the remediating party may demonstrate meeting the protection of groundwater soil remediation goals if **either (a) or (b) applies**.
 - (a) The remediating party has determined that all on-site disposal and releases of hazardous substances occurred over 15 years ago *and* groundwater monitoring immediately at the source area(s) demonstrates that the concentrations of the constituents of concern and any daughter products in groundwater are below the groundwater remediation goals (see Section 4.1.2 for groundwater remediation goals);
 - (b) The Branch-approved remedial action plan (RAP) for the site includes active groundwater remediation (including remediation of any non-aqueous phase source material in the saturated zone) which will capture soil contamination such that it will be reduced to meet the protection of groundwater remedial criteria within 5 years of initiation of groundwater remediation and will not cause an increase in groundwater contaminant concentrations during that period. If active groundwater remediation is discontinued, it will be necessary to demonstrate the contaminants will no longer leach from the soil to groundwater by meeting applicable protection of groundwater remediation goals. Note that Monitored Natural Attenuation is *not* considered to be an active groundwater remedy.

4.1.2 Remediation goals for groundwater

For contaminants with 15A NCAC 2L standards, groundwater remediation goals are the permanent and interim groundwater standards established under 15A NCAC 2L unless groundwater is or may be used for potable purposes in any area where the groundwater contaminant plume is currently located or may be located in the future. In those situations, the remediation goal would be the lower of the 15A NCAC 2L standards or federal maximum contaminant level (MCL). For contaminants without 15A NCAC 2L standards, the remediating party should contact the Branch.

Note 1: Remediation below the practical quantitation limits (using the analytical methods specified in Section A.7.1.2) or site specific natural background levels (for metals only) is not required.

Note 2: The permanent and interim groundwater standards are listed in the North Carolina Administrative Code (NCAC) at 15A NCAC 2L .0202 Groundwater Quality Standards. The NCAC can be found at: <http://portal.ncdenr.org/web/wm/sf/ih/sguide>.

4.1.3 Remediation goals for sediments

Remediation goals for sediment must meet all of the following:

1. The health-based soil remediation goals listed in the PSRG Table (*or the upstream “background” concentrations, if lower*);
2. Levels that ensure contaminated sediment will not cause exceedances of the remediation goals for groundwater and surface water; and
3. Levels that ensure the protection of aquatic receptors. Maximum sediment contaminant concentrations will be compared to USEPA Ecological Risk Assessment sediment screening values. The sediment screening values can be found at: <http://www2.epa.gov/risk/region-4-ecological-risk-assessment-supplemental-guidance>.

Note 1: To demonstrate compliance with the Branch’s preliminary sediment remediation goals for the protection of aquatic receptors, the laboratory must achieve sample quantitation limits less than or equal to the sediment screening values. If this is not possible, the laboratory must state in the case narrative that the quantitation limits are the lowest that can be achieved using U.S. EPA-approved methods.

Note 2: If sediment screening values are exceeded, the remediating party must provide the following additional information:

- A topographic map of the affected area with roads, surface water features, etc. clearly identified.
- A map drawn to scale with locations of all sampling points.
- A summary table containing maximum contaminant concentrations, upstream contaminant concentrations, USEPA sediment screening values and sample quantitation limits. All contaminant concentrations that exceed screening values should be clearly identified and highlighted. Also, contaminants that have no screening level should be identified and highlighted.

- A statement that indicates whether the contaminated surface water body is perennial or intermittent.
- A discussion of the potential mobility of contaminated sediment and the potential for contaminants to leach into surface water.
- The names and classifications of all downstream surface water bodies *if* they are potential recipients of contaminated surface water or sediment.
- The identity of adjacent or downstream wetlands that could be affected.
- An estimate of the width and depth of the contaminated surface water body.

Note 3: If contaminated sediments are located in a wetland or other sensitive environment, the Branch will weigh the benefit of active remediation with the need for protecting and preserving sensitive environments and instead using passive remedies or institutional controls. In addition, if remediation of sediment is determined to cause unreasonable harm to a wetland (or other protected environment) alternate goals will be determined by the Branch.

Note 4: At sites with surface water contamination, remediating parties may need to plan the remedial action to address continuing source areas first. For example, surface water contamination may result from continuing releases from sediment. In this case, sediment must be remediated to whatever levels will ensure attainment of the surface water remediation goals.

The Branch will determine final remediation goals based on numbers of carcinogens and non-carcinogens present, ecological risks present, background concentrations, and levels that cause other media to exceed cleanup targets.

4.1.4 Remediation goals for surface water

Preliminary remediation goals for surface water are established by using State or Federal surface water standards for the protection of human health and/or aquatic life. Final remediation goals will be the Division of Water Resources standards with the following exception: if surface water contamination is causing sediments to exceed cleanup criteria, remediation of surface water will be necessary to eliminate this effect.

Note: In any case, cleanup to less than upstream background concentrations is not required.

4.2 Remediation Goals for Restricted Land Use

Soil Only:

Under certain site conditions, it may not be appropriate or feasible to meet the soil or sediment remediation goals described in Sections 4.1.1 and 4.1.3. The remediating party may propose (for Branch review and approval) alternate health-based remediation goals for soil or sediment based on a restricted land-use exposure scenario. In any case, remediation goals for protection of groundwater (Section 4.1.1.2) must be met. For sediment (and sometimes soil), ecological concerns can also alter remediation goals higher or lower. The process and requirements for proposing restricted land use as a remedy are described in detail in Appendix D of this document.

Groundwater (and Other Media):

N.C.G.S. 130A-310.65 - 310.77 allows for alternate health-based remediation goals for groundwater and other media at certain eligible sites. If you feel your site qualifies for risk-based remediation, contact the Branch.

4.3 Structural Vapor Intrusion Potential Evaluation

Structural vapor intrusion potential must be assessed at any site having volatile organic compounds. For additional information, see the Branch's vapor intrusion guidance at: <http://portal.ncdenr.org/web/wm/sf/ihsguide>.

4.4 Additional Provisions

The Branch considers "monitored natural attenuation" to be a potential remedial alternative for attaining the remediation goals. It is *not* a waiver of the remediation goals. If natural attenuation of any contaminated medium is proposed, the remediating party must demonstrate that it is supported by the results of the feasibility study and that it is the preferred remedy.

If a remediating party determines that cleanup to the established final remedial goals is not technically practicable from an engineering perspective, they may submit such a demonstration to the Branch for consideration.

5.0 Remedial Action

5.1 Introduction

Once the Branch has approved the remedial investigation in writing, the remediating party must prepare and submit a Remedial Action Plan (RAP) that includes the minimum information listed below. After the Branch reviews the RAP and any necessary amendments have been made, the RAP will be made available for public comment. At that time, the Branch may request that the remediating party provide additional copies of the RAP for distribution to the local health director, register of deeds office, and the public library closest to the site as part of the public notice.

The Branch will mail notice of the development of the RAP to those parties who have requested such notice (N.C.G.S. 130A-310.9(b)). The RAP will be available for public comment in this manner for 30 days after such mailing. If the division director determines that there is significant public interest in a site, the Branch may hold a public meeting or public hearing. The Branch will evaluate and consider all public comments before approving the RAP. *RAPs should not be implemented until written approval is received from the Branch.*

The Branch will approve or disapprove the RAP within a reasonable period of time of receipt, but in a period not less than 30 days (public comment period).

Any modifications to the approved final RAP (including scheduling) must be submitted in writing to the Branch for approval.

5.2 Remedial Action Plan

The RAP should be organized in sections corresponding to the following. At minimum, it should include the following elements.

5.2.1 Objectives

1. A discussion of the results of the remedial investigation. The discussion should include the media contaminated, contaminants of concern, and the lateral and vertical extent of contamination.
2. A brief statement of objectives for the remedial action.

5.2.2 Evaluation of remedies

1. Technology screening: Identification and listing of potentially applicable technologies. This should also include any ongoing remedial measures.

2. Feasibility Study: An evaluation of applicable remedial alternatives using the following feasibility study criteria:
 - a. Protection of human health and the environment, including the attainment of remediation goals.
 - b. Compliance with applicable federal, state and local regulations.
 - c. Long-term effectiveness and permanence.
 - d. Reduction of toxicity, mobility and volume.
 - e. Short-term effectiveness: effectiveness at minimizing the impact of the site remediation on the environment and the local community.
 - f. Implementability: technical and logistical feasibility, including an estimate of time required for completion.
 - g. Cost.
 - h. Community acceptance.

5.2.3 Proposed remedy

1. A demonstration that the proposed remedy is supported by the results of the feasibility study.
2. A detailed description of the proposed remedy, including (where applicable): process flow diagrams of all major components of the treatment train; conceptual engineering design reports, plans and specifications; and a project schedule.
3. A description of all activities that are necessary to ensure that the proposed method(s) of remedial action is (are) implemented in compliance with applicable laws and regulations, and that the established remediation goals are met. (Review entire section on remediation goals - Section 4 of this guidance) These activities include, but are not limited to, well installation and abandonment, sampling, run-on/run-off control, discharge of treated waste streams, and management of remediation-derived wastes.
3. A summary of health and safety measures that conform to all applicable federal and state regulations to ensure that the health and safety all persons on and off site will not be adversely affected by any remedial activity.
5. The results of any treatability studies and/or additional site characterization needed to support the proposed remedy. Any sampling conducted in this regard must have the same support documentation as that provided for remedial investigation sampling. The applicable reporting requirements listed in Sections 3.0 and A.8 must be identified in the RAP.
6. A description of the criteria for remedial action completion, including procedures for post-remedial and confirmatory sampling.
7. Equipment and personnel decontamination procedures.

5.2.4 Planned progress reporting

The remediating party should specify in the RAP the intended progress reporting. A description of procedures and a schedule for completing construction, operation and maintenance, system monitoring and performance evaluation, and progress reporting should also be provided in the RAP. The progress reports must comply with the terms of the Agreement and the approved RAP.

5.2.5 Certification

5.2.5.1 A signed and notarized certification by a representative of the remediating party stating, “I certify that, to the best of my knowledge, after thorough investigation, the information contained in or accompanying this certification is true, accurate, and complete.”

5.2.5.2 A signed and notarized certification by the consultant responsible for the day to day remedial activities stating, “I certify that, to the best of my knowledge, after thorough investigation, the information contained in or accompanying this certification is true, accurate, and complete.”

5.2.5.3 Any work that would constitute the “practice of engineering” as defined by G.S. 89C shall be performed under the responsible charge of, and signed and sealed by, a professional engineer registered in the state of North Carolina. Any work that would constitute the “public practice of geology” as defined by G.S. 89E shall be performed under the responsible charge of, and signed and sealed by, a geologist licensed in the state of North Carolina.

Note: Documents submitted electronically must also include appropriate signed and notarized certifications within the electronic document.

5.3 Progress Reports

Weekly progress reports should be submitted during remedial actions of less than three months duration. Quarterly progress reports are acceptable for remedial actions of greater than three months duration. The content of weekly and quarterly progress reports will be specified in the approved RAP. In most cases, the following information should be included in progress reports:

1. Operation and maintenance results: summaries of remedial action operating experience and maintenance requirements, and a discussion of major problems encountered.
2. Performance evaluation results: tabulated and graphical presentation of monitoring data, and comparison of remedial action performance to design goals.

3. The results of any ongoing or completed treatability study or pilot test.
4. Copies of waste manifests for any RCRA hazardous wastes shipped off site.
5. For remedial actions lasting longer than 3 months, periodic updates to receptor surveys may be needed (e.g. use of water supply wells, new construction on nearby properties). Progress reports should indicate any observed changes.
6. Copies of any permits needed for remedy implemented.
7. All progress reports must be certified as described in Section 5.2.5.

Note: For remedial actions lasting longer than 3 months, periodic updates to receptor surveys may be requested by the Branch. In addition, changes to surrounding property use may trigger additional requirements.

5.4 Remedial Action Completion Report (Final Progress Report)

Within ninety days of remedial action completion, the remediating party should submit a final report which demonstrates that the remedial action has been completed in accordance with the approved RAP. The final report should include at least the following:

1. The information shown in Section 5.3.
2. A demonstration that the remedy as set out in the RAP has been fully implemented and remediation goals achieved (supported by confirmation sampling data). All confirmation sampling results should include the same support documentation as that provided for remedial investigation sampling. The applicable reporting requirements listed in Section 3.0 and Section A.8 must be identified.
3. A summary of total project costs.
4. Certifications described in Section 5.2.5.

***Note:* To be considered complete, the remedial action must achieve the current remedial goals at the time of remedial action completion.**

Appendix A: Sampling and Analytical Procedures for the Remedial Investigation

A.1 Introduction

This appendix provides general guidance on sampling and analytical procedures. At most sites, the remediating party will need to prescribe additional sampling and analysis based on site-specific conditions.

The remedial investigation should include collection of the minimum number of samples described below, from each area of concern. (Analytical procedures are addressed in Section A.7 of this appendix.) Once the first phase of sampling is completed, the Branch will review the information provided and compile a list of contaminants of concern. The second phase of the remedial investigation should be structured to define the extent of each contaminant in each area of concern for each medium that is contaminated. The extent of contamination must be delineated to the unrestricted use remediation goals referenced in Section 4.1 of this document or site-specific natural background levels for metals, if less stringent.

A.2 Soil Sample Collection

A.2.1 Phase I sampling

The purpose of the Phase I soil investigation is to identify all releases of hazardous substances to site soils, to characterize the chemical nature of such releases, and to collect sufficient sampling data to establish remediation goals.

Known or suspected spills and disposal areas must be investigated using historical research, such as waste management records, employee interviews, vintage maps, and aerial photographs. Samples must be collected from *each* known or suspected area of concern. All areas known, suspected or having a reasonable probability of being contaminated by hazardous substances must be investigated. “Areas known, suspected or having a reasonable probability of being contaminated” includes any media or areas where there is evidence (such as, but not limited to, allegations or indications of spills, visual observations, field instrument readings, laboratory data, and chemical odor) of a release of hazardous substances or of materials that contain or may contain hazardous substances. The necessary sampling strategy depends on whether or not there is visible evidence of contamination.

A.2.1.1 Visible evidence of contamination

At least one grab soil sample should be collected centrally from the most visibly contaminated location and horizon in each area of hazardous substance release or possible release.

A.2.1.2 *No visible evidence of contamination*

A.2.1.2.1 Surface release:

- a. If no visible evidence exists in an area of a suspected *surface release* of contaminants, sampling should be conducted by first establishing a grid with grid line intersections (nodes) spaced no farther than 50 feet apart. Samples collected for all analyses except volatile organics (VOCs) should be collected from at ground surface at each grid node. Samples collected for volatile organic analysis should be collected at a depth of 6 to 12 inches below ground surface. Compositing to reduce the total number of samples for non-VOC analyses may be conducted as follows:

≤ 62,500 square feet: No more than four adjacent grid node (250 ft. x 250 ft.) samples may be composited.

> 62,500 square feet: A greater number of adjacent grid node samples may be composited, but a minimum of five resulting composite samples should be submitted for laboratory analysis.

Samples for VOC analyses should be collected at each node as unmixed grab samples without compositing. If the area exceeds 15,000 square feet, a minimum of five samples should be collected from locations that are evenly distributed across the area of suspected contamination. Field screening methods may be used to select the locations of these unmixed samples. For areas greater than 62,500 square feet, at least five additional samples should be collected by compositing grab samples from at least 25% of the nodes and generally reflect an even distribution across the area. These composited samples will be used for qualitative purposes only.

Note: For extremely large sites (sites several acres in size), contact the Branch to discuss site specific conditions.

- b. In addition to A.2.1.2.1.a., if the actual contaminants released are unknown, mobile contaminants or contaminants that have been detected in groundwater at the site, a soil boring should be advanced to the water table. The boring should be centrally located in the area of concern and adequately sampled at intervals from ground surface to the water table. Examples of sampling intervals include 0 to 6 inches below ground surface, every five feet from 6 inches to the water table, and at the water table. Additional sampling depths should also be chosen based on visual and field-screening evidence. Samples collected for volatile organic analysis should be unmixed grab samples.

A.2.1.2.2 Subsurface release:

- a. The results of the historical research should be used to conduct geophysical surveys and test trenching. Geophysical surveys should be conducted by scanning areas of concern on parallel and perpendicular traverses spaced no further than 30 feet apart. Closer spacing may be necessary when using a metal detector. Grids should be established in all areas that yield anomalous readings during the scanning phase. Grid nodes should be spaced no greater than 10 feet apart. Readings should be recorded at each grid node and mapped. If areas are excluded from the survey due to instrument interference, the remediating party should provide a written justification for exclusion along with a map delineating the features causing the interference with the remedial investigation report.
- b. Once the subsurface disposal area has been identified, it should be sampled in accordance with Sections A.2.1.1, A.2.1.2.1 (b) and A.5.1 (1). If the suspected subsurface disposal area cannot be located using the methods described above, a soil boring should be advanced through the suspected disposal area in accordance with Section A.2.1.2.1 (b).

A.2.2 Subsequent sampling

The purpose of the next phase(s) of soil investigation is to delineate the lateral and vertical extent of contamination in each area of concern to concentrations less than or equal to the unrestricted use (or naturally occurring background levels for metals) and protection of groundwater soil remediation goals. Delineating the extent of soil contamination requires sampling all ditches, culverts or other drainage features that may have received runoff from known-contaminated areas. Field screening methods, such as soil gas testing and immunoassay test kits, may be used to help define the extent of contamination. If these methods are used, soil samples should also be collected at the expected vertical and lateral boundaries of each contaminated area and sent to the laboratory for confirmation.

A.3 Groundwater Sample Collection

A.3.1 Phase I sampling

The purpose of the Phase I groundwater investigation is to identify all releases of hazardous substances to groundwater, to characterize the chemical nature of the contaminant plume(s), and to collect sufficient sampling data to establish remediation goals.

The need for groundwater assessment at a site with known soil contamination will be determined on a case-by-case basis. If the water table is within five feet of the ground surface, the contaminants are known to extend to within a five-foot depth of the water table, or the contaminants are somewhat mobile (such as VOCs and leachable metals) the uppermost groundwater aquifer should be sampled. At least one well should be installed centrally *within each area of release* meeting one or more of the above criteria. Where contaminants are believed to be “floaters” due to density and solubility in water, well screens should be positioned across the water table. Where contaminants are believed to be “sinkers,” the well screen should be positioned just above the bedrock surface. In many cases, insufficient information on the nature of hazardous substance releases at the site will make it necessary to perform the Phase I groundwater field work after the Phase I soil work is completed.

If the remediating party decides not to install a well within an area due to grossly contaminated conditions or concern for rupturing buried vessels, a minimum of three wells must then be installed immediately surrounding the suspect area. Once groundwater flow patterns are clearly defined, a well will be necessary on the hydraulically down-gradient perimeter of the area of concern. A previously installed well may be appropriately located. Depending on the size of the area and nature of the release, additional monitoring wells may be necessary once the source is removed or remediated.

Groundwater elevation data should be collected during each sampling event and at least every six months during the remedial investigation. If subsequent water table elevation data indicate a significant change in the direction of groundwater flow, additional wells will be necessary to adequately evaluate groundwater contamination. Groundwater elevations should be measured from a datum established by a professional land surveyor.

A minimum of one sample must be collected from each monitoring well.

A.3.2 Subsequent sampling

If Phase I sampling indicates hazardous substances are present in groundwater, additional groundwater assessment will be required. The purpose of the next phase(s) of groundwater investigation is to delineate the lateral and vertical extent of all contaminant plumes, on - and off-site. The lateral and vertical extent of the groundwater contaminant plumes must be defined by wells free from hazardous substance concentrations that exceed Branch remediation goals.

Note: Site-specific conditions may necessitate more than two phases to complete the groundwater investigation. Examples include complex hydrogeology, such as fractured bedrock aquifers, and complex contaminant behavior, such as the migration of dense non-aqueous phase liquids.

A.4 Surface Water and Sediment Sample Collection

A.4.1 Phase I sampling

The purpose of the Phase I surface water/sediment investigation is to identify all releases of hazardous substances to surface water or sediments, to characterize the chemical nature of such releases, and to collect sufficient sampling data to establish remediation goals. Surface water assessment will be necessary if there is a potential for contaminants to migrate to surface water via surface runoff or through a discharge of contaminated groundwater to a surface water body. If a surface water assessment is necessary, water and sediment samples should be collected at the probable point of entry. In addition, at least one water and one sediment sample must be collected immediately upstream of the site and one water and one sediment sample collected immediately downstream of the site. These samples need only be analyzed for contaminants previously detected in other media at the site unless a non-permitted direct discharge of a hazardous substance from the site to surface water has occurred. If such a discharge has occurred, samples should be analyzed for the Phase I analyses described in Section A.7.1.

A.4.2 Subsequent sampling

If contamination is detected in any downstream sample, additional surface water/sediment assessment will be needed. The purpose of the next phase(s) of surface water/sediment investigation is to define the downstream extent of contamination to concentrations less than or equal to the remediation goals established by the Branch.

A.5 Other Sample Collection

A.5.1 Phase I sampling

1. If any abandoned or buried vessels containing unknown materials or hazardous substances are discovered, contact the Branch before proceeding with assessment. Depending on the scope, full characterization may be part of the remedy. When investigation does occur the contents should be sampled and analyzed for parameters sufficient to meet disposal or treatment facility requirements. A full scan composite soil sample(s) in the vessel area should be collected as described in Section A.2.1. Soil samples should also be collected at the time of vessel excavation in the immediate vicinity of all joints and junctures of subsurface pipe associated with any underground vessels known or suspected to contain or have contained hazardous substances.
2. Waste materials (e.g. fly ash, sludge, etc.) that are known or suspected to contain hazardous substances that may cause an exposure hazard and contaminate other media should be evaluated using the same procedures as if it were contaminated soil. Laboratory analyses are necessary to determine if the contaminants in the waste materials exceed the Branch's remedial goals. See Section A.2 for additional information

3. Site-specific background soil samples should be collected to establish natural metals concentrations if metals are a contaminant of concern at the site. Samples should be located away from roadways, railways, parking areas and other potential sources of contamination. Because natural metals concentrations are highly variable, the Branch recommends collecting a minimum of five background soil samples. Background soil samples should be collected from depths and soil types that are representative of contaminated soils, but should not be collected from topsoil (0-6 inches). Statistical methods for establishing representative background concentrations may be used. Sample concentrations that are obvious outliers should not be used to establish background concentrations.
4. Background soil samples should also be collected at any site having known or suspected Dioxin, PAH, and/or PCB contamination in order to establish anthropogenic background levels. After any obvious outliers are removed, the upper end of the range of concentrations detected can be used as the anthropogenic level.
5. If groundwater assessment is necessary, background groundwater samples should be collected to established natural background conditions if metals exceed remediation goals for the site. Samples should be collected upgradient of any on-site sources of contamination.
6. If surface water assessment is necessary, background (upstream) surface water and sediment samples should be collected to establish natural or anthropogenic background conditions. Samples should be collected upstream of any on-site sources of contamination. If contamination is found upstream of the site in concentrations greater than the downstream concentrations, downstream delineation may not be necessary.

A.5.2 Subsequent sampling

Areas determined to have hazardous substance contamination resulting from a release from a vessel should be characterized according to Section A.2.2.

Note: Remediating parties will need to assess structural vapor intrusion potential at any site having volatile organic compounds. For additional information, please see the Branch's vapor intrusion guidance located on our website at <http://portal.ncdenr.org/web/wm/sf/ih/s/ihsguide>.

A.6 Standard Field Protocols

1. Unless otherwise noted below, field procedures relating to sample collection techniques, sample containers, sample preservation, equipment decontamination and field measurement procedures, should comply with the most current version of the U. S. Environmental Protection Agency (USEPA) Region IV Science and Ecosystem Support Division (SESD) *Field Branches Quality System and Technical Procedures*. This information is available from the USEPA Region IV SESD at: <http://www.epa.gov/region4/sesd/fbqstp/>.

2. In addition to the standard protocols outlined in the USEPA information referenced above, please observe the following procedures.
- a. Field QC samples: (i.) minimum of one duplicate sample, per medium, per container type, per field day; (ii.) equipment rinsate blanks and trip blanks (VOC analysis) are strongly recommended.

Note: If site conditions, sample frequency or number of samples warrant more limited QA/QC testing, contact the Branch.

- b. Other than composited samples collected under Section A.2.1.2.1.a., all soil, sediment and waste samples for volatiles analysis should be collected directly into sample containers without mixing.
- c. All soil sampling and boring locations should be staked and flagged (or surveyed) until the remedial investigation is complete. Alternatively soil sampling and boring locations can be located using GPS coordinates (in decimal degrees to 5 decimal places).
- d. A professional land surveyor, registered in North Carolina, must survey all monitoring well locations.
- e. Filtration of groundwater samples for metals analysis before acid digestion is not permitted for metals other than hexavalent chromium. If turbidity is a problem, groundwater samples should be collected using a low-flow purging and sampling technique. Additional well development may also be necessary. Rapid analysis of samples is also recommended to reduce contact time with acid preservative.

Note: Samples collected for hexavalent chromium analyses must be field filtered within fifteen minutes of collection into a sample container using the preservation procedures in the USEPA Region IV modification to Method 218.6.

- f. For surface waters that are very shallow (less than six inches deep) or turbulent, highly turbid samples may be collected in a separate collection container and then decanted into the sample container. Samples for organic analysis must be decanted into the sample container immediately. Samples for metals analysis may be allowed to settle for a few minutes prior to decanting. All collection containers must be made of the same materials as the sample container. They must be pre-cleaned and handled in the same manner.

- g. Investigation derived waste or IDW (may include drill cuttings and muds, sampling materials, purge water, soil and residuals from testing) generated as part of assessment activities may be discharged or stored in the area of contamination and are not subject to RCRA permitting as long as the material: (1) stays on site and remains in the contaminated area, (2) is secured, (3) does not increase the spread of contamination or concentrations in a particular medium, (4) does not cause mobilization of contaminants, and (5) does not introduce contamination to uncontaminated soil (causing an increase in contaminant concentrations). In residential and public use areas, IDW will require off-property management unless it meets unrestricted use levels and disposal permission has been granted by the property owner. IDW cannot be transferred and discharged to another area of concern.

A.7 Sample Analyses

The remediating party must provide the laboratory with copies of Sections A.7 and A.8 of this Guidance document to ensure that appropriate analyte lists are used in the analysis of samples.

A.7.1 Phase I analyses

A.7.1.1 Analytical parameters

In most cases the parameters listed below must be included in the first phases of testing each contaminated medium. Typically, the contaminants for an area of concern at an inactive hazardous site are not clearly understood or are unknown due to the uncertainty of past practices at the site (e.g. poor recordkeeping of disposal practices, uncertainty of the business practices of a previous property owner or operator, etc.). If the remediating party believes some of the analyses listed below should be excluded, the remediating party should contact the Branch to discuss the site specific conditions before excluding analyses.

Each Phase I sample should be analyzed for:

1. Hazardous substance list metals (totals analysis) including antimony, arsenic, beryllium, cadmium, chromium, copper, lead, manganese, mercury, nickel, selenium, silver, thallium and zinc. Hexavalent chromium testing is only needed if: total non-speciated chromium concentrations (by totals analysis) in the Phase I samples exceed 2 times the site-specific natural background concentrations and the hexavalent chromium soil remedial goal and chromium is a known or suspected contaminant the site.

2. All of the volatile and semi-volatile compounds listed on the most current USEPA Contract Laboratory Program (CLP) Target Compound List using analytical methods specified in Section A.7.1.2 with a library search (using the National Institute of Standards and Technology mass spectral library) to produce a list of tentatively identified compounds (TICs). The library search should identify TICs for the largest 10 peaks in each analytical fraction that have reasonable agreement with reference spectra (i.e., relative intensities of major ions agree within $\pm 20\%$). The list of identified TICs should not include laboratory control sample compounds, surrogates, matrix spike compounds, internal standards, system monitoring compounds or target compounds. Any TICs that have reasonable agreement with reference spectra, and are detected in more than one sample in an area of concern should be included in all subsequent analytical work unless the compound is a laboratory contaminant, naturally occurring, or otherwise a non-toxic anthropogenic source constituent. If only one sample is collected from an area of concern, include the library search of TICs in subsequent analyses. Check with the laboratory on possible procedures to quantify the TICs so that cleanup levels can be determined. A summary of the nature of any TICs eliminated from future analysis and reporting should be provided in the remedial investigation report, including reasons for discounting the constituent.
3. Pesticides, PCBs, dioxins, cyanide, formaldehyde, nitrates, nitrites, ammonia, phosphorus, and any other CERCLA hazardous substances or pollutants not mentioned here, if the remediating party suspects they were discharged or used at the site based on its chemical usage history .
 - a. If cyanide is a known or suspected contaminant of concern, Phase I soil samples should initially be analyzed for *Total Cyanide*. The remedial goal in the PSRG table for *Total Cyanide* is based on the most toxic of a number of cyanide compounds, so if the analytical results are less than the *Total Cyanide* PSRG, then no further analyses for cyanide in soil are warranted. If the *Total Cyanide* PSRG is exceeded, then a Phase II soil sample can be collected for both *Total Cyanide* and *Free Cyanide* analyses to see if a higher remedial goal can be used. If the *Free Cyanide* concentration is less than the *Total Cyanide* PSRG, subtract the *Free Cyanide* sample concentration from the *Total Cyanide* sample concentration and compare that result to the *Total Cyanide (With No Free Cyanide Present)* PSRG.

Groundwater samples should be analyzed for *Total Cyanide* and the results compared to the 15A NCAC 2L standard. Note, the 15A NCAC 2L standard is based on the toxicity for *Free Cyanide*; no 15A NCAC 2L standard exists for other cyanide species and the 2L Standard would otherwise become the practical quantitation limit (PQL). .

- b. If PCBs are a known or suspected contaminant of concern in soils, Phase I soil samples should be analyzed using congener specific analysis and the results compared to applicable remedial goals. If concentrations detected are less than soil remedial goals, no additional PCB sampling is required. If concentrations exceed applicable remedial goals, delineation can be performed using immunoassay test kits. In areas where PCBs are detected, soil samples should also be collected and analyzed for volatile organic compounds as indicated in Section 2, above. Confirmation samples must be analyzed using congener specific analyses. Arochlor analyses should not be performed for delineation purposes.

Groundwater samples should be analyzed for *Total* PCBs and the results compared to the 15A NCAC 2L standard.

Note: At sites having large areas of PCB contamination, alternate analytical methods may be appropriate. Please contact the Branch for additional information.

4. If coal ash is known or suspected to have been disposed or buried at the site, please contact the Branch for additional information on soil and groundwater analytical parameters.

A.7.1.2 Analytical methods

The analytical methods used to test for the parameters discussed in A.7.1 should be the *most recent* versions of the analytical methods tabulated below. For SW-846 Methods, the latest edition of SW-846, including any subsequent updates which have been incorporated into the edition, must be used. Sampling must be planned so that required holding times for analytical methods are met.

Soil and Sediment Samples

Volatile Organic Compounds ¹	SW-846 Method 8260
1,4-Dioxane ²	SW-846 Method 8260 SIM
Semi-volatile Organic Compounds ¹	SW-846 Method 8270
Metals ³ (excluding hexavalent chromium), Pesticides, PCB congeners, Dioxins, Cyanide, Formaldehyde and any other analytes not covered by above methods	USEPA method or method published in <i>Standard Methods for the Examination of Water and Wastewater</i> having the lowest detection limits or having detection limits below unrestricted use remedial goals. For PCB congeners use USEPA Method 1668.
Hexavalent chromium (if total chromium exceeds 2 times the site-specific natural background concentrations and the remedial goal for hexavalent chromium and chromium is a known or suspected contaminant at the site)	SW-846 Method 3060A ⁴ alkaline digestion coupled with a USEPA method or method published in <i>Standard Methods for the Examination of Water and Wastewater</i> having the lowest detection limits or having detection limits below unrestricted use remedial goals.

Water Samples (including groundwater, surface water and TCLP/SPLP leachate)

Volatile Organic Compounds ¹	SW 846 Method 8260
1,4-Dioxane ²	SW 846 Method 8260 SIM
Semi-volatile Organic Compounds ¹	SW-846 Method 8270
Metals ^{3, 5} (excluding hexavalent chromium), Pesticides, PCBs, Dioxins, Cyanide, Formaldehyde and any other analytes not covered by above methods	USEPA method or method published in <i>Standard Methods for the Examination of Water and Wastewater</i> having the lowest detection limits or having detection limits below the 15A NCAC 2L standards
Hexavalent chromium (if total chromium exceeds 2 times the site specific natural background concentrations and the applicable remedial goal for hexavalent chromium and chromium is a known or suspected contaminant at the site) ^{6, 7}	USEPA Method 218.7 or Method 218.6 as modified by USEPA Region IV.

- 1 *Analyses must include a library search as described in Section A.7.1.1.*
- 2 *1, 4-dioxane must be analyzed for if chlorinated solvents are present or if it is a suspected contaminant of concern.*
- 3 *SW-846 Method 6010 does not have detection limits below the unrestricted use standards/15A NCAC 2L standards for all of the hazardous substance list metals. Therefore it should not be used when conducting first phase metals scans.*
- 4 *SW-846 Method 3060A extraction for soil and sediment samples allows for a 30-day holding time prior to extraction.*
- 5 *Rapid analyses of samples is recommended to lessen the contact time with the acid preservative. Filtration of groundwater and surface water samples before digestion is not permitted. Highly turbid water samples for metals analysis should be collected in accordance with Appendix A, Section A.6 (2)(e) and (f).*
- 6 *Samples collected for hexavalent chromium analyses must be field filtered within 15 minutes of collection. Each sample must be collected in a separate pre-preserved container from those for other metals analyses. See USEPA Region IV modified Method 218.6 for specific details.*

7. *Method 218.7 or Method 218.6 as modified by USEPA Region IV should be used. Method 218.7 requires low turbidity and allows for a 14-day holding time. USEPA Region IV has developed a modification to Method 218.6 that allows for a 28-day holding time. Bottles must be pre-preserved as specified in the modification to the Method. Laboratories should contact the USEPA in Region IV for the methodology. Otherwise, any USEPA Method or Standard Method may be used. However, other methods have a 24-hour holding time. Selection of methods and pre-preservation of bottles should be discussed with the laboratory prior to sample collection.*

A.7.2 Subsequent analyses

A.7.2.1 Analytical parameters

After the first phase of sampling is conducted as specified in Section A.2 through A.5 above, any samples subsequently collected need only be analyzed for the following compounds.

1. TICs that meet the criteria in Section A.7.1.1 (2) that are also CERCLA hazardous substances must be quantified in subsequent phase analyses using a USEPA Method or method published in *Standard Methods for the Examination of Water and Wastewater* (latest edition) having the lowest method detection limit or one that achieves the 15A NCAC 2L standards for water samples and Branch unrestricted use remediation goals for soil.
2. All CERCLA hazardous substances present detected (including those with qualified estimated concentrations), unless the contaminant concentration is proven through sampling to be the result of a naturally-occurring condition, or the contaminant is a common laboratory contaminant detected in concentrations below that detected in the method blank. If a compound that is not a common laboratory contaminant is detected in both the blank and a sample, another phase of sampling is necessary to demonstrate the absence or presence of the contaminant.
3. Potential degradation compounds (which are also CERCLA hazardous substances) of those CERCLA hazardous substances detected at the site.
4. If total chromium concentrations in the Phase I soil samples exceed 2 times the site- specific natural background concentrations and the hexavalent chromium soil remedial goals standard and chromium is a known or suspected contaminant of concern at the site, hexavalent chromium analyses are required.
5. If laboratory sample dilutions were performed on Phase I samples, subsequent phase samples must be analyzed for the entire analytical fraction previously diluted in addition to the above items. Sample dilutions raise analytical detection limits and can mask the presence of other constituents at lower concentrations.

A.7.2.2 Analytical methods

1. Subsequent phase samples should be analyzed using the methods specified above for Phase I samples. Other USEPA-approved Methods or methods published in *Standard Methods for the Examination of Water and Wastewater* (latest edition) may be substituted, if the substitute methods achieve equal or lower method detection limits or if they achieve the 15 A NCAC 2L standards for water samples and the unrestricted use remediation goals for soils.

A.8 Data Reporting

Laboratory reports submitted with remedial investigation reports must include the items listed below. Full CLP documentation packages are not required.

1. The laboratory report must state that the laboratory is either certified for applicable parameters under 15A NCAC Subchapter 2H .0800 and provide its certification number, or that it is a contract laboratory under the USEPA's Contract Laboratory Program.
2. A signed statement from the laboratory that the samples were received in good condition, at the required temperature and that analysis of the samples complied with all procedures outlined in the analytical method used, unless otherwise specified. Any deviation from the methods, additional sample preparation, sample dilution and unrectified analytical problems, must be justified in a narrative with the laboratory report.
3. Laboratory sheets for all analytical results, including sample identification, sampling dates, date samples were received by laboratory, extraction dates, analysis dates, analytical methods used, dilution factors and sample quantitation limits.

Note: The laboratory must provide a written explanation for any sample having sample quantitation limits that exceed 10 times the USEPA method detection limits.

4. Laboratory sheets for all laboratory quality control samples, including results for bias and precision and control limits used. The following minimum laboratory quality control sample reporting information must be provided: (a) at least one matrix spike and one matrix spike duplicate per sample delivery group or 14-day period, whichever is more frequent (control limits must be specified); (b) at least one method blank per sample delivery group or 12-hour period, whichever is less; and (c) system monitoring compounds, surrogate recovery required by the method and laboratory control sample analysis (acceptance criteria must be specified). All samples that exceed control limits/acceptance criteria must be flagged in the laboratory report.
5. The results of any library searches performed for “tentatively identified compounds.” See Section A.7.1.1 (2).
6. Data quality should be reviewed and validated by both the remediating party and the laboratory. Any quality control concerns, data qualifiers or flags should be evaluated and discussed in the associated report.

7. All constituents detected must be reported even if they were not definitively quantified. All estimated concentrations with data qualifiers must be reported.
8. Completed chain-of-custody with associated air bill (if applicable) attached.
9. The laboratory report should include the names of the individuals performing each analysis, the quality assurance officer reviewing the data and the laboratory manager.

Appendix B: Procedures for Confirmation Sampling and Analysis

B.1 Introduction

This appendix provides general guidance on “post-remediation” sampling and analyses needed to demonstrate compliance with Branch remediation goals. At most sites, the remediating party will need to prescribe additional sampling and analysis based on site-specific conditions.

B.2 Soil Sampling

B.2.1 Post in-situ remediation

For in-situ soil remedies, a confirmation sampling plan should be designed to verify that the entire soil column has been remediated to below Branch remediation goals. To demonstrate that remedial goals have been attained, the remediating party should design a three-dimensional sampling grid that meets the four requirements below.

1. Design a surface sampling grid over the area(s) of concern. Grid nodes should be no more than 50 feet apart.
2. At each grid node, specify “candidate” sampling locations at the surface, at 0 - 6 inches below ground surface, and at 5-foot intervals (or less) down to the vertical limit of contamination. The result is a three-dimensional grid of "candidate" sampling locations that encompasses the area of concern.
3. Select at least two candidate locations at each grid node for sample collection, using a combination of random and biased selection. Biased samples should be collected from known “hot spots” and from soil zones that are known to be resistant to in-situ methods (e.g., clay lenses).
4. Same-depth samples from up to four adjacent grid nodes may be composited. Samples at different depths may not be composited. For samples submitted for volatiles analysis, at least five samples or 25% of the node samples, whichever is greater, need to be unmixed grab samples. Field screening methods may be used to select these unmixed samples, or the unmixed samples should be collected from locations that are evenly distributed across the area of suspected contamination. The remaining samples should be collected as either unmixed grab samples or composited samples. Composited samples will be used for qualitative data only. For very large areas (multiple acres), the remediating party may propose an alternate approach.

B.2.2 Post ex-situ remediation

B.2.2.1 Post-excavation sampling

Post-excavation sampling plans need to be designed to verify that all soils/wastes above Branch remediation goals have been removed. Excavations should be sampled using the four requirements below.

1. Design a sampling grid over the base and sidewalls of the excavation. Grid nodes should be no more than 50 feet apart. At each grid node, collect a sample from 0-3 inches into the base or sidewall.
2. For very small excavations, collect at least one composite sample from the base and one composite sample from each sidewall. Composite samples should consist of at least four aliquots each.
3. Biased samples should also be collected from areas of residual contamination, based on visible or field-screening evidence.
4. For excavations <62,500 square feet (surface area), samples from up to four adjacent grid nodes may be composited. For excavations > 62,500 square feet (surface area), a greater number of grid nodes may be composited, but a minimum of five resulting composite samples should be submitted for laboratory analysis. For all excavations, samples from different sidewalls may not be composited. For samples submitted for volatiles analysis, at least five samples or 25% of the node samples, whichever is greater, should be unmixed grab samples. Field screening methods may be used to select these unmixed samples, or the unmixed samples should be collected from locations that are evenly distributed across the area of suspected contamination. The remaining samples should be collected as either unmixed grab samples or composited samples. Composited samples will be used for qualitative data only. For very large areas (multiple acres), the remediating party may propose an alternate approach.

B.2.2.2 Treated soil stockpiles

Treated soils/wastes must meet Branch remediation goals before they can be replaced on site. Treated soil stockpiles should be sampled using the following four procedures.

1. Stockpiles should be divided into equal segments of approximately 100 cubic yards each.
2. Within each segment, use either random or biased selection to locate at least three hand-auger borings. Samples should be collected from two depths within each boring (minimum six samples per segment).

3. Use visible or field-screening evidence to collect additional biased samples from areas of residual contamination.
4. Samples may be composited only within each segment. For samples submitted for volatiles analysis, at least 25% should be collected as unmixed grab samples.

B.3 Groundwater Sampling

Groundwater confirmation sampling must demonstrate that site groundwater has been remediated to below Branch remediation goals. Demonstrate this using the following procedures.

B.3.1 Active groundwater remediation

1. Groundwater remediation systems may be shut down when two consecutive semi-annual (twice a year) sampling events demonstrate that *all* monitoring wells (on-property and off-property) are free of contamination above Branch remediation goals. To account for the effects of seasonal fluctuations in the water table, semi-annual sampling events should be conducted in winter and summer.
2. Following system shutdown, data from two additional sampling events (spaced at least 3 months apart) should demonstrate that *all* monitoring wells are free of contamination above Branch remediation goals and contaminant concentrations are not increasing.

Note: For remedial alternatives using injection, the first confirmation sampling event must occur after reagent is spent.

B.3.2 Passive groundwater remediation

1. For sites using passive groundwater remedial alternatives (e.g. monitored natural attenuation, phytoremediation, etc.), data from four consecutive sampling events (spaced at least three months apart) should demonstrate that *all* monitoring wells are free of contaminant concentrations above Branch remediation goals and contaminant concentrations are not increasing.

B.4 Surface Water/Sediment Sampling

Confirmation sampling must demonstrate that site surface water and sediment have been remediated to concentrations below Branch remediation goals. Four consecutive quarterly sampling events should demonstrate that concentrations in downstream samples are less than or equal to concentrations in upstream samples or to Branch remediation goals.

B.5 Confirmation Sample Analyses

Confirmation sampling should demonstrate that all contaminants identified during the remedial investigation meet applicable remedial goals.

All confirmation samples should be analyzed for all contaminants identified during the remedial investigation. Confirmation samples need to be analyzed using USEPA methods with detection limits less than or equal to Branch remediation goals, or *Standard Methods for the Examination of Water and Wastewater* (latest edition), or lowest available detection limits for each contaminant of concern.

Appendix C: Sensitive Environment Contacts

CONTACT	NAME & CONTACT INFORMATION	SENSITIVE ENVIRONMENT
<p>NC Division of Conservation, Planning, and Community Affairs – Natural Heritage Program</p>	<p>Visit the Natural Heritage Program’s data services website (http://portal.ncdenr.org/web/nhp/data-services). Use the NHP Map Viewer to search for records within 2 miles of your project area or the database search tool for record summaries by county and USGS 7.5-minute topo map. You can also download GIS shapefiles of our data; see the “GIS Download” page for details.</p> <p>Email inquiries to: natural.heritage@ncdenr.gov</p>	<p>State Parks</p> <p>Areas Important to Maintenance of Unique Natural Communities</p> <p>Sensitive Areas Identified Under the National Estuary Program</p> <p>Designated State Natural Areas</p> <p>State Seashore, Lakeshore and River Recreational Areas</p> <p>Rare species(state and federal Threatened and Endangered)</p> <p>Sensitive Aquatic Habitat</p> <p>State Wild & Scenic Rivers</p>
<p>National Park Service - Public Affairs Office</p>	<p>Anita Barnett</p> <p>Anita.Barnett@nps.gov (404) 507-5706</p> <p>http://www.nps.gov/rivers</p>	<p>National Seashore, Lakeshore and River Recreational Areas</p> <p>National Parks or Monuments</p> <p>Federal Designated Wild & Scenic Rivers</p>
<p>US Forest Service</p>	<p>Heather Luczak (828) 257- 4817</p>	<p>Designated and Proposed Federal Wilderness and Natural Areas</p> <p>National Preserves and Forests</p> <p>Federal Land Designated for the Protection of Natural Ecosystems</p>
<p>NC Division of Water Resources</p>	<p>Ian McMillan (919) 807-6364</p> <p>or Melanie Williams (919) 707-9000 <i>Ask for Clean Water Act 305b report</i></p>	<p>State-Designated Areas for Protection or Maintenance of Aquatic Life</p>

NC Division of Forest Resources	Chris Carlson (919) 857-4819	State Preserves and Forests
US Fish & Wildlife Service	Pete Benjamin (919) 856-4520 x 11	Endangered Species
NC Department of Natural and Cultural Resources	Renee Gledhill-Earley (919) 807 – 6579 email inquiries to: environmental.review@ncdcr.gov	National and State Historical Sites
NC Division of Coastal Management	Ted Tyndall (252) 808-2808 http://dcm2.enr.state.nc.us	Areas Identified Under Coastal Protection Legislation Coastal Barriers or Units of a Coastal Barrier Resources System.
NC Wildlife Resources Commission	David Cox (919) 707-0366 David.Cox@ncwildlife.org	National or State Wildlife Refuges State lands designated for wildlife or game management Migratory Pathways and Feeding Areas Critical for Maintenance of Anadromous Fish Species within River Reaches or Areas in Lakes or Coastal Tidal Waters in which such Fish Spend Extended Periods of Time Spawning Areas Critical for the Maintenance of Fish/Shellfish Species within River, Lake or Coastal Tidal Waters.
US Army Corps of Engineers	Dorothy Harrington (919) 554-4884, x 28	Wetlands

Appendix D: Land Use Restrictions

D.1 Approval Process for Use of Land Use Restrictions as a Remedy

If contaminated soils meet protection of groundwater criteria, pose no vapor intrusion potential but exceed health-based levels for unrestricted use, the remediating party may consider land use restrictions coupled with alternate soil cleanup levels as part or all of the proposed remedy.

Upon completion of a Branch-approved remedial investigation, cleanup levels for the standard industrial/commercial exposure scenario will be provided. The remediating party may calculate cleanup levels for other site specific exposure scenarios (park settings, restricted access, etc.) as well. A risk assessor familiar with the USEPA risk assessment procedures should conduct this work. If the remediating party calculates alternate cleanup levels, all supporting risk and exposure assessment calculations must be provided for the Branch's review and approval. Land use restrictions and alternate soil cleanup standards are not appropriate for sites with limited volumes of soils exceeding the unrestricted use standards unless obstructed by buildings.

The following steps outline the process that the remediating party should follow for approval of remedies involving land use restrictions.

1. The remediating party notifies the Branch in writing that it proposes the use of land use restrictions at a site. The notification letter should include either a request for standard industrial/commercial cleanup levels or indicate that site specific cleanup levels will be calculated. The remediating party should include descriptions of the current site and surrounding property use, the site's proposed future use, and current and proposed zoning of the site and surrounding properties.
2. Provide a copy of all existing, non-financial encumbrances/restrictions (e.g. utility easements, lease agreements, land use restrictions, etc.) on the property.
3. The remediating party submits a draft RAP that includes a land use restriction proposal. The land use restriction proposal should contain the following elements.
 - a. A proposal stating what activities and uses should be restricted at the site. Examples of possibly precluded activities are:
 - Construction of buildings and other man-made structures;
 - Excavating, dredging or otherwise removing soils and sediments at all, or below specified depths;
 - Planting or removal of vegetation including edible varieties, trees and shrubs; and

- Limitations on site use (e.g., preclusion of all uses other than industrial/commercial).
- b. The deed book and page numbers for the property or properties where the restrictions will apply, if approved.
- c. The plat book and page numbers for any “Notice of an Inactive Hazardous Substance or Waste Disposal Site” (Notice) already recorded in relation to the site.
- d. Proposed remediation goals for restricted land use.

Note: The remediating party must provide all supporting risk and exposure assessment calculations if a site specific exposure scenario is proposed.

- e. Written consent by the owner(s) of the site to the imposition of land use restrictions using the form provided in Section D.2.
- f. A proposed inspection plan for the site to verify that the recorded land use restrictions are in place and activities at the site are in compliance with these restrictions. The proposed inspection plan should be included in the section of the RAP that describes planned inspection, maintenance and progress reporting.

Note: The site owner or remediating party will be required to conduct an inspection of the site no less than annually. They also need to submit a signed and notarized statement stating that the land use restrictions are still in effect and that conditions at the site are not in violation of the land use restrictions. The Branch may later supply a form for such purposes. Owners, operators and other responsible parties are required under N.C.G.S. 130A-310.3(f) to enforce the land use restrictions and are expected to take action immediately upon discovery of a violation of the land use restrictions. Failure to do so will cause automatic revocation of Branch approval of the remedial action.

- 4. After reviewing the proposal, the Branch will approve, reject or provide comments on the proposal. If an agreement is reached on the proposal, the Branch will transmit the land use restriction document to the remediating party as it is to be recorded. If the document is acceptable to the remediating party and the site owner, a final RAP including the land use restrictions document as an appendix, must be submitted. Upon receipt, the Branch will initiate the 30-day public comment period in accordance with G.S. 130A-310.4(c) (2).

5. During the RAP public notice period, the remediating party should submit a draft Notice to the Branch for review. The Notice takes the form of a site survey plat prepared in accordance with N.C.G.S. 130A-310.8 and Branch guidance. The remediating party can opt to prepare the draft Notice plat earlier as part of the RAP. The Branch will not issue approval to proceed with recordation of the land use restrictions until the Branch has received the draft Notice, concludes it is complete, the public comment period on the RAP is concluded and the RAP has subsequently been finalized. The Notice and the land use restrictions document should be recorded together on the same day.
6. After the RAP public notice period concludes, the Branch will provide written approval of the RAP and notify the remediating party to proceed with implementation of the RAP. Upon receipt of written approval of the RAP, the remediating party needs to return original signed copies of the final version of the land use restriction document and Notice to the Branch. Upon receipt, the Chief of the Superfund Section will sign and formally approve these documents. The signed documents will then be returned to the remediating party for recording in the appropriate Register of Deeds office. The documents must be noted in the grantor index under the names of the owners of all affected property. The Branch will provide additional instructions on the content and recordation procedures for these two documents.

Note 1: The Notice and the land use restrictions document should be recorded together on the same day. These documents should be recorded in the following order: (1) Notice; (2) land use restriction document (*only after the Book and Page number where the Notice has been recorded have been entered on the land use restriction document*).

Note 2: The remediating party should only record the Notice and the land use restrictions document after they have been approved by the Branch and contain the signature of the Chief of the Superfund Section.

7. Within a time period specified by the Branch, the remediating party needs to submit certified copies of both the recorded Notice and the land use restrictions document and copies of the relevant grantor index page(s) to the Branch.

D.2 Land Use Restrictions Consent Form

One of the following statements should be completed and submitted to demonstrate the site property owner's provisional consent to the imposition of land use restrictions. Use the appropriate text that corresponds to the property's ownership (individual or corporate). This consent is subject to later withdrawal if the property owner has objections after reviewing the land use restrictions document.

Note: For land use restrictions recorded pursuant to N.C.G.S. 130A-310.65 - 310.77, NCDEQ is in the process of developing a form for owner consent.

Individual Ownership:

I, _____ *[name of owner]* _____, owner in fee simple of real property located at *[street address]* _____, *[town or city]* _____, _____ County, North Carolina, am agreeable to the imposition of Land Use Restrictions ("Restrictions") partially or completely in lieu of actual remediation of hazardous substances at the property. I understand that I may refuse to consent upon review of the actual Restrictions.

Signature

Signatory's name typed or printed

- Or -

Corporate Ownership:

_____ *[name of corporation]* _____, the owner in fee simple of real property located at *[street address]* _____, *[town or city]* _____, _____ County, North Carolina, hereby states that it is agreeable to the imposition of Land Use Restrictions ("Restrictions") partially or completely in lieu of actual remediation of hazardous substances at the property. Said corporation understands that it may refuse to consent upon review of the actual Restrictions.

Signature of Corporation Representative:

Signatory's name typed or printed

Title

D.3 Cancellation of Land Use Restrictions

If the owner believes that all hazards have been removed and that hazardous substances are no longer present at the site above unrestricted use remediation goals, the owner may subsequently request Branch approval to cancel the land use restrictions. Canceling land use restrictions without prior Branch approval will cause automatic revocation of approval of the RAP and will subject the party taking such action to enforcement.

Appendix E: Procedures for Demonstrating Attainment of Health-Based Soil Remedial Goals Through Averaging Contaminant Concentrations

Cleanup levels for soils under the Inactive Hazardous Sites Program have three components. These are the health-based remedial goal for direct contact, the protection of groundwater remedial criteria and, if applicable, the ecological risk component, concerns for transfer to surface water and agricultural use of the property (plant uptake and livestock exposure). All must be met at the site. In addition if soils pose the potential for structural vapor intrusion, those soils must be addressed

Averaging of contaminant concentrations in soil may be used in demonstrating attainment of final health-based SRGs for both unrestricted and restricted land use. Averaging cannot be used to demonstrate that protection of groundwater SRGs have been attained. Averaging should only be conducted in areas of consistent use and generally uniform release of contaminants (e.g. former waste lagoons, spray fields, orchards, etc.) All of the following conditions apply to the use of such averaging:

- Only sample points within 1/4 acre sectors may be averaged for comparison to unrestricted-use levels. For restricted industrial use (land use restrictions approved as part of the remedial action plan), averaging over larger areas can be performed if the access and use across the area is consistent. Remote areas and areas of less frequent access may not be included in the industrial restricted-use averaging.
- **No single sample point may exceed ten times the site-specific adjusted cleanup level for all contaminants except lead.** For lead, no single sample point used in an average may exceed 1000 ppm for unrestricted-use and no more than three times the site-specific cleanup level for restricted-use.
- The quarter-acre zone may be a circle or a square or triangle of generally equal sides. One dimension of the zone's perimeter may not be disproportionately longer than another.
- Samples must generally be evenly spaced over the zone of averaging.
- Only samples of the same vertical horizon may be averaged (0-6 inches for surface samples and no more than 5-foot vertical spread for subsurface samples).
- Only actual sample data may be used for all points included in the average and not published averages for background concentrations.
- The laboratory practical quantitation limit (PQL) must be used for points where concentrations are at or below lab reporting limits. Sample data should not be diluted or elevated unnecessarily above normal reporting limits.

- Composite sample results may be included in an average, but must be weighted proportionally to the area they represent. For example, if one composite sample in an area represents $\frac{1}{2}$ of the area and 5 others represent $\frac{1}{10}$ of the area each, then the concentration of the first composite should be multiplied by 5, added to the sum of the other concentrations and then divided by 10 to compute the average concentration.
- For characterizing soil concentrations over a $\frac{1}{4}$ acre area, a sampling grid with 50-foot grid node spacing should be established. The average concentration for each compound within a $\frac{1}{4}$ acre area is presumed to represent the entire $\frac{1}{4}$ acre area. If the average concentration for any compound exceeds unrestricted-use remedial goals, the $\frac{1}{4}$ acre area would require cleanup or land use restrictions. For very large areas (e.g., a 500-acre orchard), an alternative is to collect samples in multiple $\frac{1}{4}$ acre sectors within the overall contaminated area that represent the range of environmental conditions present (i.e., various geologic and geographic conditions such as slope vs. valley, wetter vs. drier, etc.). Grids with a 50-foot node spacing should be established across these representative areas. The highest $\frac{1}{4}$ acre average from all the areas tested would be presumed to reflect the overall area. This approach requires the area to be consistent in use and accessibility and requires land use restrictions as part of the remedy.
- For unique circumstances, contact the Inactive Hazardous Sites Branch for further guidance.