Inactive Hazardous Sites Branch

GUIDELINES FOR ADDRESSING PRE-REGULATORY LANDFILLS AND DUMPS

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Department of Environmental Quality
Division of Waste Management
Superfund Section
Inactive Hazardous Sites Branch
Pre-Regulatory Landfill Unit

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DEFINITIONS

The following definitions apply to this guidance:

1. **Contamination**: a contaminant released into an environmental medium that has resulted in or has the potential to result in an increase in the concentration of the contaminant in the environmental medium in excess of unrestricted use standards.

2. **Disposal**: the discharge, deposit, injection, dumping, spilling, leaking or placing of any solid waste into or on any land or water so that the solid waste or any constituent part of the solid waste may enter the environment or be emitted into the air or discharged into any waters, including groundwaters (Ref. GS 130A-290(a) (6)).

3. **Hazardous waste**: a solid waste, or combination of solid wastes, which because of its quantity, concentration or physical, chemical or infectious characteristics may:
    a. cause or significantly contribute to an increase in mortality or an increase in serious irreversible or incapacitating reversible illness; or
    b. pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of or otherwise managed (Ref. GS 130A-290(a) (8)).

4. **Industrial solid waste**: solid waste generated by manufacturing or industrial processes that is not hazardous waste (Ref. GS 130A-290(a) (13b)).

5. **Municipal solid waste**: any solid waste resulting from the operation of residential, commercial, industrial, governmental, or institutional establishments that would normally be collected, processed, and disposed of through a public or private solid waste management service. Municipal solid waste does not include hazardous waste, sludge, industrial waste managed in a solid waste management facility owned and operated by the generator of the industrial waste for management of that waste, or solid waste from mining or agricultural operations (Ref. GS 130A-290(a) (18a)).

6. **Pre-1983 landfill:** any land area, whether publicly or privately owned, on which municipal solid waste disposal occurred prior to 1 January 1983 but not thereafter, but does not include any landfill used primarily for the disposal of industrial solid waste (Ref. GS 130A-290(a) (22a)).

7. **Property/Properties:** the parcel(s) that include the site/waste disposal area and anywhere contamination from the Pre-1983 landfill has come to be located.

8. **Site:** any area where a hazardous substance or waste has been deposited, stored, disposed of, placed, or otherwise come to be located.

9. **Waste disposal area (WDA):** the estimated or actual waste disposal footprint derived from investigation activities regardless of the number of properties on which it is located.

INTRODUCTION

The Pre-Regulatory Landfill Unit (Unit) was established in 2007 to address pre-1983 non-industrial landfills and dumps (landfills and dumps that ceased accepting waste prior to January 1, 1983). These landfills and dumps are unlined waste disposal areas (WDA) that are not subject to the North Carolina Division of Waste Management's 15A NCAC 13B post-closure regulations administered by the Solid Waste Section. The legislation passed in 2007 established funding for contaminant assessment and risk based remedial measures at these sites. The contaminant assessment and risk based remedial measure work activities are completed by Professional Engineering firms (Contractors) under contract and by the direction of Pre-Regulatory Landfill (PRLF) Unit Project Managers (PM).

The Unit also manages a Local Government Reimbursement Program for certain eligible activities. Local governments may conduct contaminant assessment activities in accordance with this guidance document including subsequent amendments and editions and request reimbursement of assessment expenses if the activities and costs are pre-approved by the Unit and comply with statutory requirements. *Guidelines for the Local Government Reimbursement Program* are outlined in Attachment 1.

Unit PMs will initiate the remedial investigation (RI) phase for each pre-1983 landfill by obtaining property access permission for DEQ staff and Contractors and U.S. Army Corp of Engineers (USACE) staff. Once property access permission has been obtained, an initial site visit is performed by the Unit PM, the Contractor PM, and Contractor staff personnel who will be performing field work.

The initial site visit allows the Contractor PM to gather site specific information such as physical obstacles above and below the ground surface that will be useful for preparing all work plans and cost estimates. The RI is usually separated into two phases, the first phase (non-invasive activities) and the contaminant delineation phase (invasive/land disturbing activities). After the initial site visit, the first phase of the RI will be tasked by the Unit PM. The contaminant delineation phase will commence after the Unit PM reviews the information obtained from the first phase. Various reports may be requested by the Unit PM throughout the RI phase.

Typical RI first phase activities include collecting receptor information, identifying all potential sensitive environments and performing a geophysical survey to delineate the edge of waste disposal. The RI contaminant delineation phase includes soil borings to confirm the extent of waste and media sampling (groundwater, surface water, soil, sediment, surface vapor screening and subsurface landfill gas) to identify and delineate the extent of contaminants of concern. These assessment activities are planned based on historic information available in the Unit's records and the risks posed by current site conditions and any pending redevelopment. If needed, the Unit PM will obtain access permission from the NC Department of Transportation (DOT) to install temporary borings in the DOT right-of-way (ROW).

Unit PMs will request a work plan, cost estimate and proposed schedule for all work activities from the Contractor PM. The Contractor PM must submit a separate work plan, cost estimate and proposed schedule for each request. All work plans and estimated costs must be pre-approved by the Unit PM prior to implementation. Additional information regarding general task order management protocol is available in the *Pre-Regulatory Landfill Program Contract Task Management Guidance*, which can be found in Attachment 2.

After the RI is complete, the next step is the remedial design (RD) phase. The Unit PM will meet with the Contractor PM to discuss the RI phase results and determine the appropriate risk based remedial measures. The Contractor PM will prepare a draft remedial action plan (RAP) based on the pre-1983 landfill contaminants of concern, topography, and sensitive environments for review by the Unit. The draft RAP will be made available for public comment prior to final approval and implementation. If significant public interest exists, a public meeting and/or informational session may be held. Contractors may need to provide technical and administrative support for public meetings and informational sessions.

Note: Due to the wide range of conditions encountered at pre-1983 landfill sites, these guidelines will not address every conceivable situation.

DOCUMENT FORMATTING AND SUBMITTAL REQUIREMENTS

All documents must be submitted electronically in PDF format unless otherwise specified by the Unit PM. The associated cover letters, appendices, and signed and notarized certifications should be included with the document as one PDF. Company logos may be used on the report cover page, but company logos and file names cannot be in the text of the report including headers/footers and figures. Documents may be e-mailed, but if they are large in size then a file-sharing system may be used. Electronic documents should not be password protected or encrypted. Any paper submissions to the Unit should be double-sided (except for figures, tables and color photographs).

The Unit PM will review draft reports. The Contractor PM is expected to make all requested revisions as directed and submit an updated final report. The Contractor PM shall perform a complete review of all draft reports to identify all errors and omissions prior to submitting to the Unit PM for review. The Contractor PM should not make report revisions that are not requested by the Unit PM unless the Contractor identifies a reporting error.

All reports must be submitted in accordance with the following:

1. summarize methods and results and do not include conclusions or recommendations;
2. sequentially numbered sections that reflect each task in the task order;
3. letter size paper (8.5 x 11 inch) and ledger (11x17) if approved by the Unit PM;
4. font size 9 or greater for all text in documents, tables and figures;
5. font size must remain 9 or greater after conversion to Adobe PDF;
6. shading and color should not be used except for color maps and photographs;
7. bold, underline and italics text may be used for emphasis or clarification;
8. submittal date;
9. name of the pre-1983 landfill;
10. identification number of the pre-1983 landfill;
11. approved task order identification number;
12. summary of any required variances from the approved work plan (Contractor must seek Unit pre-approval where possible); and
13. copies of all Contractor field notes and waste manifests.

Field notes include but are not limited to, soil boring logs, equipment calibration logs and water sample collection field sheets. All abbreviations and symbols used for field notes must correspond

to the requirements as outlined in the *Pre-Regulatory Landfill Program Contract Task Management Guidance*, which can be found in Attachment 2.

Report appendices should not include correspondence with the Unit relative to contracting and task orders, but may include the following:

1. photographs;
2. GPS coordinates;
3. site survey plat;
4. soil boring and well construction logs (digital and in diagram form);
5. field notes;
6. geophysical survey; and
7. laboratory analytical reports.

All site reports are stored with other site records electronically in an online document management system (Laserfiche). Instructions for accessing the Laserfiche system can be found at the following website: http://deq.nc.gov/about/divisions/waste-management/superfund-section/sf-file-records.

REPORT CERTIFICATION REQUIREMENTS

The following certification statement with the notarized signature of the Contractor PM, must be included on each RI report and remedial action (RA) report: "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."

Additional certification by relevant professionals is required if applicable. Any work that would constitute the "practice of engineering" as defined by GS 89C shall be performed under the responsible charge of, and signed and sealed by, a professional engineer licensed in the state of North Carolina. Any work that would constitute the "public practice of geology" as defined by GS 89E shall be performed under the responsible charge of, and signed and sealed by, a geologist licensed in the state of North Carolina.

SURVEY CERTIFICATION REQUIREMENTS

All surveys must comply with and be signed and sealed by a surveyor licensed in the state of North Carolina in accordance with NCGS 47-30 (plats and subdivisions; mapping requirements). In addition to NCGS 47-30, Appendix A, *Instructions for Preparing a Notice Plat for Recordation*, outlines the requirements for preparing a pre-1983 landfill Notice Plat and the associated recordation process.

REMEDIAL INVESTIGATION PHASE

A Unit PM will submit a request to the Contractor PM for a work plan, cost estimate and proposed schedule to perform RI phase activities. The request from the Unit PM will include a scope of work outlining expectations and authorized activities. The request will include a task order number associated with a specific activity. The Contractor PM must submit a detailed work plan and cost estimate (identifying personnel and materials) addressing the scope of work and each task in the task order to the Unit PM within 10 business days of receipt. The work plan and cost estimate must be based on information gathered during the initial site visit. Prior to conducting RI activities, the proposed work plan and cost estimate must be pre-approved by the Unit PM. Each task order should be authorized, completed and invoiced separately.

Generally, the pre-1983 landfills included in the Unit Inventory have location-receptor summary reports on file. Unit PMs will complete a file review to ensure completed work is not duplicated.

Note: certain activities may not be necessary based on developing results.

Required field procedures and sample collection techniques are outlined in Appendix B, *Field Procedures and Sample Collection Techniques*. Information pertaining to asbestos containing materials, required handling protocols and notification procedures are provided in Appendix C, *Asbestos Containing Material*.

All soil and water samples must be submitted to either a laboratory certified under 15A NCAC Subchapter 02H .0800 or a laboratory currently part of the US EPA Contract Laboratory Program and analyzed in accordance with the requirements outlined in Appendix D, *Laboratory Analytical Parameters*. Laboratories analyzing vapor samples should have NELAP certification.

Upon receipt of a laboratory analytical report, the Contractor PM must perform a quality assurance and quality control review (QA/QC) of the laboratory report to ensure that the sample results are valid and submit a statement that the data is valid for its intended purpose with the laboratory report to the Unit PM.

During the RI, 15A NCAC 02L standards and 02B standards must be used as delineation endpoints for groundwater and surface water, respectively. Unrestricted-use preliminary soil remediation goals (PSRGs) and may be used as the preliminary screening tool for soil delineation. If unrestricted-use PSRGs cannot be met, the analytical results must be entered into the DEQ risk calculator for final evaluation. However, at some sites, local natural background concentrations (metals only) and anthropogenic background concentrations (PAHs, PCB and/or Dioxins) or sample reporting limits may serve as delineation endpoints, provided that the laboratory's reporting limits are not elevated more than 10 times the laboratory's MDLs, and/or published average MDLs for the particular method.

Subsequent delineation work phases may be limited to compounds detected in the first phase and their degradation compounds.

Investigation-derived waste or IDW (may include drill cuttings and muds, sampling materials or purge water) 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 (if not being transported off-site to a facility permitted to accept such waste);
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. All drummed waste and associated fencing must be removed from the site within 90 calendar days after completion of field activities.

The completion of the RI phase should establish the following:

1. lateral and vertical extent of contamination in each area of concern for all contaminated media (soil, groundwater, sediment, surface water and vapor);
2. potential exposure pathways and receptors currently or that may become exposed to contamination; and
3. site contaminant, geologic and use conditions sufficient to conduct a feasibility study of remedial alternatives to support the proposed RAP.

Once the Unit PM is satisfied that the RI phase is complete, the Contractor PM will receive a request to submit a RI summary report using the template in Appendix E, *Remedial Investigation Summary Report Template*.

Note: The Unit must be notified within 24 hours if contamination is detected in a potable well, spring, in indoor air or if newly discovered conditions require immediate mitigation, remediation, or other action to abate a direct contaminant exposure to workers, nearby communities, and/or the environment.

GENERAL REQUIREMENTS FOR RI AND RA WORK PLANS AND REPORTS

The following items may need to be included in RI and RA work plans and reports.

1. All work proposals for RI activities must include a description of:
    a. equipment and personnel decontamination procedures; and
    b. measures that assure the health and safety of nearby residential and business communities by demonstrating that they will not be adversely affected by activities related to the RI.

2. All work proposals, cost estimates, reports and other relevant correspondence submitted to the Unit PM must include the following:
    a. name of the pre-1983 landfill;
    b. pre-1983 landfill identification number;
    c. task order number; and
    d. date(s) samples collected.

3. Before task activities begin, current site conditions must be photographed. The photographic record must include areas or objects that may be disturbed or affected. Restoration efforts and noteworthy items encountered during task activities must be documented. After task activities are complete, a photograph is required to document restoration. If pre-disturbed conditions are not documented to support complete restoration, the Contractor will be held responsible for all associated restoration expenses. Photographs must be submitted with a point of reference description in the report for the particular task. Unit PMs may identify specific photographs to include in reports.

4. The Contractor PM must ensure all personnel, including subcontractor personnel, engaged in intrusive field activities at the site comply with OSHA required health and safety training for hazardous waste sites and site health and safety plans. The Contractor PM must also ensure that personnel in the field are qualified to identify contaminated material and landfill waste.

5. All GPS coordinates must be submitted in the following format:
    a. latitude/longitude;
    b. decimal degrees to the fifth order;
    c. differentially corrected;
    d. WGS84 format; and
    e. tabulated as an appendix.

6. All supporting figures and maps must be CAD drawn to scale and include, at a minimum, the following:
    a. bar scale (in feet and miles);
    b. legend with an explanation of all symbols;
    c. north arrow; and
    d. background topographic contours (light grey shading).

Note: Multiple maps or figures may be required to adequately display information.

7. All professional work (reports) must be signed and sealed by the appropriate State licensed professionals (geologist and engineers). A single document may require the signature and seal of more than one professional.

FIRST PHASE RI ACTIVITIES (NON-INVASIVE)

The following items may be requested by the Unit PM. Data for each tasked item must be submitted to the Unit in a report.

RI HISTORICAL USE RESEARCH

8. Provide a summary of historical operations including, but not limited to:
    a. a chronological listing of owners and operators;
    b. written documentation and interviews with individuals who have historical knowledge to provide verification of time operated;
    c. types of waste received;
    d. other relevant information about disposal operations;
    e. current site use;
    f. surrounding property use;
    g. street address of site;
    h. records, if available, indicating large quantities of industrial waste (more than expected at a municipal solid waste landfill for the time period of operation); and
    i. known or suspected areas of hazardous substance disposal (hot spots).

Note: If research indicates that paragraph 8(h) or 8(i) may be of concern at the WDA, contact the Unit. Waste characterization of exposed wastes or hot spots may be required prior to any other investigation activities.

9. Provide aerial photography and Sanborn Fire Insurance maps, if available, showing:
    a. WDA conditions from pristine land;
    b. WDA during the time period of active operation; and
    c. WDA present conditions.

10. Provide copies of all non-financial encumbrances (easements and rights-of-way) and leases for the site.

RI SITE LOCATION

11. Provide geographic coordinates (GPS) for the following:
    a. WDA entrance;
    b. site entrance; and
    c. points delineating the suspected perimeter of the WDA.

12. Provide a map titled, "USGS Topographic Location Map," using the current published United States Geological Survey topographic map for the subject area that includes the following:
    a. WDA estimated perimeter;
    b. 500-foot radius from the estimated WDA perimeter;
    c. 1,000-foot radius from the estimated WDA perimeter; and
    d. maximum scale: 1" = 1,000'.

13. Provide a map, titled "Vicinity Map," that includes the following:
    a. property owner name, zoning classification, and property boundaries of property/properties containing the WDA;
    b. WDA estimated perimeter;
    c. property owner name, zoning classification, and property boundaries of adjacent properties within 500 feet of the WDA perimeter;
    d. roadways; and
    e. easements.

14. Provide a map, titled "Surface Water Map," that includes the following information pertaining to surface water bodies within 1,000 feet of the estimated WDA perimeter:
    a. WDA estimated perimeter;
    b. locations of surface water bodies:
        i. streams (perennial and intermittent);
        ii. lakes;
        iii. storm ditches;
    c. name of each water feature; and
    d. flow direction of each water feature.

15. Provide a map, titled "Water Supply Map," that includes the following water supply sources within 1,000 feet of the estimated WDA perimeter:
    a. WDA estimated perimeter;
    b. water supply wells;
    c. water supply springs;
    d. surface water intakes; and
    e. distance in feet to the WDA perimeter.

16. Provide a table, titled "Water Supply Table," that includes the following information cross referenced to the "Water Supply Map":
    a. current water source owner;
    b. current water source user (if other than water source owner);
    c. address of water source; and
    d. tabulated GPS coordinates of water supply locations.

Note: water sources should be identified using available maps, online resources, local utility offices and by visual inspection.

17. Provide a map, titled "Site Map," (multiple maps may be used) that includes the following:
    a. WDA estimated perimeter;
    b. accessibility issues;
    c. existing monitoring wells;
    d. paved areas;
    e. landscaped areas;
    f. type and extent of ground cover;
    g. general surface conditions;
    h. on-site structures;
    i. sumps;
    j. septic systems;
    k. storm water conduits;
    l. above ground and underground utilities (electric, water and sewer);
    m. non-financial encumbrances (easements and rights-of-way);
    n. leases; and
    o. surface or exposed waste.

18. Provide a summary of a sensitive environment survey of the WDA and areas located within 500 feet of the estimated WDA perimeter. For each sensitive environment (as listed in Appendix F, *Sensitive Environment Survey*) identified, the following is required:
    a. provide a brief summary of potential effects to sensitive environments identified for RA options (i.e. excavation or capping);
    b. tabulate results to include the following:
        i. contacts;
        ii. responses; and
        iii. dates and types of communication.

19. Provide a map, titled "Sensitive Environment Map," that includes the delineated boundary of all sensitive environments across all properties containing, all or a portion of, the WDA and any additional property within 500 feet of the estimated WDA perimeter. The map should be prepared using the contacts provide in Appendix F.

20. Provide a map, titled "Geophysical Survey Results Map" that includes the following:
    a. WDA perimeter determined visually and by the geophysical survey;
    b. 25-foot buffer beyond the estimated WDA perimeter;
    c. point locations where survey grade GPS data delineating the WDA boundary were collected; and
    d. tabulated survey grade GPS coordinates.

21. Conduct and provide a summary of a geophysical survey delineating the horizontal extent of the WDA, including a 25-foot buffer beyond the estimated WDA perimeter using single frequency methods on a 100-foot grid. Describe any on-site features that may cause interference with the survey (i.e. railroad, electric fence, etc.). If a site has been redeveloped or waste is considered to be in contact with groundwater, then the vertical extent of waste must also be determined using geophysical methods.

22. Provide a description of local/regional geologic and hydrogeologic conditions. Discuss naturally occurring inorganics in soil and groundwater that includes a range of concentrations for each inorganic constituent and provide reference information about the naturally occurring conditions.

BACKGROUND SAMPLE COLLECTION

Site-specific soil, sediment, surface water and groundwater samples should be collected to establish natural metals concentrations and area-wide anthropogenic background.

NATURAL SOIL METALS CONCENTRATIONS

Note: For soils, identify analytes above the direct contact PSRG screening level (as adjusted using the risk calculator) and provide the rational for determining the analytes are naturally occurring or anthropogenic.

23. Collect background soil samples in locations designated by the Unit PM. Samples must be collected away from roadways, railways, parking areas and other potential sources of contamination. Samples must be collected from depths and soil types that are representative of contaminated soils but should not be collected from topsoil (0-6 inches).

AREA-WIDE SOIL ANTHROPOGENIC BACKGROUND DUE TO AIRBORN RELEASES

24. Where Dioxin, PAH, and/or PCB contamination have been found in surface soils, background samples must be collected across an area between the outer edge of the landfill footprint and a 1,000-foot perimeter of that edge. Samples should not be collected on known contaminated sites or in drainage features. After any obvious outliers are removed, the upper end of the range of concentrations detected can be used as the anthropogenic level.

NATURAL GROUNDWATER METALS CONCENTRATION

25. Groundwater samples must be collected up gradient of the delineated WDA to establish natural background conditions. Install and sample monitoring wells in locations designated by the Unit PM.

SURFACE WATER AND SEDIMENT BACKGROUND CONCENTRATION

26. Surface water and sediment samples must be collected upstream of the delineated WDA if a perennial surface water feature crosses or adjoins site contaminated areas. If contamination is found upstream of the site in concentrations greater than the downstream concentrations, downstream delineation may not be necessary.

BACKGROUND SAMPLE RESULTS

27. Provide a map(s), titled “Background Sample Results Map” that depicts the location of all background samples and provide a table, titled “Background Sample Results Table,” that includes the following information cross referenced to the “Background Sample Results Map,”

associated analytical results compared to 15A NCAC 02L and 02B standards for groundwater and surface water, respectively and unrestricted-use preliminary soil remediation goals (PSRGs).

CONTAMINANT DELINEATION RI ACTIVITIES (INVASIVE)

The following items may be requested by the Unit PM. Data for each tasked item must be submitted to the Unit in a report.

Prior to initiating invasive field work activities, the Contractor PM must contact the North Carolina One-Call Center (NC811) to request the identification of all publicly owned underground utilities. The Contractor PM must also ensure that publicly and privately owned utilities are not damaged during invasive field work activities.

The clearing of vegetative material to enable access to proposed sampling points should be minimized. Hand tools must be used for clearing unless justification for use of heavy equipment is provided to and approved by the Unit PM.

WASTE DISPOSAL AREA PERIMETER DELINEATION

28. All contaminant delineation work plans and reports must provide a summary of the planned and actual handling of investigation-derived wastes.

29. Determine the perimeter of the WDA by completing the following:
    a. advance hollow stem auger (HSA) borings around the perimeter of the WDA as depicted by the geophysical survey;
    b. if waste is not encountered in the initial boring, offset additional borings in the direction of the estimated WDA until waste is encountered;
    c. if waste is encountered in the initial boring, offset additional borings in the direction away from the estimated WDA until no waste is encountered; and
    d. extend borings a minimum of 10 feet below ground surface (bgs) unless waste is encountered.

Note: Waste is generally determined not to be present if it is not encountered within ten feet of ground surface.

30. Provide a map, titled "WDA Perimeter Delineation," that includes the following:
    a. unique identifier for each boring;
    b. locations of all borings;
    c. perimeter of WDA based on borings;
    d. location of surface waste;
    e. location of partially buried waste;
    f. number of parcels and parcel pin identification numbers containing waste and/or contaminated media;
    g. acres of waste determined by the delineated boundary; and
    h. acres for all parcels containing waste and/or contaminated media.

31. Provide a table, titled "WDA Perimeter Delineation," that includes the following:
    a. unique identifier for each boring;
    b. GPS coordinates for each boring (perimeter coordinates starting at the northern most point listed in a clockwise progression);
    c. total depth of each boring;
    d. depth to waste from the surface;
    e. waste type (if applicable); and
    f. lithologic description based on Unified Soil Classification System.

ABOVE GROUND VAPOR SURVEY

32. Evaluate the potential for above ground vapors by collecting landfill gas readings across the WDA on a 50-foot grid using field instrumentation. Reference the geophysical survey or the WDA delineation maps for the location and extent of the WDA. At each sampling point collect measurements in accordance with the following:
    a. instruments must run for at least 30 seconds or as specified in the manufacturer's instructions before recording the measurement;
    b. collect measurements no more than six inches above the ground surface;
    c. do not perform the above ground vapor evaluation on rainy or windy days;
    d. record background measurements upwind of, but in close proximity to the WDA;
    e. collect the following parameters at each sampling point and report each parameter in the units as outlined in Appendix B:
        i. methane;
        ii. oxygen;
        iii. carbon dioxide;
        iv. hydrogen sulfide;
        v. total volatile organic compounds; and
        vi. mercury;
    f. collect the following parameters hourly during the above ground vapor evaluation and report each parameter in the units as outlined in Appendix B:
        i. barometric pressure;
        ii. ambient temperature; and
        iii. humidity;
    g. place temporary flagging (i.e. wooden stakes) at all grid points with detectable concentrations of any of the contaminants listed in paragraph 32e;
    h. recheck each of the grid points with detectable concentrations of any landfill gas before leaving the WDA;
    i. collect GPS coordinate data for all sampling points; and
    j. if any contaminants are detected or if the survey was conducted during a period of rising barometric pressure, a second confirmation survey will need to be conducted on a later day.

33. Provide a map, titled "Above Ground Vapor Survey," that includes the following:
    a. unique identifier for each sampling node;
    b. locations of all above ground vapor sampling points;
    c. locations of background sampling points; and
    d. locations where contaminants of concern were detected.

34. Provide a table, titled "Above Ground Vapor Survey," that includes the following:
    a. unique identifier for each sampling node;
    b. GPS coordinates for each sampling node; and
    c. field measurement results as outlined in item 32.

Note: The Unit PM may adjust the sample grid spacing based on site conditions. Alternatively, for larger sites with consistent terrain and no known hot spots, a larger grid spacing could be used.

WASTE CHARACTERIZATION (TOTAL REMOVAL OR HOT SPOT ASSESSMENT)

Note: After waste removal, native soils below removed waste must be sampled and the results compared to unrestricted-use and protection of groundwater preliminary soil remediation goals (PSRGs). If the direct contact PSRGs cannot be met, the analytical results must be entered into the DEQ risk calculator for final evaluation. Note that this comparison for soils is not required if contaminant concentrations are below natural background concentrations.

Note: The Unit PM will request waste characterization for sites that qualify for waste removal. In addition to characterizing the waste, an estimated volume, reported in cubic yards, will be required. Generally, if the waste is to remain in place, characterization will not be required.

35. Characterize surface, partially buried and buried waste at the WDA by completing the following:
    a. advance HSA borings in the locations identified by the Unit PM;
    b. continuously log each boring and characterize (describe) the waste/soil encountered;
    c. provide boring logs with the following information:
        i. ground elevation;
        ii. soil cover thickness;
        iii. soil lithology based on Unified Soil Classification System;
        iv. soil contamination ranges;
        v. top of waste elevation; and
        vi. thickness of waste;
    d. collect solid media samples from each boring from intervals below ground surface provided by the Unit PM;
    e. collect solid media samples from the highest readings recorded, using a PID instrument, for analysis and identify the sampled interval(s);
    f. collect one solid media sample from the base of waste;
    g. collect one sample from native soil beneath waste;
    h. provide a description of the surface waste and list tires and white goods separately; and
    i. provide an estimate of waste volume in cubic yards for surface waste, partially buried waste and buried waste.

36. Provide a map(s), titled "Waste Characterization Borings," that includes the following:
    a. unique identifier for each waste characterization boring;
    b. locations of all waste characterization borings;
    c. soil cover iso-thickness contours;

d. waste iso-thickness contours; and
e. PID field screening results for each waste characterization boring.

37. Provide a table, titled "Waste Characterization Borings," that includes the following:
    a. unique identifier for each waste characterization boring;
    b. GPS coordinates for each waste characterization boring;
    c. thickness of waste (reported in feet) in each waste characterization boring;
    d. depth (reported in feet) to native soil below waste;
    e. PID field screening results for each waste characterization boring;
    f. native soil beneath waste analytical results compared to direct contact and protection of groundwater PSRGs; and
    g. waste characterization analytical results compared to permitted receiving facility requirements.

EVALUATION OF WDA EXISTING SOIL COVER FOR USE AS THE PERMANENT COVER SYSTEM

Note: The Unit PM will request soil cover investigation for sites that meet specific criteria. Generally, if a site is relatively flat and currently does not have trees covering the WDA, the thickness and quality of the existing soil cover would be considered. If grubbing activities are needed, the existing soil cover thickness and quality may not be evaluated. Items 38 and 39 below may be tasked alone, in sequence, conditionally, or at the same time depending on the size of the WDA.

Note: If the WDA is greater than 5 acres in size, the Unit PM may adjust the grid spacing or allow for composite sampling of non-VOC samples.

38. Determine preliminary quality and thickness of the existing WDA soil cover by completing the following using hand augers, direct push methods or HSA:
    a. advance soil borings based on the transect provided by the Unit PM;
    b. install soil borings to a depth of 3 feet or until waste is encountered, whichever is first;
    c. evaluate the soil in each soil boring using a PID and XRF prior to sample collection;
    d. submit the PID and XRF results to the Unit PM for review.

39. Collect soil cover samples for laboratory analysis according to the following:
    a. install soil borings based on a 100-foot grid across the delineated WDA;
    b. if the soil cover is greater than or equal to 12 inches, collect a soil sample at 6 inches bgs; or
    c. if the soil cover is greater than or equal to 2 feet, collect one sample at 6 inches bgs and one sample at 18 inches bgs;
    d. soil cover samples must be collected in accordance with Appendix B, *Field Procedures and Sample Collection Techniques*; and
    e. soil cover analysis must be conducted in accordance with Appendix D, *Laboratory Analytical Parameters*.

Note: Sample results must be compared to unrestricted-use and protection of groundwater preliminary soil remediation goals (PSRGs) for soils. If the direct contact PSRGs cannot be met, the analytical results must be entered into the DEQ risk calculator for final evaluation.

Note that this comparison for soils is not required if contaminant concentrations are below natural background concentrations.

40. Provide a map, titled "Evaluation of WDA Existing Soil Cover for use as the Permanent Cover System," that includes the following:
    a. unique identifier for each soil cover sample;
    b. locations of all soil cover samples;
    c. analytical results detected above unrestricted-use PSRGs;
    d. provide soil cover thickness at each sample location; and
    e. provide soil cover iso-thicknesses for the WDA.

41. Provide a table, titled "Evaluation of WDA Existing Soil Cover for use as the Permanent Cover System," that includes the following:
    a. unique identifier for each soil cover sample;
    b. GPS coordinates for each soil cover sample location; and
    c. analytical results compared to unrestricted-use PSRGs.

SURFACE WATER/SEDIMENT/SEEP INVESTIGATION

42. Collect a surface water and sediment sample from the locations designated by the Unit PM according to the following:
    a. if surface water features traverse or adjoin the WDA collect one set of samples in this order:
        i. immediately downstream of the WDA;
        ii. where the stream traverses or contacts the WDA;
        iii. immediately upstream of the WDA;
    b. surface water and sediment samples must be collected in accordance with Appendix B, *Field Procedures and Sample Collection Techniques*;
    c. surface water and sediment sample analysis must be in accordance with Appendix D, *Laboratory Analytical Parameters*; and
    d. samples must be collected in a downstream to upstream progression.

43. Collect one set of sediment and water samples from each seep location designated by the Unit PM.

44. Provide a map, titled "Surface Water/Sediment/Seep Investigation," that includes the following:
    a. unique identifier for each surface water/sediment/seep sample;
    b. location of surface water samples;
    c. location of sediment samples;
    d. location of seep samples; and
    e. analytical results detected above 15A NCAC 02B for surface water and unrestricted use direct contact PSRGs for sediment.

45. Provide a table, titled "Surface Water/Sediment/Seep Investigation," that includes the following:
    a. unique identifier for each surface water/sediment/seep sample;
    b. GPS coordinates for each surface water/sediment/seep sample location; and

c. analytical results compared to 15A NCAC 02B for surface water and unrestricted use direct contact PSRGs for sediment.

Note: If contamination is detected in any downstream sample above upstream conditions, additional surface water/sediment assessment will be needed. The downstream extent of contamination must be delineated to concentrations less than or equal to the 15A NCAC 02B standards for surface water or upstream concentrations whichever is higher.

GROUNDWATER INVESTIGATION

Note: If initial well sampling indicates hazardous substances are present in groundwater, additional groundwater assessment will be required. The lateral and vertical extent of all contaminant plumes, on-site and off-site must be delineated to develop a conceptual site model, which may include complex hydrogeology, such as fractured bedrock aquifers, complex contaminant behavior and dense non-aqueous phase liquids. The lateral and vertical extent of the groundwater contaminant plumes must be defined to the 15A NCAC 02L standards. Where a contaminant does not have a standard, contact the Unit PM for an alternate number. In some situations, the US EPA Tap Water Numbers may be used. Large perennial surface water features may be used as investigation limits as determined by the Unit PM.

46. Install temporary groundwater wells according to the following:
    a. advance soil borings outside of the delineated WDA to groundwater at locations designated by the Unit PM;
    b. install a 1-inch diameter temporary groundwater well (may use pre-packs if applicable) in each boring; and
    c. if groundwater is not encountered or if waste is encountered in borings, contact the Unit immediately.

47. Permanent groundwater monitoring wells must be installed according to the following:
    a. advance soil borings outside of the delineated WDA to groundwater at the locations designated by the Unit PM;
    b. install a 2-inch diameter permanent groundwater monitoring well in each boring;
    c. drilling methods may vary depending on the depth to groundwater. Air rotary, hollow stem augers or direct push could be required to advance the borings; and
    d. flush mount versus stick up well covers will be determined by the Unit PM.

48. In-waste permanent groundwater monitoring wells (used when there is a suspected hot spot) must be installed according to the following:
    a. advance soil borings within the WDA at locations designated by the Unit PM;
    b. install a permanent Type III groundwater monitoring well in each boring, double case the well to the waste-soil interface;
    c. drilling methods may vary depending on the depth to groundwater. Air rotary or hollow stem augers could be required to advance the borings; and
    d. flush mount versus stick up well covers will be determined by the Unit PM.

49. Bedrock surface permanent groundwater monitoring wells must be installed according to the following:

a. advance soil borings outside of the delineated WDA to the top of bedrock;
b. install a 2-inch diameter permanent groundwater monitoring well in each boring; and
c. install ten feet of screen.

50. Provide the following for each permanent and temporary monitoring well:

Note: All borings must be logged in the field.

a. boring log information must include but is not limited to:
    i. top of ground elevation;
    ii. detailed soil description and lithology at depths;
    iii. depth of groundwater observed during drilling;
    iv. notable reaction of drill rig during advancement;
    v. depth of competent rock encountered;
    vi. detailed notes/remarks;
b. a well construction diagram;
c. non-residential well construction record form GW-1;
d. ground water elevation for each well;
e. details of well development;
f. details of well abandonment;
g. water level measurements for all available groundwater wells;
h. one groundwater sample from each well must be collected in accordance with Appendix B, *Field Procedures and Sample Collection Techniques*, and the groundwater sample analysis must be in accordance with Appendix D, *Laboratory Analytical Parameters*;
i. well construction details in a table and including the following:
    i. installation date;
    ii. top of casing elevation;
    iii. ground surface elevation;
    iv. total well depth;
    v. well screen interval;
    vi. depth to groundwater;
    vii. groundwater elevation;
j. groundwater contour and flow direction map showing:
    i. land surface topography;
    ii. surface water features; and
    iii. monitoring well locations.

51. Provide a map, titled "Groundwater Investigation," that includes the following:
a. unique identifier for each monitoring well;
b. location of temporary monitoring wells;
c. location of permanent monitoring wells;
d. location of bedrock permanent monitoring wells; and
e. analytical results detected above 15A NCAC 02L.

52. Provide a table, titled "Groundwater Investigation," that includes the following:
a. unique identifier for each monitoring well;
b. GPS coordinates for each monitoring well location; and

c. analytical results compared to 15A NCAC 02L.

53. Monitoring well construction and abandonment documentation must be submitted to the NC Division of Water Resources and to the County Health Department responsible for the county in which the monitoring well is located and included in the report to the Unit.

Note: Subsequent monitoring well installation and sampling may only require analysis for contaminants previously detected and their degradation products.

Note: Well installation and abandonment must comply with the current codified edition of 15A NCAC 02C well construction standards.

POTABLE WATER SUPPLY WELL SAMPLING

54. Collect a potable water supply well sample from each potable water supply well that is within 1,000 feet of the delineated WDA boundary according to the procedure outlined in Appendix B, item 8.

55. Provide a map, titled "Potable Water Supply Well Sampling," that includes the following:
    a. unique identifier for each potable water supply well;
    b. location of each potable water supply well; and
    c. analytical results detected above applicable Federal Maximum Contaminant Levels (MCLs) and 15A NCAC 02L standards (IMACs if final standards not available).

56. Provide a table, titled "Potable Water Supply Well Sampling," that includes the following:
    a. unique identifier for each potable water supply well;
    b. GPS coordinates for each potable water supply well; and
    c. analytical results compared to MCLs and 15A NCAC 02L standards (IMACs if final standards not available).

LANDFILL GAS PROBE INSTALLATION AND MONITORING

Note: Landfill gas probe locations will be based on the results of the above-ground landfill vapor evaluation, groundwater sampling results and information of known chemical waste disposal. Additionally, areas exhibiting odors, stressed vegetation, or bubbling water should be investigated.

Note: Landfill gas probes must be installed with a minimum spacing of one probe every two acres across the WDA. If the WDA is less than two (2) acres in size, install at least one probe. The Unit PM may request additional probes based on site conditions, such as when the WDA is within 500 feet of structures or the property boundary or if a passive venting system will need to be designed.

Note: If landfill gas probes cannot be constructed according to the minimum requirements outlined in Appendix B, contact the Unit PM.

57. Install landfill gas probes within the WDA, according to the minimum requirements outlined in Appendix B, at locations designated by the Unit PM and according to the following:
    a. document any variances from the approved work plan and minimum installation requirements as outlined in Appendix B;
    b. gas samples must be collected using batch-certified Summa canisters and analyzed for all VOCs on the US EPA Target Compound List;

       Note: (individually certified Summa canisters are required if collecting in-door air samples)

    c. gas sample analysis must be in accordance with Appendix D, *Laboratory Analytical Parameters*;
    d. collect landfill gas probe samples (summa canisters) for laboratory analysis **prior** to collection of landfill gas probe field screening measurements;
    e. following collection of laboratory samples, collect landfill gas probe field direct reading instrumentation measurements for the following and report each parameter in the units as outlined in Appendix B:
        i. methane;
        ii. oxygen;
        iii. carbon dioxide;
        iv. barometric pressure;
        v. hydrogen sulfide;
        vi. mercury;
        vii. volatile organic compounds (VOC's);
        viii. temperature; and
        ix. humidity;
    f. evaluate laboratory analysis data with the DEQ risk calculator and submit the results to the Unit PM;
    g. if mercury is detected by direct reading instrument action in a landfill gas probe or previously during surface screening, collect a sorbent tube sample for mercury in accordance with NIOSH Method 6009;
    h. provide a tabularized summary of the field instrument readings and calibration data in accordance with Appendix B.

58. Provide a map, titled "Landfill Gas Probe Results," that includes the following:
    a. unique identifier for each landfill gas probe;
    b. location of landfill gas probes;
    c. identify the landfill gas probes with detections using field instruments in accordance with Appendix B, item 4 (*Field Instrument Parameters and Equipment Requirements*); and
    d. identify the landfill gas probes with summa canister detections.

59. Provide a table, titled "Landfill Gas Probe Results," that includes the following:
    a. unique identifier for each gas probe;
    b. GPS coordinates for each gas probe location;
    c. field measurement results as outlined in item 57; and
    d. contaminant concentrations detected in summa canister samples.

Note: Once groundwater investigation and WDA landfill gas probe sampling is complete, a structural vapor intrusion investigation will be necessary if contaminants were detected above Branch vapor intrusion screening numbers for groundwater and soil gas. The DEQ risk calculator should be used to make this determination. If contaminants exceed vapor screening numbers, the Unit PM will evaluate the need for additional structural vapor intrusion sampling for current and future structures on or within 500 feet of the WDA perimeter and within 100 feet of the perimeter of groundwater volatile organic contaminant plumes.

60. Collect soil gas samples in locations designated by the Unit PM using batch-certified Summa canisters for VOC analysis in accordance with Appendix D, *Laboratory Analytical Parameters*. Sample collection must comply with the DWM Vapor Intrusion Guidance (in particular, collection protocols and Appendix B within the DWM Vapor Intrusion guidance). Soil gas samples should be collected ideally 10 feet bgs. However, sampling in areas of elevated groundwater contamination (source area) and/or closer to the water table will provide a conservative screen.

Note: Samples should only be analyzed for VOC contaminants previously detected and their degradation products using Method TO-15.

Note: If land use restrictions will be employed at the property so that no structures will be allowed on the landfill, no further structural vapor intrusion evaluation is needed on the WDA.

61. Compare the results of vapor intrusion soil gas testing to the Soil Gas Screening Levels on the Division's Vapor Intrusion Screening Tables. The vapor intrusion screening tables are available at the following website: https://deq.nc.gov/about/divisions/waste-management/waste-management-permit-guidance/dwm-vapor-intrusion-guidance. If the results exceed the vapor screening numbers, use the DEQ risk calculator to determine if the samples exceed site-specific adjusted levels.

62. Provide a map, titled "Soil Gas Probe Results," that includes the following:
    a. unique identifier for each soil gas probe;
    b. location of soil gas probes;
    c. identify the soil gas probes with summa canister detections.

63. Provide a table(s), titled "Soil Gas Probe Results," that includes the following:
    a. unique identifier for each gas probe;
    b. GPS coordinates for each gas probe location; and
    c. summa canister analytical results compared to Soil Gas Screening Levels.

Note: If the results of the soil gas testing exceed the site-specific adjusted vapor screening numbers, further vapor intrusion potential evaluation will be needed. Soil gas samples close to structures (current or potential future structures) may be the next step.

64. Collect crawlspace gas samples for laboratory analysis from buildings identified by the Unit PM in accordance with the following:
    a. samples must comply with the DWM Vapor Intrusion Guidance (in particular, collection protocols and Appendix B within the DWM Vapor Intrusion guidance);
    b. survey the crawlspace for background sources;
    c. if present, remove background sources 24 to 72 hours prior to sample collection;
    d. document background sources that cannot be removed and collect photos;
    e. screen for the following using field instrumentation to locate points of vapor entry and background sources to assist in determining sample locations and report each parameter in the units as outlined in Appendix B:
        i. methane;
        ii. oxygen;
        iii. carbon dioxide;
        iv. barometric pressure;
        v. hydrogen sulfide;
        vi. mercury;
        vii. volatile organic compounds (VOC's);
        viii. temperature; and
        ix. humidity;
    f. confirm that exhaust fans, clothes dryers, fireplaces and other items that may induce short term pressure changes are inoperable during the sampling event;
    g. collect samples using batch-certified Summa canisters and analyze for only VOC contaminants detected at the site and their degradation products;
    h. use TO-15 SIM if the TO-15 detection limits are not lower than the IHSB Indoor Air Vapor Intrusion Screening Levels;
    i. collect an exterior upwind background sample initiated 1 hour prior to the collection of the crawlspace samples;
    j. continuous supervision of the equipment by the consultant performing the test or secured access is required; and
    k. use the DEQ risk calculator to compare the results to risk targets.

65. Collect indoor air samples for laboratory analysis for buildings and locations identified by the Unit PM in accordance with the following:
    a. samples must comply with the DWM Vapor Intrusion Guidance (in particular, collection protocols and Appendix B within the DWM Vapor Intrusion guidance);
    b. survey the interior of the structure for background sources;
    c. if present, remove background sources 24 to 72 hours prior to sample collection;
    d. document background sources that cannot be removed and collect photos;
    e. screen for the following using field instrumentation to locate points of vapor entry and background sources to assist in determining sample locations and report each parameter in the units as outlined in Appendix B:
        i. methane;
        ii. oxygen;
        iii. carbon dioxide;
        iv. barometric pressure;
        v. hydrogen sulfide;
        vi. mercury;

vii. volatile organic compounds (VOC's);
viii. temperature; and
ix. humidity;

f. confirm that exhaust fans, clothes dryers, fireplaces and other items that may induce short term pressure changes are inoperable during the sampling event;
g. collect samples using individually-certified Summa canisters and analyze for only VOC contaminants detected at the site and their degradation products;
h. use TO-15 SIM if the TO-15 detection limits are not lower than the IHSB Indoor Air Vapor Intrusion Screening Levels;
i. collect an exterior upwind background sample initiated 1 hour prior to the collection of the indoor samples; and
j. continuous supervision of the equipment by the consultant performing the test or secured access is required.

66. Provide a table, titled "Structural Vapor Intrusion Potential," that includes the following:
    a. unique identifier for structures screened for vapor intrusion potential;
    b. GPS coordinates for each structure screened for vapor intrusion potential;
    c. laboratory results compared to Indoor Air Vapor Intrusion Screening Levels; and
    d. if the laboratory results in item 66c exceed the Indoor Air Vapor Intrusion Screening Levels then the DEQ risk calculator must be used to determine if results meet risk targets.

Note: Contact the Unit PM immediately upon receipt of any indoor-air samples that exceed DEQ risk calculator target.

CONTAMINANT SOURCES AND IMPACTED RECEPTORS

67. Identify contaminant sources that maybe contributing to the potential and/or documented contamination at the pre-1983 landfill.

68. Provide a map, titled "Contaminant Sources and Impacted Receptors," that includes the following:
    a. unique identifier for points of contamination and impacted receptors;
    b. location of each impacted receptor;
    c. contaminants with associated concentrations impacting each receptor; and
    d. iso-concentrations for each contaminant;

69. Provide a table, titled "Contaminant Sources and Impacted Receptors," that includes the following:
    a. unique identifier for points of contamination and impacted receptors; and
    b. contaminants (including degradation products) in concentrations by media type.

RI SUMMARY REPORT

Once the Unit PM is satisfied the RI phase is complete the Contractor PM will receive authorization to draft the RI summary report according to the requirements outlined in Appendix E, *Remedial Investigation Summary Report Template*.

REMEDIAL ACTION PLAN DESIGN

The Unit PM and Unit Supervisor will meet with the assigned Contractor PM to discuss a WDA remedy and any remedy for other contaminated media (i.e. groundwater, surface water, vapor or exposed contaminated soils) based on risks posed and determine the appropriate risk based remedial activities for the site. The Unit PM will authorize the RAP design (RAPD) phase after the review meeting. The Contractor PM is responsible for acquiring all applicable permits and approvals during the RAPD phase to ensure there is not a delay implementing the RAP.

Non-containment remedies may be evaluated at landfills with less than 10,000 cubic yards of waste. This is especially important at landfills having groundwater contamination and/or those having the potential for vapor intrusion into structures.

1. Elements of the remedy will most often include:
    a. removal and proper disposal of any exposed waste and/or surface debris;
    b. excavation and removal of waste "hotspots" causing localized groundwater or vapor contamination;
    c. removal of wastes and consolidation on one property if material to be moved is not significant;
    d. additional efforts to stop leachate seepage;
    e. excavation of waste in easements to clear utility corridors;
    f. excavation of waste to create a buffer between the WDA and/or other receptors;
    g. slope stabilization; and
    h. installation of an engineered WDA cover system (containment remedies).

At a minimum, the RAP must include the following:

Note: This is not an exhaustive list of RAP criteria and the Unit may request additional items for consideration during the RAPD phase to address site specific conditions.

2. A summary of the results of the RI including media contaminated, contaminants of concern and the areal and vertical extent of contamination.

3. A brief evaluation of available risk-based remedial alternatives using the following feasibility study criteria:
    a. protection of human health and the environment, including attainment of cleanup levels;
    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 (i.e., effectiveness at minimizing the impact of the site remedial action on the environment and the local community);
    f. implementability (i.e., technical and logistical feasibility, including an estimate of time required for completion);
    g. cost; and
    h. community acceptance.

4. A detailed description and conceptual design of the proposed remedy, for each contaminated medium including an evaluation of the potential for the remedy to affect sensitive environments identified.

5. A description of well installation and abandonment, stormwater management and management of investigation and remedial action derived wastes (i.e. purge water and drill cuttings).

6. Mitigation measures pertaining to Waters of the United States (404/401 permits, buffer permitting and pre-construction notifications).

7. Planned erosion control measures must be designed to manage a twenty-five-year storm event. The Contractor design engineer must meet with the Unit and the Division of Energy, Mineral & Land Resources to ensure storm water and erosion control regulatory compliance.

8. A description of procedures and a schedule for construction, implementation, operation and maintenance, system monitoring and performance evaluation, and progress reporting. The construction schedule must include the total time needed to complete the remedy plus the average number of adverse weather days for the proposed time of year. The number of proposed adverse weather days per month, must be based on the number of days each month with recorded rainfall equal to one inch or greater in a 24-hour period averaged for the past three calendar years. The expectation is to develop a realistic construction schedule to include the average number of adverse weather days.

Note: The National Oceanic and Atmospheric Administration (NOAA) should be used to establish the number of proposed adverse weather days per month using the following website: https://www.ncdc.noaa.gov/cdo-web/datatools/lcd. **Select the county corresponding to the location of the pre-1983 landfill and add the county station to the cart. Once added to the cart, select the file format, daily output and the date range for the requested report.**

9. A description of procedures for post-remedial and confirmatory sampling for any areas of contaminated soil removal.

10. Identification of Off-site borrow material that will be used for the engineered WDA cover system. Fill must be evaluated pursuant to the guidance outlined in Appendix G, *Borrow Soil Location and Sampling Procedure*.

11. An evaluation of the off-site borrow material analytical results using the DEQ risk calculator to ensure the material is acceptable for use in the engineered WDA cover system. The risk calculator results must be submitted to the Unit PM for review before any material is transported to the site.

12. An evaluation of surface preparation techniques and engineered WDA cover systems according to the guidance outlined in Appendix H, *Engineered Cover Systems*.

13. A description of procedures for establishing a vegetative cover as a component of the engineered WDA cover system.

14. A health and safety plan that assures that the health and safety of nearby residential and business communities will not be adversely affected by exposure to site contaminants and activities related to the remedial action. The plan should conform to all local, state, and federal regulations for health and safety.

15. Equipment and personnel decontamination procedures.

16. All professional work must be signed and sealed by the appropriate professionals, if necessary (e.g., licensed geologist, registered professional engineer, etc.). A single document may require the signature and seal of more than one professional.

PUBLIC COMMENT

1. All draft RAPs must be made available for public comment prior to final approval by the Unit and implementation.

2. Before the Unit approves the draft RAP, the Unit will distribute copies to the following:
    a. impacted property owners (parcels containing the WDA and adjoining parcels);
    b. local government officials (city/town manager or county manager depending on the location of the pre-1983 landfill);
    c. the county health director; and
    d. the public library closest to the site location.

3. Before the Unit approves each draft RAP, the Unit will give notice of the proposed plan by publishing weekly for a period of three consecutive weeks in a newspaper having general circulation in the county or counties where the site is located and by mail to persons that have requested to be on the mailing list for the site in accordance with NCGS 130A-310.4(c)(2).

4. The public comment period must remain open for 45 days after the three-week publication in a local newspaper to allow for receipt of written comments before the RAP is approved.

5. The Unit will conduct a hearing if there is significant public interest at the site:
    a. the hearing date and time will be posted 30 calendar days in advance of the scheduled hearing; and
    b. the public comment period will extend to 20 calendar days after the date of the scheduled hearing.

6. All public comments will be evaluated and considered before finalizing the draft RAP.

REMEDIAL ACTION IMPLEMENTATION

The RA phase is the implementation of the final RAP. The Contractor PM must submit a final RAP to the Unit based on applicable public comments, prior to commencement of RAP activities and include an updated implementation timeline.

RECORDATION OF LAND USE RESTRICTIONS AND NOTICE PLATS

1. Land use restrictions and the associated Notice Plat, approved by the Unit, must be recorded prior to the Unit authorizing the implementation of the RAP. On properties contaminated by the site, but outside the WDA, a Notice or land use restriction instrument alone may be recorded depending on the nature of the contamination.

2. Land use restrictions and a Notice Plat will not be required when all waste will be removed and all media pass unrestricted use standards.

3. Instructions for preparing a Notice Plat and recordation instructions are outlined in Appendix A, *Instructions for Preparing a Notice Plat for Recordation*.

WDA REMEDY

4. The Contractor PM will prepare a request for proposal (RFP) for advertisement, in accordance with NCGS Chapter 143, Articles 3D and 8, to select a sub-contractor to implement the construction components of the RAP.

5. A pre-bid meeting will be held for all interested parties at the WDA.

6. The RFP advertisement must be published for 15 calendar days and include the following:
    a. WDA name and location;
    b. location of bidding documents drafted by the Contractor (Contractor website);
    c. contractor PM contact information (name, phone number and email); and
    d. day, time and location when the sealed bids will be opened (NCDEQ, 217 West Jones Street, Raleigh, NC 27603).

SOIL, GROUNDWATER AND WASTE HOT SPOT REMEDIATION

7. Active soil remediation will most often precede WDA remediation unless incorporated in the waste.

REMEDIAL ACTION PROGRESS REPORTS

Daily remedial action progress reports must be submitted to the Unit PM.

8. The daily progress report must include the following:
    a. pre-1983 landfill name and identification number;
    b. location;
    c. date;
    d. temperature (ºF);
    e. weather;
    f. name, company affiliation and title for all personnel on-site;
    g. equipment:
        i. description;
        ii. number on-site; and
        iii. number in-use;

h. narrative outlining all activities for the day listed by applicable time the action occurred;
i. signature of on-site Contractor representative; and
j. photographs documenting the daily activities.

Monthly remedial action progress reports must be submitted to the Unit PM.

9. The progress report must include the following:
    a. operation and maintenance results; and
    b. discussion of major problems encountered.

REMEDIAL ACTION COMPLETION REPORT

Remedial action completion reports must be submitted to the Unit within 30 calendar days of the Division of Energy, Mineral and Land Resources (DEMLR) closing the erosion and sedimentation control permit for the site.

10. The RA completion report must include the following:
    a. results of the remedy;
    b. final drawings (as-built plans and specifications);
    c. summary of variances from the final design plans (approved work variances and change orders);
    d. summary of any problems encountered during construction;
    e. post remedy confirmation sampling;
    f. monitoring requirements;
    g. appropriate certification statements or forms;
    h. verification DEMLR closed the erosion and sedimentation control permit and all erosion control measures have been removed from the site;
    i. photographic record of completed RAP;
    j. summary of remedial action operating experience and effectiveness in meeting design specifications; and
    k. discussion of criteria for remedial action completion.

11. For remedial action completion the following certification language must also be included in the report:

    "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."

APPENDIX A: INSTRUCTIONS FOR PREPARING A NOTICE PLAT FOR RECORDATION

The following is a list of instructions to assist in the preparation and recordation of a survey plat that serves as a notice of contamination and institutional control (Notice Plat). Populate/modify the italicized text within the brackets [*fill in*] to reflect site specific information.

1. The Notice Plat of the subject property must be prepared and certified by a professional land surveyor registered in North Carolina. Every notice plat should cover the entire property unless the property is extremely large or otherwise problematic to resurvey. The modification of an existing survey prepared by another surveyor is allowed if approved by the Unit PM.

2. The Notice Plat must meet the requirements of NCGS 47-30 for maps and plats (some, but not all are specified below) and any requirements of the Register of Deeds in the county where the site is located. The notice plat must be drawn in indelible ink on mylar (no sepia mylar). In certain circumstances as specified in NCGS 47-30 the plat may be submitted in the form of black line on white paper instead of transparent and archival, and include:
    a. a title block located at one of the plat perimeters with the following:
        i. Notice of Inactive Hazardous Substance or Waste Disposal Site NCGS 130A-310.8;
        ii. the name of the site and the PRLF identification number (precede with the phrase "A portion of the Site:" if the property is but one part of the overall contaminated site);
        iii. the names of the current owner(s) exactly as they appear on the existing property deed;
        iv. the property township, county and state, the date(s) of the survey, a scale, and name and address of surveyor or firm preparing the plat;
    b. property lines with bearings and distances, a north arrow (specifying whether true or magnetic), datum used (NAD 83 or NAD 27) or references to previously recorded deed or plat bearings (if based on magnetic north or referenced to previously recorded deed or plat bearings, must include the date and source the index was originally determined);
    c. identification of all adjacent property owners;
    d. a vicinity map;
    e. unique site features;
    f. on-property structures;
    g. a notes section including the following information:
        i. a list of hazardous substances known to be present in each environmental medium (soil, groundwater, surface water, and sediment);
        ii. the following language: "The contaminant information identified on this Notice Plat is based on the best available information at the time of filing";
        iii. if the Notice Plat is being recorded in conjunction with the recordation of a Land Use Restrictions document, the following language: "A Land Use Restrictions document entitled "[*enter the appropriate title, e.g., Declaration of Perpetual Land-Use Restrictions*]" limiting the uses of this property, is being recorded concurrently with this Notice Plat";
        iv. the following instructional language (shown in the box below):

When this property or any part of it is sold, leased, conveyed or transferred, North Carolina law requires that the following language be placed in the description section of the deed or other instrument of transfer in no smaller type than that used in the body of the deed:

This property has been used as a hazardous substance or waste disposal site. A Notice Plat is recorded at the [*fill in*] County Register of Deed's office in Map Book [*fill in*], Page [*fill in*].

h. with respect to a surveyed corner of the affected property, the location and dimensions of areas of the property where hazardous substances are known to have been disposed (only areas with distinct boundaries such as landfills, trenches, and open impoundments or pits; not spills or indistinct releases);
i. areas of contamination (groundwater contaminant plume);
j. delineated waste disposal area;
k. with respect to a surveyed corner of the affected property, the location of on-site wells (potable, production, monitoring and any other type) where hazardous substances have been detected in groundwater, unless each hazardous substance detected has an associated 15A NCAC 2L groundwater standard and the concentration is below such standard; and
l. the surveyor's certification and seal (using a permanent ink stamp) which includes, but is not limited to, specification of the source of information for the plat, the ratio of precision, and the type of survey pursuant to NCGS 47-30 (f)(11).

3. In cases where a Notice Plat is needed on a nearby, non-source property because the property's groundwater is currently affected or could become affected by the source property contamination in the future, the notes section should include the following:
   a. the condition of groundwater at the property (e.g., current, predicted, or threat of groundwater contamination). In the latter case, the notes should state that the property is currently not affected by the identified source-property contamination, but based on the information collected to date, a threat of contamination may exist if a water supply well(s) are installed on the property;
   b. the following language (shown in the box below):

Pursuant to 15A North Carolina Administrative Code 02C .0107 (b)(1), the source of water for any water supply well shall not be from a water bearing zone or aquifer that is contaminated. Therefore, state law prohibits construction of a water supply well on this property. Further, pursuant to North Carolina General Statute 87-88(c) and 15A North Carolina Administrative Code 02C .0112(a), no well may be constructed or maintained in a manner whereby it could be a source or channel of contamination of the groundwater supply or anyaquifer.

   c. reference to any local ordinances relating to groundwater use (water line connection requirements, well-installation prohibitions or groundwater-use restrictions, for example);

d. the following language positioned in the upper left corner of the plat:

Approved for the purposes of [*fill in the appropriate statutory reference from the table*].

_____

[*Enter the appropriate representative, e.g., Jim Bateson, LG*]
[*Chief, Superfund Section*]
[*Division of Waste Management*]

NORTH CAROLINA
WAKE COUNTY

I,_____, a Notary Public of said County and State, do hereby certify that_____ did personally appear and sign before me this the_____ day of_____, _____.

_____

Notary Public (signature)

My commission expires_____,_____. (official seal)

e. owner acknowledgement consisting of the printed name(s), title(s) and properly notarized (using a permanent ink stamp) signature(s) (signature(s) made in indelible ink) of individual(s) with authority to legally bind the property owner(s), with the following language:

This certifies that the undersigned is (are) the owner(s) of the property shown on this map.

_____

[*Owner or Owner's Representative signature*]

_____

[*Owner or Owner's Representative Name*]

_____

[*Owner or Owner's Representative Title and Organization*]

[*State*]
[*County*]

I,_____, a Notary Public of said County and State, do hereby certify that_____ did personally appear and sign before me this the_____ day of_____, _____.

_____

Notary Public (signature)

My commission expires_____,_____. (official seal)

4. The draft Notice Plat must be delivered directly to the Unit PM for review. After receiving approval from the Unit PM, the final Notice Plat must be delivered to the Unit PM at one of the addresses below (Do Not Fold Document):

   Via Overnight Courier or Hand Delivery
   NC Division of Waste Management
   Pre-Regulatory Landfill Unit
   DEQ Office Building
   217 W. Jones Street
   Raleigh, NC 27699

   Or

   Via US Mail
   NC Division of Waste Management
   Pre-Regulatory Landfill Unit
   1646 Mail Service Center
   Raleigh, NC 27699-1646

5. After the Unit approves and certifies the Notice Plat, the Contractor PM must, within fifteen (15) days of receiving said approval:
   a. file a certified copy of the Notice Plat in the site's county Register of Deeds' office; and
   b. send the Unit PM, (1) an electronic version of the Notice Plat affixed with the seal of the Register of Deeds and reflecting the book and page number where recorded, and (2) an electronic copy of the page in the grantor index where the Notice Plat is referenced.

Important: If the Notice Plat is being recorded concurrently with a Declaration of Perpetual Land Use Restrictions (DPLUR) document, these documents must be recorded as follows: The Notice Plat must be recorded first and assigned book and page numbers. The book and page numbers where the Notice Plat is recorded must be hand written in the designated blanks on the DPLUR document prior to the DPLUR document being recorded.

APPENDIX B: FIELD PROCEDURES AND SAMPLE COLLECTION TECHNIQUES

Sample collection and analyses must be performed by persons who are qualified by education, training, and experience. Field procedures relating to sample collection techniques, sample containers, sample preservation, sample holding times equipment decontamination and field measurement procedures, must comply with the most current version of the United States Environmental Protection Agency (USEPA) Region IV Science And Ecosystem Support Division (SESD) *Field Branches Quality System and Technical Procedures*. The technical procedures are available at the following website: https://www.epa.gov/quality/quality-system-and-technical-procedures-lsasd-field-branches
In addition to the standard protocols outlined in the USEPA technical procedures referenced above, the following are required:

1. Collect GPS coordinates of all sample locations (soil, sediment, borings) and if needed, stake and flag until the remedial investigation is complete.

2. A professional land surveyor, registered in North Carolina, must survey all permanent monitoring locations (gas probes and monitoring wells).

3. Field QC samples are required for each sampling event (field day) and each laboratory if different laboratories are utilized for the same sampling event. Include the following for each sampling event unless additional QA/QC testing is specified by the Unit PM:
    a. one duplicate sample (for multi-point soil or monitoring well sampling events only):
        i. per medium; and
        ii. per container type;
    b. one equipment rinsate blank for monitoring well sampling events (collect prior to sample collection);
    c. trip blank.

4. Field Instrument Parameters and Equipment Requirements.
Portable field instrumentation must be capable of detecting the following parameters:
    a. methane instruments must have an infrared sensor capable of detecting methane at 2,500 ppm or 0.25% by volume of air and 5% LEL. Methane must be reported in three formats:
        i. percent of lower explosive limit (% LEL);
        ii. percent by volume in air;
        iii. micrograms per cubic meter ($\mu g/m^3$);
    b. oxygen as percent by volume in air;
    c. carbon dioxide as percent by volume in air;
    d. barometric pressure;
    e. hydrogen sulfide instrumentation for ambient air measurements must have a gold film sensor or equivalent and instrumentation for subsurface measurements must have an attachment with an infrared sensor. Instrument detection limits must meet the IHSB residential vapor intrusion screening levels. Hydrogen sulfide must be reported in the following formats:
        i. percent by volume in air;
        ii. parts per million (ppm); and
        iii. micrograms per cubic meter ($\mu g/m^3$);

f. volatile organic compounds (VOC's by PID) as micrograms per cubic meter ($\mu g/m^3$) and parts per million (ppm);
g. temperature as degrees Fahrenheit; and
h. humidity as percent by volume in air.

Note: 10,000 ppm of methane in air equals 1% by volume or 20% LEL. The global background concentration for surface methane is about 0.75 ppm from decay of vegetation. Levels may be higher near wetlands and sewer lines.

5. Field Instrument Calibration Data, Quality Assurance Data and Reporting Requirements.
   Include all of the following in the landfill gas evaluation report:
   a. instrument manufacturer;
   b. model number;
   c. serial number;
   d. date of factory calibration (annual) and maintenance parameters;
   e. instrument detection limits (upper and lower);
   f. field calibration data:
      i. date and time of field calibration (must be same day as screening);
      ii. bump test(s) to verify proper calibration and instrument accuracy is maintained before, during and after evaluation;
      iii. type(s) of calibration gas and expiration dates;
      iv. additional field calibration if specified by the manufacturer due to changing weather conditions (such as barometric pressure, temperature, etc.);
   g. field conditions:
      i. name(s) of person conducting the evaluation;
      ii. brief description of weather conditions and other possible impacts on data: windy, nearby exhaust from vehicles etc.;
      iii. date and time began/end of field screening; and
      iv. ambient temperature, humidity and barometric pressure readings (collected at least hourly during field sampling).

6. Field Instrument Survey Results
   Provide a table in the landfill gas evaluation report that includes the following:
   a. sample location;
   b. instrument readings;
   c. observations that may affect the results like a water trap, filters, increasing barometer pressure, significant change in the temperature, etc;
   d. at least two (2) readings must be recorded and reported anywhere there is equal to or greater than 2% change in the reading; and
   e. two readings must be recorded for the background locations and two other randomly selected monitoring points for all direct read instruments.

Note: Manufacturer calibration is not the same as field calibration.

7. Sampling must be planned so that required holding times for analytical methods are met.

8. Potable Water Supply Well Sampling

Potable water supply well sampling must comply with the following:

a. record the location of each water supply well using a hand held GPS unit in accordance with the spatial data requirements outlined in this document;
b. photograph each water supply well to document the following:
    i. well location related to the residence (view from driveway if both residence and well can be captured in the same frame showing house number);
    ii. current condition of the wellhead;
    iii. sampling location (valve at wellhead or hose bib on residence);
c. record the sampling location (i.e. valve at wellhead or hose bib outside the house);
d. do not remove or alter insulation, heat tape or other site specific items that the homeowner has installed on their wellhead (document the current condition and sample the well as close to the wellhead as possible);
e. record site specific conditions that might impact the well (debris surrounding the well or industrial operations);
f. water supply well sampling steps (collect a total of 3 samples, pre-purge, 15-minute purge and additional 15-minute purge, and the sample with the lowest turbidity reading will be analyzed)
    i. collect initial turbidity reading and sample if the well has been in use that day;
    ii. purge tap for 15 minutes;
    iii. collect additional turbidity, conductivity and pH (at least 3 sets) readings during purging;
    iv. collect additional sample if the post-purge turbidity is lower than the pre-purge turbidity reading and discard the pre-purge sample;
    v. if post-purge turbidity reading has increased, purge an additional 15 minutes and recheck turbidity;
    vi. if turbidity is lower, follow the procedure in item iv;
    vii. if turbidity is higher, collect and filter sample and analyze with initial unfiltered (pre-purge) sample at the site. Only analyze for contaminants detected in groundwater and their degradation products unless a groundwater investigation has not been conducted. In which case, only analyze for VOCs, but include all US EPA Target Compound List analytes;
g. record the amount of time the well was purged in minutes;
h. document the total volume of water purged;
i. prepare trip blanks for each sampling event (if more than one laboratory is used, each laboratory must have a trip blank for analysis);
j. for sites with a completed remedial investigation, include only contaminants identified including TICs (library search) if retained as contaminants of concern and the degradation product of the contaminants; and
k. samples collected for Volatile Organic Analysis (VOA) should be collected directly into sample containers without mixing. Composite samples are not permitted.

9. Groundwater Samples

The following must be considered when collecting groundwater samples:

a. filtration of samples for metals analysis before acid digestion is not permitted (See exception for hexavalent chromium in water in Appendix D);
b. samples for hexavalent chromium analysis should not receive acid preservatives and should be collected in a separate container from those for other metals analysis;

c. if turbidity is a problem:
    i. collect samples using low-flow purging and sampling techniques; or
    ii. passive bag samplers;
d. additional well development may be necessary; and
e. rapid analysis is recommended to reduce contact time with the acid preservative.

10. Surface Water Samples
The following must be considered when collecting surface water samples:
    a. shallow surface waters (less than six inches deep) or highly turbid, samples may be collected in a separate collection container and then decanted into the sample container;
    b. samples for VOA must be decanted into the sample container immediately;
    c. samples for metals analysis may be allowed to settle for a few minutes prior to decanting; and
    d. all collection containers must be made of the same materials, be pre-cleaned and handled in the same manner as the sample container.

11. All soil, sediment and waste samples for VOA should be collected directly into sample containers without mixing.

12. Landfill Gas Probe Installation:
    a. gas probes will be needed to evaluate the potential for vapors associated with the landfill;
    b. Figure 1 depicts construction standards for gas probes;
    c. gas probes should be sealed at least five feet below ground surface (shallower depths may draw air from the surface) and the screened interval must be at least two feet above seasonal high groundwater (if encountered);
    d. five feet of screen is optimal, but a gas probe may be constructed with a minimum of two feet of screen;
    e. gas probes should be installed in areas where detectable concentrations of measured vapors were identified during the above ground vapor screening, areas of known chemical disposal or areas of high groundwater concentrations of volatile hazardous substances;
    f. gas probes are not required to have a protective casing (unless in areas available to the public) but must be locked with a locking expansion plug;
    g. slip caps fitted with tubing that connects to the field instrumentation may be used for measurements by removing the expansion plug and immediately sliding the slip cap on the probe;
    h. tubing from the probe may have a crimping device to control the flow through the tubing as needed;
    i. at sites where geologic conditions prevent construction of gas probes, flux chambers may be used (results from flux chambers are qualitative and not quantitative);
    j. recess the flux chamber (Figure 2) into the ground surface and seal with grout or hydrated bentonite;
    k. attach to the chamber air tight fittings that allow connections to either field instruments and/or summa canisters;
    l. use water trap filters in the sample line when moisture or liquid is found in the gas probe; and

m. record the length of time a calibrated field instrument is connected to the flux chamber when taking a reading so the procedure may be duplicated if re-testing is needed.

Figure 1: Landfill Gas Monitoring Probe

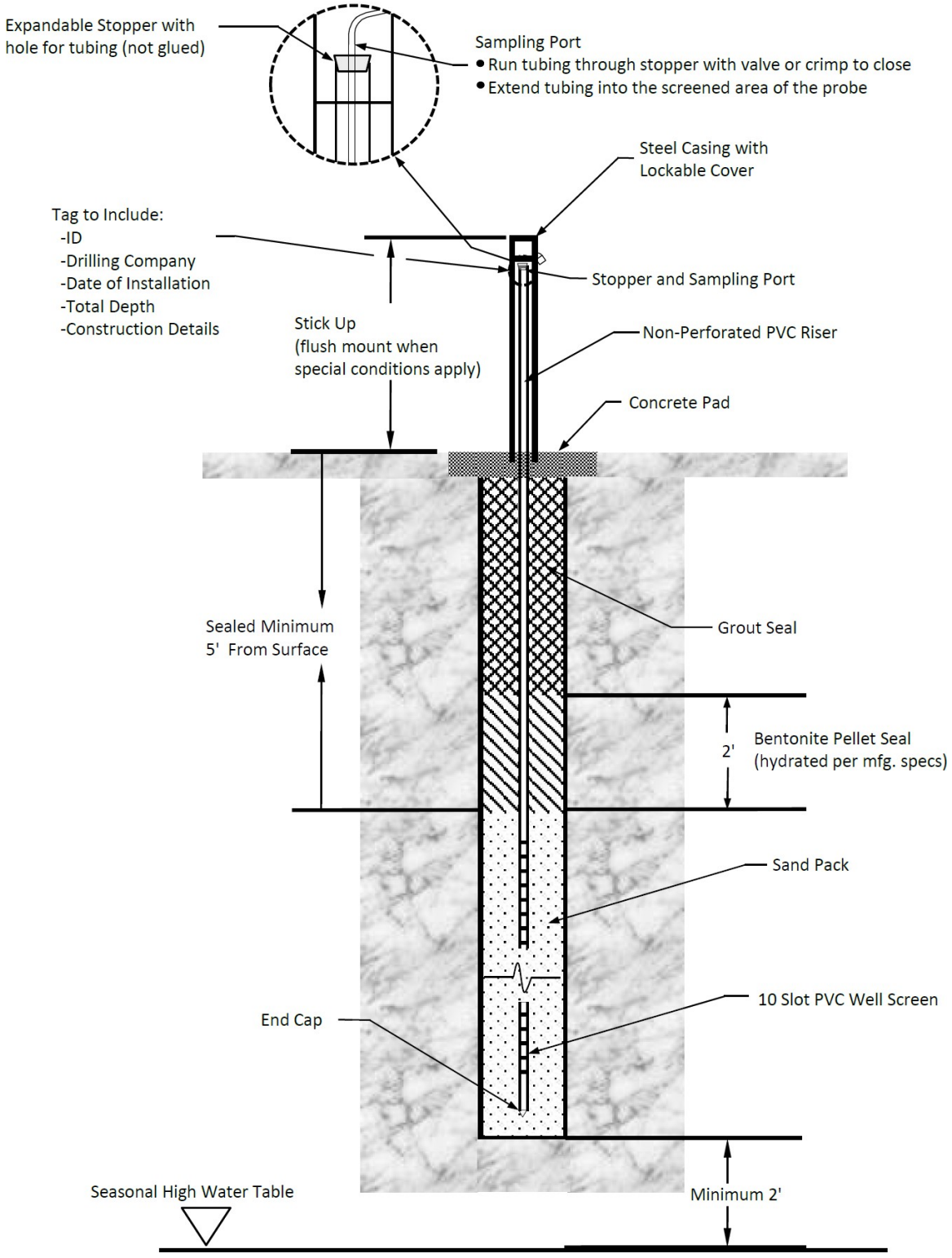
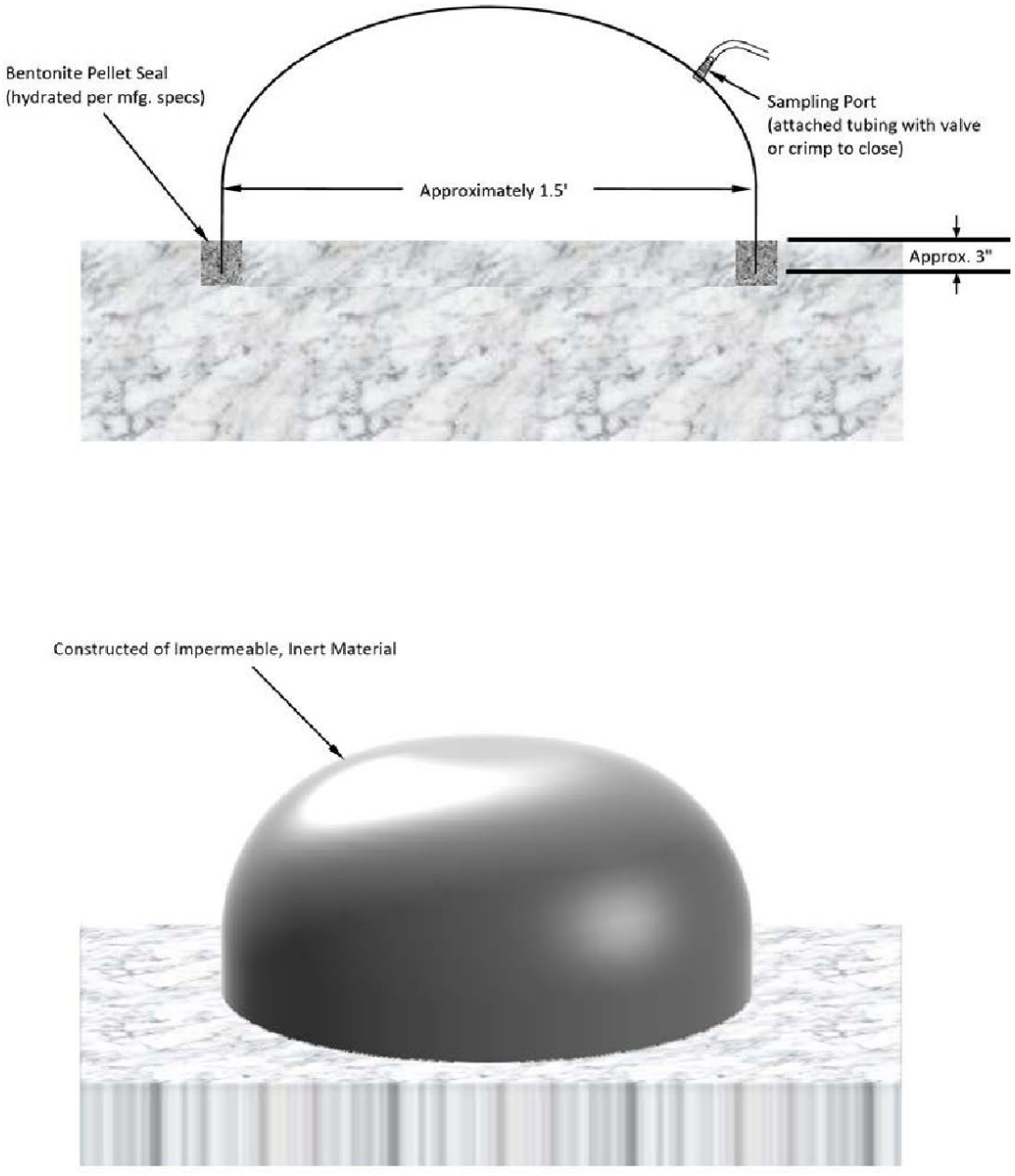


Figure 2: Flux Chamber



APPENDIX C: ASBESTOS CONTAINING MATERIAL

1. The presence of asbestos containing materials (ACM) must be determined if removal of waste material or waste consolidation is being considered as part of the remedy. If any suspected ACM are observed (demolition debris would be considered suspect) during the site investigation phase, collect samples from the suspect materials for analysis to determine percent asbestos. No additional activities should take place in the suspect area until the presence and concentration of ACM is known.

2. When asbestos is present at concentrations of 1% or greater and the remedy will cause disturbance or exposure of the ACM, then a supplement to the remediation plan for asbestos remediation cleanup is needed. The remediation contractor must arrange to have the asbestos remediation plan reviewed, approved and undersigned by an asbestos designer. A trained asbestos inspector must be on site during the asbestos remediation to ensure that National Emission Standards for Hazardous Air Pollutants (NESHAP) requirements are met, which is to identify suspect material and determine if planned handling and disposal procedures require change.

3. At least 45 days prior to any disturbance of the ACM as part of remedial activities, a cover letter and completed *Asbestos Permit Application and Notification for Demolition/Renovation* form must be submitted as a courtesy notification to Jeff Dellinger, Health Hazards Control Unit, NCDHHS-Division of Public Health. To obtain the form go to https://epi.dph.ncdhhs.gov/asbestos/ahmp.html. Select "Forms and Applications," followed by "DHHS 3768: Asbestos Permit Application and Notification for Demolition/Renovation." There are no fees associated with this submittal.

4. At sites where no suspect ACM has been observed and disturbance of waste is taking place as part of remedial activities, the remediation contractor must have a trained asbestos inspector engaged and on call in the event any demolition debris is exposed. No earth moving or removal activities will take place in the suspect area until asbestos sampling is conducted and the results are used to determine how to safely proceed.

5. In general, management of any asbestos present in concentrations greater than 1% needs to comply with NESHAP requirements. The remediation plan must include the following elements:
    a. review and signature by an asbestos designer;
    b. a trained inspector on site;
    c. keeping the ACM adequately damp;
    d. no crushing of the demolition debris or ACM; and
    e. keeping excavated ACM properly covered and labeled until disposed at an approved facility.

6. For additional information regarding asbestos regulation and guidance please contact: Jeff Dellinger, Health Hazards Control Unit, North Carolina Department of Health and Human Services.
   Telephone number: (919) 707-5972 or email jeff.dellinger@dhhs.nc.gov
   Web site: https://epi.dph.ncdhhs.gov/asbestos/healthaz.html

Edgar Geddie, Occupational Safety and Health Program, North Carolina Department of Labor
Telephone number: (919) 807-2880.
Web site: https://www.labor.nc.gov/safety-and-health/occupational-safety-and-health/occupational-safety-and-health-topic-pages/asbestos

APPENDIX D: LABORATORY ANALYTICAL PARAMETERS

GENERAL INSTRUCTION

1. All samples must be submitted to a certified laboratory under 15A NCAC Subchapter 02H .0800 or be a contract laboratory under the USEPA Contract Laboratory Program.

2. The Contractor PM must provide a copy of Appendix D to the laboratory to ensure appropriate analyte lists are used in the analysis of samples.

3. Initial analyses of all non-gas samples should include the parameters listed below:
    a. Hazardous substance list metals (totals analysis) which include antimony, arsenic, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, mercury, nickel, selenium, silver, thallium, and zinc. Hexavalent chromium is the most toxic chromium species. Hexavalent chromium testing is only needed for soils if total non-speciated chromium concentrations (by totals analysis) exceed the site-specific natural background concentrations and the hexavalent chromium soil remedial goal;
    b. If coal ash is known or suspected to have been discharged at the site, the following additional toxic, non-hazardous substance metals should be included in the testing of groundwater: boron, lithium, molybdenum, strontium and vanadium;
    c. Volatile and semi-volatile organic compounds:
        i. use the most current published USEPA Target Compound List;
        ii. include a library search (using National Institute of Standards and Technology mass spectral library) to produce a list of tentatively identified compounds (TICs) for groundwater (monitoring wells only, not water supply wells) and when assessing existing soil cover for evaluation as the permanent cover system;
        iii. the library search should identify TICs for the largest 10 peaks in each analytical fraction having reasonable agreement with reference spectra (i.e. relative intensities of major ions agree within ± 20%); and
        iv. the list of identified TICs should not include laboratory control sample compounds, surrogates, matrix spike compounds, internal standards, system monitoring compounds or target compounds;
    d. Ammonia, nitrates, nitrites and sulfate;
    e. Pesticides, PCBs, dioxins, cyanide, formaldehyde, phosphorous and any other CERCLA hazardous substance or pollutants not mentioned here if suspected to have been discharged at the site;
        i. If PCBs are a known or suspected contaminant of concern in soils that will remain exposed, first phase samples should be collected in the area of highest concentration and analyzed using congener specific analysis. The congener analysis should specify the dioxin-like PCB congeners. Additionally, Total PCB analysis should be run on these samples. The sum of the dioxin-like PCB congener concentrations should be subtracted from the Total PCB analytical result. The resulting concentration must then be compared to the Branch's allowable concentrations for non-dioxin like PCBs. If concentrations detected are less than soil remedial goals for both the individual dioxin-like congeners and for the total non-dioxin like

congeners, no additional PCB sampling is required. If concentrations exceed applicable remedial goals, more gross delineation can be performed using total PCB analyses and then the perimeter of the extent of contamination samples run for the dioxin-like congeners found at the site. In areas where PCBs are detected, soil samples should also be collected and analyzed for VOCs because they are commonly present as carriers for PCBs. If soils are found to exceed PSRGs, an evaluation of anthropogenic background concentrations may be warranted. Groundwater samples should be analyzed for *Total* PCBs and the results compared to the 15A NCAC 02L standards; and

ii. If cyanide is a known or suspected contaminant of concern, cyanide should be analyzed using total cyanide methods.

4. Any TICs that are hazardous substances, that have reasonable agreement with reference spectra (according to paragraph c iii), 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, non-toxic or documented from an anthropogenic source. 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.

5. If laboratory sample dilutions were performed on initial samples, subsequent phase samples must be analyzed for the entire analytical fraction previously diluted. Sample dilutions raise analytical detection limits and can mask the presence of other constituents at lower concentrations.

6. 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.

7. After completing the first phase of sampling in source areas, subsequent samples may only need to be analyzed for those compounds detected in the first phase and their degradation products.

8. If soils are found to exceed PSRGs for PCBs, PAHs or dioxins, if analyzed, an evaluation of anthropogenic background concentrations may be warranted.

9. Dissolved methane in groundwater may be a concern at sites with methane migration. Concentrations greater than 28 mg/l could potentially cause flammable or explosive levels in confined spaces like crawl spaces, well houses or pipes.

ANALYTICAL METHODS

Table 1: Soil, Sediment and Waste Analytical Methods.

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, Herbicides, PCB congeners, Dioxins, Cyanide, Phosphorous, Formaldehyde and any other analytes not covered by above methods	USEPA method or method published in *Standard Methods for the Examination of Water and Wastewater* having detection limits below unrestricted use remedial goals or having the lowest detection limit. For PCB congeners use USEPA Method 1668.
Hexavalent chromium (if total chromium exceeds the site-specific natural background concentrations and the remedial goal for hexavalent chromium)	SW-846 Method 3060A[4] alkaline digestion coupled with a USEPA method or method published in *Standard Methods for the Examination of Water and Wastewater* having detection limits below unrestricted use remedial goals or otherwise having the lowest detection limit.
Ammonia	USEPA Method 350.1
Nitrate & Sulfate	USEPA Method 300.0 or 353.2

Table 2: Water Analytical Methods 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], Pesticides, Herbicides, PCBs[6], Dioxins, Cyanide[7], Phosphorous, Formaldehyde and any other analytes not covered by above methods	USEPA method or method published in *Standard Methods for the Examination of Water and Wastewater* having the lowest detection limits or having detection limits below the 15A NCAC 02L 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)[8, 9]	USEPA Method 218.7 or Method 218.6 as modified by USEPA Region IV.
Ammonia	USEPA Method 350.1
Nitrate & Sulfate	USEPA Method 300.0 or 353.2
Dissolved methane[10]	Method RSK 175

Table 3: Gas Analytical Methods.

Volatile Organic Compounds using batch-certified or individually certified (indoor air only) Summa canisters	Method TO-15 or TO-15 SIM (indoor air or crawlspace only)
Hydrogen Sulfide	USEPA Method 15
Mercury[11]	NIOSH 6009

References for Tables 1, 2 and 3:

1. *Analyses must include the USEPA Target Compound List plus a library search in certain cases as described in paragraph 3a, Appendix D.*

2. *1, 4-dioxane analysis must be conducted if chlorinated solvents are present or if it is a suspected contaminant of concern.*

3. *ICP-MS should be used instead of ICP when conducting first phase metals scans due to lower quantitation limits and less (metals) interference issues. However, ICP can be used in subsequent phases if quantitation limits are adequately low enough for metals of concern.*

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 are 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 B.*

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

7. *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).*

8. *Hexavalent chromium analysis is not needed for groundwater samples as the 15A NCAC 02L standard for total chromium is based on the more toxic hexavalent chromium species. This level must be met for all chromium in groundwater.*

9. *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. 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.*

10. *Dissolved methane in groundwater may be analyzed by Method RSK 175.*

11. *If any contaminants of concern are detected in landfill gas, always submit a sample for mercury analysis.*

LABORATORY DATA REPORTING

Laboratory reports submitted to the Unit must include the items listed below:

1. The laboratory report must state the name and address of the laboratory and that the laboratory is either certified for applicable parameters under 15A NCAC Subchapter 02H .0800 and provide its certification number, or that it is a contract laboratory under the US EPA's Contract Laboratory Program (CLP). Full US EPA CLP documentation packages are not required.

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, 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 (any quantitation limits exceeding 10 times the MDL must be justified with supporting information).

3. Laboratory sheets for all analytical results, including sample identification, sampling dates, sample matrix description, sample filtration or preservation procedures, date samples were received by laboratory, extraction dates, analysis dates, dilution factors, sample preparation and analytical method name(s) and number(s) and results of the analysis (all estimated concentrations with data qualifiers must be reported).

4. Details of any known conditions or findings which may affect the validity of analytical data, including but not limited to equipment blank, trip blank, method blank, surrogate, spiked sample, or other quality control data.

5. 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.

6. The results of any library search performed for 'tentatively identified compounds."

7. The laboratory report should include the names of the individuals performing each analysis, the quality assurance officer reviewing the data and the laboratory manager.

8. Data quality should be reviewed and validated by both the Contractor PM and the laboratory. Any quality control concerns, data qualifiers or flags should be evaluated and discussed in the associated report.

9. Completed chain-of-custody with associated air bill (if applicable) attached.

Note: The Unit will not approve payment for samples analyzed out of holding time or if the Contractor fails to comply with this guidance document including subsequent amendments and editions.

APPENDIX E: REMEDIAL INVESTIGATION SUMMARY REPORT TEMPLATE

The following template must be used to draft a RI summary report. Populate/modify the text within the brackets [ ] to reflect site specific information.

REMEDIAL INVESTIGATION SUMMARY REPORT
[SITE NAME]
[SITE CITY], [SITE COUNTY], North Carolina
Site ID No. [SITE ID]
State Contract No. [N1####S]
Task Order [TASK ORDER NUMBER]

Prepared By:

_____
[Name]
[Title]
[NC License #]

_____
[Name]
[Title]
[NC License #]

[Company Logo]

Submitted To:

North Carolina Department of Environmental Quality
Division of Waste Management
Inactive Hazardous Sites Branch
Superfund Section
Pre-Regulatory Landfill Unit
1646 Mail Service Center
Raleigh, North Carolina 27699-1646

Prepared By:
[Company Name]
[Address]
[Phone #]

[Date]

TABLE OF CONTENTS

1.0 INTRODUCTION

State the purpose of the report (this report provides an executive summary of the RI) and provide the information required in the First Phase RI Activities (Non-Invasive) Section for items 8 through 17:

2.0 SENSITIVE ENVIRONMENTS

Provide the information required in the First Phase RI Activities (Non-Invasive) Section for items 18 and 19.

If sensitive environments were not identified, state "No sensitive environments were identified in the site vicinity."

3.0 GEOPHYSICAL SURVEY

Provide the information required in the First Phase RI Activities (Non-Invasive) Section for items 20 and 21.

4.0 GEOLOGY AND HYDROGEOLOGY

Provide the information required in the First Phase RI Activities (Non-Invasive) Section for item 22.

5.0 NATURAL AND ANTHROPOGENIC BACKGROUND

Provide the information required in the Background Sample Collection Section for items 23 through 27.

6.0 WASTE DISPOSAL AREA

Provide the information required in the Contaminant Delineation RI Activities (Invasive) Section for items 28 through 31.

7.0 MEDIA CHARACTERIZATION

7.1 Above Ground Vapor Survey

Provide the information required in the Contaminant Delineation RI Activities (Invasive) Section for items 32 through 34.

If above ground vapors were not detected during the above ground vapor survey, state "No above ground vapors were detected at the ground surface."

7.2 Waste Characterization

Provide the information required in the Contaminant Delineation RI Activities (Invasive) Section for items 35 through 37.

7.3 Evaluation of Existing Soil Cover for use as the Permanent Cover System
Provide the information required in the Contaminant Delineation RI Activities (Invasive) Section for items 38 through 41.

7.4 Surface Water/Sediment/Seep Investigation
Provide the information required in the Contaminant Delineation RI Activities (Invasive) Section for items 42 through 45.

7.5 Groundwater Investigation
Provide the information required in the Contaminant Delineation RI Activities (Invasive) Section for items 46 through 53.

7.6 Potable Water Supply Well Sampling
Provide the information required in the Contaminant Delineation RI Activities (Invasive) Section for items 54 through 56.

7.7 Landfill Gas Probe Installation and Monitoring
Provide the information required in the Contaminant Delineation RI Activities (Invasive) Section for items 57 through 59.

7.8 Structural Vapor Intrusion Potential
Provide the information required in the Contaminant Delineation RI Activities (Invasive) Section for items 60 through 66.

7.9 Contaminant Sources and Impacted Receptors
Provide the information required in the Contaminant Delineation RI Activities (Invasive) Section for items 67, 68 and 69.

8.0 EVALUATION OF PRELIMINARY SOIL REMEDIATION GOALS (PSRGs)

For all soil and sediment analytical results, include the following statement: “Soil and sediment analytical results for this RI summary report were initially compared to unrestricted-use Preliminary Soil Remediation Goals (PSRGs) established by the North Carolina Inactive Hazardous Sites Branch (IHSB).”

If all analytical results are below the unrestricted-use PSRGs, include the following statement: “Soil and/or sediment at this site have met both direct contact unrestricted-use and protection of groundwater PSRGs.”

9.0 DEQ RISK CALCULATOR RESULTS

If analytical results are above unrestricted-use PSRGs, the data must be entered into the DEQ risk calculator and the following statement must be included in the RI summary report with the risk calculator results: “The DEQ risk calculator was utilized to evaluate the risks of contaminants of concern identified at the site and the risk calculator results are outlined in this report.”

10.0 SOLE USE STATEMENT AND CERTIFICATION

Suggested language: The report was prepared solely for the intended use of NCDEQ Inactive Hazardous Sites Branch, Pre-Regulatory Landfill Unit performed in the scope of work for Task Order [_____]. Use of this document for other purposes is at the sole risk of the user.

Report Certification

11.0 REFERENCES

APPENDIX F: SENSITIVE ENVIRONMENT SURVEY

1. Sensitive environment surveys must include the WDA and all areas within 500 feet of the delineated WDA perimeter.

2. The survey must also identify areas that likely serve as natural areas attractive to terrestrial ecological receptors and for the existence of stressed vegetation or stressed wildlife.

3. Establishing the presence of sensitive environments is necessary to determine if special sampling (such as aquatic toxicity testing) is required and if remediation activities would result in more harm than good (for example, excavation and destruction of a wetland versus leaving in place residual contamination which may not significantly impact the wetland environment).

4. Refer to the *Sensitive Environment Contact List* for agency information. These individuals must be contacted in order to identify specific sensitive environments.

5. Provide survey results from the listed agency contacts in the RI first phase report.

6. Sensitive environments include the following:
    a. State Parks;
    b. Areas Important to Maintenance of Unique Natural Communities;
    c. Sensitive Areas Identified Under the National Estuary Program;
    d. Designated State Natural Areas;
    e. State Seashore, Lakeshore and River Recreational Areas;
    f. Rare Species (state and federal Threatened and Endangered);
    g. Sensitive Aquatic Habitat;
    h. State Wild and Scenic Rivers;
    i. National Seashore, Lakeshore and River Recreational Areas;
    j. National Parks or Monuments;
    k. Federal Designated Scenic or Wild Rivers;
    l. Designated and Proposed Federal Wilderness and Natural Areas;
    m. National Preserves and Forests;
    n. Federal Land designated for the protection of Natural Ecosystems;
    o. State-Designated Areas for Protection or Maintenance of Aquatic Life;
    p. State Preserves and Forests;
    q. Terrestrial Areas Utilized for Breeding by Large or Dense Aggregations of Animals;
    r. National or State Wildlife Refuges;
    s. Marine Sanctuaries;
    t. National and State Historical Sites;
    u. Areas Identified Under Coastal Protection Legislation;
    v. Coastal Barriers or Units of a Coastal Barrier Resources System;
    w. Spawning Areas Critical for the Maintenance of Fish/Shellfish Species within River, Lake or Coastal Tidal Waters;
    x. 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;
    y. State Lands Designated for Wildlife or Game Management; and
    z. Wetlands.

SENSITIVE ENVIRONMENT CONTACT LIST

CONTACT	NAME & CONTACT INFORMATION	SENSITIVE ENVIRONMENT
NC Division of Conservation, Planning, and Community Affairs – Natural Heritage Program	Visit the Natural Heritage Program's interactive maps of Natural Heritage resources 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. Email inquiries to: natural.heritage@ncdenr.gov	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 & Scenic Rivers
National Park Service - Public Affairs Office	Anita Barnett Anita_Barnett@nps.gov (404) 507-5706 http://www.nps.gov/rivers	National Seashore, Lakeshore and River Recreational Areas National Parks or Monuments Federal Designated Wild & Scenic Rivers
US Forest Service	Heather Luczak hluczak@fs.fed.us (828) 257- 4817	Designated and Proposed Federal Wilderness and Natural Areas National Preserves and Forests Federal Land Designated for the Protection of Natural Ecosystems
NC Division of Water Resources	Nora Dreamer Nora.Dreamer@ncdenr.gov (919) 707-9119 Ian McMillan Ian.Mcmillan@ncdenr.gov (919) 707-9026 Ask for Clean Water Act 305b report	State-Designated Areas for Protection or Maintenance of Aquatic Life
NC Forest Service	Christian Vose christian.vose@ncagr.gov (919) 857-4812	State Preserves and Forests
US Fish & Wildlife Service	Pete Benjamin Pete_benjamin@fws.gov (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 Ted.Tyndall@ncmail.net (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 David.Cox@ncwildlife.org (919) 528-9886	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 lakes or coastal tidal waters. Spawning Areas Critical for the Maintenance of Fish/Shellfish Species within River, Lake or Coastal Tidal Waters.
US Army Corps of Engineers	Dorothy Harrington Dorothy.Harrington@usace.army.mil (919) 554-4884, x 28	Wetlands

APPENDIX G: BORROW SOIL LOCATION AND SAMPLING PROCEDURES

The following procedures are required to identify a borrow source that could be utilized as acceptable clean soil for an engineered WDA cover system and the associated sampling and testing requirements prior to purchase and transport to the Site.

OFF-SITE BORROW SOURCES

1. Preferred borrow sources for clean soil are those that were previously undeveloped or used solely for agricultural or residential purposes. The following list of sources are considered undesirable as soil fill material and shall not be utilized:
    a. locations on or within 1,000 feet of a site that the Division of Waste Management (DWM) manages, permits or has inventoried;
    b. dredged material from a marine environment;
    c. soils from below the groundwater table;
    d. soils containing construction or demolition debris or reclaimed asphalt pavement;
    e. soils from recycling operations that collect, sort, reprocess or manufacture new products;
    f. soils from transfer stations that collect, consolidate, temporarily store, sort, or recover refuse or used materials from off site;
    g. soils from a contaminant cleanup or removal;
    h. commercial or industrial sites were hazardous materials were used, handled or stored; and
    i. coal and wood ash.

2. The history and location of the proposed borrow source must be established and documented. If the proposed borrow source is identified as acceptable clean soil based on the site history and location, the following procedure shall be used for verification sampling and testing.

IN-SITU MATERIAL

3. The borrow source site should be divided into five approximately equal-sized sections (the number of sections is independent of the total acreage).

4. A sample should be collected in each section from zero (0) feet to one-half (0.5) foot below ground surface (bgs).

Note: No composites, the five (5) samples are individual grab samples.

5. The next sampling interval should be collected from 5 feet (bgs). If the desired fill material is from a shallower horizon, consult with the Unit PM prior to adjusting the sampling plan.

Note: No composites, the five (5) samples are individual grab samples.

6. Sampling methodologies must be in accordance with U. S. Environmental Protection Agency (US EPA) Region IV Science and Ecosystem Support Division (SESD) *Field Branches Quality System and Technical Procedures, Soil Sampling (SESDPROC-300-R3)* and these Guidelines.

7. All samples should be analyzed for the following parameters:
    a. Volatile and Semi-Volatile Organic Compounds (USEPA Target Compound List plus 1,4

Dioxane): SW-846 Methods 8260/8270;
b. Metals: SW-846 Method 6020 (Antimony, Arsenic, Beryllium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Nickel, Selenium, Silver, Thallium and Zinc);
c. Mercury: Method 7471; and
d. Organochlorine Pesticides: Method 8081 (Include in analysis if the borrow source was used for agricultural purposes).

STOCKPILED MATERIAL

8. The owner of the stockpiled borrow source will be required to sign an affidavit, attesting that the stockpiled material originated from the same source location and not from a different off-site source. The stockpiled material that is sampled and tested, must be the same material that is purchased and imported for use as clean structural fill.

Sampling the stockpiled borrow source shall be in accordance with the following schedule:

Volume of stockpile borrow source	Samples per Volume
Up to 1,000 cubic yards	3 composite samples
1,000 to 5,000 cubic yards	2 composite samples for the first 1,000 cubic yards plus 1 composite sample for each additional 1,000 cubic yards
>5,000 cubic yards	5 composite samples for the first 5,000 cubic yards plus 1 composite sample for each additional 5,000 cubic yards

Note: Each composite sample contains three grab samples from three different depths. VOC samples can and should be composited for stockpiled borrow sources.

9. The soil analytical results, must be compared to both direct contact unrestricted use and protection of groundwater PSRGs. If all analytical results are below the unrestricted use PSRGs, submit the data packet and a summary cover letter to the Unit PM for review and approval prior to purchase and transport of fill material to the Site.

10. If the soil analytical results are above unrestricted use direct contact PSRGs, the data must be entered into the DEQ risk calculator to confirm if the metals concentrations are below unrestricted use risk targets or naturally occurring background soil metals concentrations. If the soil analytical results are above the protection of groundwater PSRGs, TCLP or SPLP analysis is required. The data packet, risk calculator results and a summary cover letter must be submitted to the Unit PM for review and approval prior to purchase and transport of fill material to the Site.

APPENDIX H: ENGINEERED COVER SYSTEMS

Two types of engineered cover systems may be used at pre-1983 landfills to prevent dermal exposure to physical or chemical hazards created by the WDA: a soil cover with an orange geotextile demarcation fabric or a matrix of soil filled high-density polyethylene (HDPE) expandable cells.

SOIL COVER WITH GEOTEXTILE DEMARCATION FABRIC

1. The soil cover with the geotextile demarcation fabric consists of a total of 18 inches of fill material on top of the WDA.

2. After grubbing activities are complete and the WDA has been graded for positive storm water runoff, the WDA is covered with six inches of fill material.

3. The orange geotextile demarcation fabric is installed on top of the six inches of fill material.

4. The demarcation fabric (or equivalent) that may be used is listed in the following table:

Company Name	Product Name	Model Number	Description
TenCate Geosynthetics	Mirafi 140NL/O	Orange	Nonwoven geotextile composed of polypropylene fibers, which are formed into a stable network such that the fibers retain their relative position. The product is inert to biological degradation and resists naturally encountered chemicals.

5. Additional information pertaining to the NC Department of Transportation (DOT) approved geotextiles (1056-4) is available at the following website: https://apps.ncdot.gov/vendor/approvedproducts/. If other geotextiles are recommended for use, the Unit must approve the product before installation.

6. Twelve inches of non-vegetative (e.g. soil, sand, crushed stone) fill material must cover the demarcation fabric.

7. The top six inches of the cover system must be composed of soil capable of supporting vegetative growth.

8. A vegetative cover, consisting of grasses appropriate for the physiographic province where the Site is located, must be established over the WDA.

SOIL COVER WITH HIGH-DENSITY POLYETHYLENE EXPANDABLE CELLS

9. The high-density polyethylene expandable cells consist of either a six inch or four-inch-deep cell filled with soil.

10. After grubbing activities are complete (if applicable) and the WDA has been graded for positive storm water runoff (if applicable), the WDA is covered with the HDPE expandable cell system and filled with soil, aggregate or a soil/aggregate mixture.

11. The following are NCDOT approved products and may be used:

Company Name	Product Name	Model Number	Description
Presto Geosystems	Presto Geoweb	GW20V4, GW30V4, and GW40V4	Cell length ranges from 8.8 to 18.7 inches. Cellular confinement system for soil stabilization and slope protection.
Hanes Geo Components	TerraCell	140	Cellular confinement system for soil stabilization and slope protection.
Strata Systems, Inc.	Strataweb (4 inch height)	Styles 356 & 445	High performance three dimensional cellular confinement system manufactured from extruded strips of HDPE, precision welded to form multiple cell heights and sizes. When filled with granular material, provides superior confinement and reinforcement.
Geo Products	EnviroGrid	EGA20 4 inch	Cellular confinement.

12. Additional information pertaining to the approved NCDOT geocells (1056-6) is available at the following website: https://apps.ncdot.gov/vendor/approvedproducts/

13. Research these products and be familiar with their characteristics (strength, flexibility, installation procedures, accessories, tools required for installation and etc.) and Site specific conditions (environmental, logistical and engineering challenges) before selecting a product for the cover system.

14. The product must be manufactured from high density polyethylene (HDPE), and chemical analysis of the specific material being installed must be submitted to the Unit for review and approval prior to installation.

15. The cellular confinement systems may be installed on slopes or flat areas underlain by waste. A minimum cell height of 4-inches is required on the WDA and slopes.

16. Follow the manufacturer recommendations when anchoring the product to the ground surface. Anchors may include product specific anchors, cut rebar stakes, polyethylene strips, and/or installation of an anchor trench.

SURFACE PREPARATION

17. Installation of these cellular confinement systems is equivalent to installing 18-inches of soil and a non-woven geotextile demarcation fabric over waste. Therefore, these products may be placed directly on soil containing waste without installation of a soil buffer between waste and the product (refer to manufacturer installation recommendations and guide lines pertaining to the use of a geotextile between waste and the base of the cellular confinement system).

18. All daylighting tires and white goods must be removed prior to installation of the cellular confinement system and large individual pieces of daylighting waste that would result in a surface variation greater than 3-inches must be removed.

19. If stormwater infiltration has not created an exposure pathway, and is not ponding over the WDA, grading may not be necessary. If grading is not required, the cellular confinement system may be placed directly over non-denuded soil.

20. Woody vegetation shall be cut to the surface and large stumps ground a minimum of six inches below the current surface elevation. Since additional material may be required to fill the cellular confinement system over a non-graded, non-denuded surface, a cost analysis would be required to compare this method to denuding and grading the Site.

21. The cellular confinement system is to be filled with material appropriate for site conditions. Examples of possible fill materials are:
    a. soil as structural fill;
    b. topsoil;
    c. structural fill amended with organics;
    d. angular gravel;
    e. angular ballast stone;
    f. sand; and
    g. mix of two-parts soil and one-part stone.

22. The same fill material is to cover the top of the cellular confinement system with a minimum thickness of 2-inches and compacted with a vibratory roller. If the chosen fill material varies significantly from the WDA surface material, and sufficient surface compaction cannot be achieved, a non-woven geotextile may be required to maintain separation of the WDA surface and fill materials.

23. Rigid porous pavers are an option to be installed only on flat surfaces. Due to product rigidity, and the need for finer grading to enhance preparation of the WDA surface relative to the flexible cellular confinement systems. These pavers can create a more uniform, flatter appearance across the WDA.

ATTACHMENT 1: GUIDELINES FOR THE LOCAL GOVERNMENT REIMBURSEMENT PROGRAM

The following guidelines pertain to local governments requesting approval to conduct contaminant assessment activities at pre-1983 landfills and participate in the reimbursement program.

INTRODUCTION

1. Local governments may conduct contaminant assessment phase activities in accordance with the current published edition of the *Guidelines for Addressing Pre-Regulatory Landfills and Dumps* guidance document including subsequent amendments and editions and seek reimbursement of assessment expenses if the activities were pre-approved by the Unit.

2. Questions regarding the local government reimbursement program may be emailed to the Unit Supervisor, Ryan Channell at Ryan.Channell@ncdenr.gov or by telephone at (919) 707-8333.

3. General Statute 130A-310.6 (f) establishes the local government reimbursement program and outlines the four criteria necessary to qualify for reimbursement.

A unit of local government that voluntarily undertakes assessment or remediation of a pre-1983 landfill may request that the Department reimburse the costs of assessment of the pre-1983 landfill and implementation of measures necessary to remediate the site to eliminate an imminent hazard. The Department shall provide reimbursement under this subsection if the Department finds all of the following:

(1) The unit of local government undertakes assessment and remediation under a plan approved by the Department.
(2) The unit of local government provides a certified accounting of costs incurred for assessment and remediation.
(3) Each contract for assessment and remediation complies with the requirements of Articles 3D and 8 of Chapter 143 of the General Statutes.
(4) Remedial action is limited to measures necessary to abate the imminent hazard.

LETTER OF INTEREST/REIMBURSEMENT ELIGIBILITY

4. To establish eligibility, the local government must submit a "Letter of Interest" to the North Carolina Division of Waste Management PRLF Unit stating the desire to voluntarily conduct an environmental assessment of a qualified pre-1983 landfill. The "Letter of Interest" should include the pre-1983 Landfill ID#, Landfill Name, and Landfill street address (including the City and County). Mail the "Letters of Interest" to:

PRLF Unit Supervisor
Local Government Reimbursement Program
Pre-Regulatory Landfill Unit
1646 Mail Service Center
Raleigh, NC 27699-1646

5. Prior to submittal of the initial work plan, the local government must provide a signed statement to the Unit confirming that the local government's consultant contract complies with Articles 3D (Procurement of Architectural, Engineering, and Surveying Services) and 8 (Public Contracts) of Chapter 143 of the North Carolina General Statutes to be eligible for reimbursement. A *Certification of Contracting Procedures Form* is provided in this document and must be completed to meet this requirement. The local government is required to provide, on official letterhead, its vendor and federal identification number to establish a reimbursement account with the Unit.

6. Once the completed *Certification of Contracting Procedures Form* has been received, the Unit will contact the local government to arrange a meeting with the local government and its consulting firm to provide guidance on the work plan.

7. The local government's consultant then must provide a work plan, summary of costs and timeline for implementation once approved by the Unit.

8. All assessment work plans and cost proposals require review and pre-approval by the Unit. Reimbursement is subject to availability of funds and the Units review of the local government certified accounting of costs to ensure they are fair and consistent with standard assessment costs. To ensure reimbursement, the local government should closely monitor costs and confirm the consultant complies with GS 130A-310.6 (f).

WORK PLAN/COST PROPOSAL PREPARATION

WORK PLAN

9. Work plans should include: an in-depth description of the proposed scope of work and methodologies that will be utilized and a proposed schedule for completing the scope of work.

10. The local government contracted consultant must comply with the current published edition of the *Guidelines for Addressing Pre-Regulatory Landfills and Dumps* guidance document including subsequent amendments and editions to develop and complete all work activities. Procedures outlined in work plans must also comply with the current published version of the US Environmental Protection Agency Region IV Science and Ecosystem Support Division "Field Branches Quality System and Technical Procedures".

11. Due to the wide range of conditions encountered at pre-1983 landfills, the guidance document will not address every conceivable situation. The local government contracted consultant may need to consider proposing additional analyses and sample collection based on existing site-specific conditions and future land use.

COST PROPOSAL

12. A cost proposal outlining the costs for completing the scope of work presented in the work plan, must be attached to each work plan for review and approval by the Unit. Cost proposals must be submitted to the Unit in accordance with the *Cost Proposal and Invoice Format Sheets* which can be found in Attachment 4. All costs not pre-approved by the Unit will not be eligible for reimbursement.

13. Cost proposals are required to be prepared on a time and materials basis and should be broken out per task as outlined in the associated work plan. Labor costs per personnel level unit rates, subcontractor costs (i.e. driller, analytical, etc.), and expense details (i.e. mileage, instruments, etc.) should be provided for each task. Use the Personnel Qualifications and Task Descriptions reference sheet, which can be found in Attachment 3, to determine the labor costs for various personnel.

REIMBURSEMENT

1. The local government must pay the consultant in accordance with their contract and then submit a certified accounting of costs with the consultant invoice(s) to the Unit for reimbursement.

2. All invoices must be submitted to the Unit in accordance with the *Cost Proposal and Invoice Format Sheets* which can be found in Attachment 4. Invoices must be submitted in the same format as the cost proposal for reconciliation and each invoice submittal must include a completed *PRLF Invoice Check List Form* which can be found in Attachment 5.

3. Submit a cover letter on official local government letterhead to request reimbursement and include the following:
    a. vendor/Federal ID number;
    b. current mailing address;
    c. invoice(s) from contractor in the same format as the proposal cost sheet;
    d. copies of the check(s) used to pay the contractor;
    e. dollar amount you are requesting for reimbursement; and
    f. a statement verifying that certified accounting in accordance with NCGS 130A-310.6(f)(2) was conducted.

4. The invoice packet will be reviewed by the Unit and compared to the work plan and cost proposal. After the invoice review is complete, the invoice packet will be submitted to accounting for processing, or the Local Government representative will receive a response requesting additional invoicing details.

Note: To avoid delay in reimbursement and multiple requests for additional supporting documentation, the Local Government representative must submit invoices in the same format as the cost proposal with the completed *PRLF Invoicing Check List Form* (Attachment 5) and all receipts organized and numbered to reflect the order outlined in the approved work plan.

CERTIFICATION OF CONTRACTING PROCEDURES FORM

Complete the Certification of Contracting Procedures Form by populating/modifying the italicized text within the brackets [ ] to reflect site specific information.

[name of unit of local government], hereby affirms that it complied with the requirements of Articles 3D and 8 of Chapter 143 of the North Carolina General Statutes in all contracts entered into to date for the assessment and/or remediation of the *[name of landfill]* Landfill *[landfill ID number]* located at *[street address, city, county]* for which it is seeking reimbursement of expenses from the North Carolina Division of Waste Management.

IN WITNESS WHEREOF, *[name of unit of local government]* has caused these presents to be executed in its name by *[name of authorized agent]*, its *[title]*, on this the *[date]* day of *[month]*, *[year]*.

[name of unit of local government]

By: *[signature of authorized agent]*

Signatory's name typed or printed: *[name of authorized agent]*

STATE OF NORTH CAROLINA

COUNTY OF *[county]*

I, *[name]*, a Notary Public, do hereby certify that *[name of authorized agent]* personally appeared before me on this day, produced proper identification in the form of _____, was duly sworn and or affirmed, and declared that he or she holds the title of *[title]* of *[name of unit of local government]*, and declared that, to the best of his or her knowledge and belief, that the information contained in the above Certification is true and accurate, and he or she then signed this Certification in my presence.

WITNESS my hand and official seal this *[date]* day of *[month]*, *[year]* .

[name]

Notary Public

My commission expires *[date]*.

REQUEST FOR PROPOSAL (RFP) TEMPLATE

The following template may be used to draft a request for proposal (RFP). Populate/modify the italicized text within the brackets [ ] to reflect site specific information.

Request for Proposals (RFP): Pre-Regulatory Landfill Assessment

[North Carolina Local Government Name] is exploring the potential for re-use of a tract of land known as the [*Pre-Regulatory Landfill Site Name]*. In order to determine the feasibility of the re-use of this property, a detailed assessment of this closed landfill is needed. The landfill is located in [*City*], [*County*], North Carolina.

[North Carolina Local Government Name] is interested in contracting the services of an approved environmental consultant to perform and certify assessment services for this landfill in full cooperation of and under the guidance of the North Carolina Department of Environmental Quality (NC DEQ) Division of Waste Management, Inactive Hazardous Sites Branch, Pre-Regulatory Landfill Unit (Unit).

All environmental consultants interested in responding to this RFP should refer to the current published edition of the Unit's *Guidelines for Addressing Pre-Regulatory Landfills and Dumps* guidance document including subsequent amendments and editions when responding in order to adequately prepare for the effort required in work plan preparation, cost proposals and report submittal. All services proposed must be approved by the Unit following these guidelines and other regulations as determined by the Unit.

[North Carolina Local Government Name] is voluntarily undertaking the assessment of this pre-1983 landfill as defined in GS130A-290(a) (21a). The approved environmental consultant must be qualified to perform and will be responsible for compliance of all phases of this voluntary remedial investigation as directed by the Unit.

[North Carolina Local Government Name] will not be responsible for any activities, services or other costs associated with this RFP or subsequent contract work that is not pre-approved by the Unit. All work must comply with the requirements of North Carolina GS 130A-310.6 (f) and designated by NC DEQ as reimbursable to the *[North Carolina Local Government Name]* under this statute. It is the sole responsibility of the approved environmental consultant to assure that all work performed as a result of this RFP is reimbursable to the *[North Carolina Local Government Name]* under this program administered by the Unit.

The property is known to the Unit and listed on the *Old Landfill Inventory* as: [*SITE NAME*], [*IDENTIFITACTATION NUMBER*]. The landfill is located on a portion of [*County*] Parcel, PIN: [*number*]. Only the landfill and areas that may have been impacted by past landfill activities as outlined in the *Guidelines for Addressing Pre-Regulatory Landfills and Dumps* is to be considered for this RFP.

ATTACHMENT 2: PRE-REGULATORY LANDFILL PROGRAM CONTRACT TASK MANAGEMENT GUIDANCE

The following guidelines pertain to Professional Engineering firms (Contractors) awarded a contract to complete contaminant assessment and risk based remedial measures with the North Carolina Department of Environmental Quality's (NC DEQ) Pre-Regulatory Landfill Unit (Unit).

INTRODUCTION

Executed contracts are in accordance with Articles 3D and 8 of Chapter 143 of the North Carolina General Statutes. The statutory references can be found at the following websites, respectively:
https://www.ncleg.net/EnactedLegislation/Statutes/HTML/ByArticle/Chapter_143/Article_3D.html and
https://www.ncleg.net/EnactedLegislation/Statutes/HTML/ByArticle/Chapter_143/Article_8.html

The Contractor shall ensure that all documents and work plans comply with the Contractor's executed contract with the NC DEQ and the Inactive Hazardous Sites Response Act. All work activities shall be conducted in compliance with the current published editions of the following guidance documents including subsequent amendments and editions:

1. Guidelines for Addressing Pre-Regulatory Landfills and Dumps, May 2020;
2. Division of Waste Management: Vapor Intrusion Guidance, March 2018, Version 2.

The Contractor must assign a PM who will manage all RI and RA activities for the pre-1983 landfill. The Contractor PM is critical for maintaining communication and efficiently completing RI and RA activities assigned by the Unit PM. During the preparation of a remedial action plan (RAP), the Contractor PM may transition to an engineer PM due to engineering design components.

TASK ORDERS

All work activities must be performed on a task order not to exceed basis as outlined in the executed contract.

The Unit PM will provide pre-1983 landfill specific task order requests to the Contractor PM to develop work plans, cost proposals, schedules and reports. The Unit PM will provide deadlines for submittal of the requested work plans, cost proposals, schedules and reports. Deadline extensions may be requested in writing on Contractor company letterhead only when unforeseen circumstances arise, otherwise all work is expected by the requested deadline.

Once the Unit PM confirms the work plan, cost proposal and schedule satisfy the requested task order, an approval authorization letter will be sent to the Contractor PM via e-mail. The Contractor PM must receive the task order approval authorization letter prior to commencement of any work activities.

Note: Work activities completed without prior authorization from the Unit will not be reimbursed.

Once the Unit PM confirms the work activities outlined in the approved task order are complete, the Unit PM will send the Contractor PM a task order completion letter. The Contractor PM must receive a task order completion letter for all task orders before submitting an invoice to the Unit.

The initial site visit and first phase RI activities are generally completed using a single task order. Contaminant delineation RI activities will most likely be tasked in multiple phases.

WORK PLANS, COST PROPOSALS AND SCHEDULES

Work plans, cost proposals and schedules must include a cover letter addressed to the attention of the assigned Unit PM and submitted via email. Include the pre-1983 landfill identification number and name along with the task order number exactly as listed in the task order request.

Only propose or address work activities requested by the Unit PM in work plans and cost proposals. Include a proposed schedule with all work plans that includes the task(s)/subtask(s) to be performed each day (field activities) and the Contractor personnel that will be on site based on the Personnel Qualifications and Task Descriptions as outlined in Attachment 3 (i.e. Staff Geologist, Technician, sub-contractor).

Figure 1 is an example of a field activities schedule outlining the number of weeks, the day of the week, associated task order/subtask number and quantity and classification of contractor personnel and sub-contractor personnel for each day.

Week 1 – Day 1	Subtask #(s)	Quantity of Staff	Personnel Classification
Week 1 – Day 2	Subtask #(s)	Quantity of Staff	Personnel Classification
Week 1 – Day 3	Subtask #(s)	Quantity of Staff	Personnel Classification
Week 1 – Day 4	Subtask #(s)	Quantity of Staff	Personnel Classification
Week 1 – Day 5	Subtask #(s)	Quantity of Staff	Personnel Classification
Week 1 – Day 6	Subtask #(s)	Quantity of Staff	Personnel Classification
Week 1 – Day 7	Subtask #(s)	Quantity of Staff	Personnel Classification

Figure 1: Field Activities Schedule

The week is the week that field work begins for the associated task(s)/subtask(s). Day 1 is the first day that field work begins, regardless of the day of the week. The task/subtask number(s) are the task/subtask(s) that will be performed on the listed day(s). The number of personnel for each day represents the number of staff in the field for that day.

Contractor field personnel must receive a copy of the approved work plan for reference during field activities.

If revisions to work plans, cost proposals and/or reports are required, provide the Unit PM, via email, a complete document with revisions including a new revision date. The new revision date is a critical component of the revision/resubmittal process and allows the Unit PM and the public to track work activities at each pre-1983 landfill. Work should not be modified without approval of the Unit.

Cost proposals must have numbered pages and conform to the formatting as shown in the *Cost Proposal and Invoice Format Sheets* which can be found in Attachment 4.

Unit rates must match with the corresponding Personnel Level description based on the type of work activity such as remedial investigation/design and active remedial oversight as outlined in the Fee Schedule of each executed contract.

Costs associated with the preparation of health and safety plans are part of the Contractor's responsibility to ensure the safety of field staff. When special site conditions exist that consider public safety, i.e. exclusion zones to protect the public then costs associated with the health and safety plan may be included.

Activities exceeding $3,000 require quotes to document the competitive bidding process. The Contractor must comply with paragraph K as outlined in the Scope of Work in each executed contract.

COST ADJUSTMENTS AND WORK VARIANCES

When the approved work plan, cost proposal or schedule will not be maintained or cannot be completed as planned, the Contractor PM must notify the respective Unit PM and explain the pending issues. The Contractor PM must request a cost adjustment (change order) when a specific activity will exceed the approved task order dollar amount or a work variance if there are significant changes to the approved work plan impacting itemized costs or the approved schedule.

In accordance with the terms of the executed contract, the Contractor PM must immediately contact the Unit PM and provide the reasons why the approved cost proposal will be exceeded. The Unit PM may provide verbal approval of the cost adjustment. If verbal approval is granted, the Contractor PM must submit a written request along with the itemized costs within 48 hours of the verbal approval. If the Unit PM does not receive the written request within 48 hours, the Contractor may not be paid for the work activities.

Note: Work activities completed without approval from the Unit will not be paid.

A variance from the approved work plan must also be requested when there are significant changes to work plan activities that will affect individual line item costs (unit rates), but will not exceed the total approved cost of the task order. The Contractor PM must immediately contact the Unit PM when issues arise that will result in work not being completed in accordance with the work plan. Discuss all work plan variances with the Unit PM. The Unit PM may provide verbal approval of the variance. If verbal approval is granted, the Contractor PM must submit a written request along with the new itemized costs within 48 hours of the verbal approval. If the Unit PM does not receive the written request within 48 hours, the Contractor may not be paid for the work activities.

INVOICES

After the Contractor PM provides notification that all work activities associated with a particular task order is complete and the Unit PM is satisfied with the deliverable, the Unit PM will send the Contractor PM a task order completion letter. Once the Contractor PM receives this letter the Contractor shall submit invoices.

Upon completion of each task order, including submittal of all approved related documents (including but not limited to written reports on technical progress, identification of problems, delays and cost updates) and

the associated certifications, the Contractor PM may submit an invoice for payment that complies with the authorized costs outlined for each task order.

The Contractor PM should submit invoices as soon as possible once task order(s) activities are complete, but must submit the invoice and all associated verification documents within 30 days from the date when the Unit PM issued the task order completion letter.

All invoices must be submitted in the same format as the approved cost proposal with all costs identified and a completed *PRLF Invoice Check List Form* which can be found in Attachment 5. Each invoice packet must include numbering to identify the costs associated with quotes and supporting documentation. The numbering will assist both the Contractor PM and Unit PM with review and verification of all required documentation. The Contractor PM must initial and date all invoices submitted to the attention of the Unit PM assigned to the project.

Include approved cost adjustments and approved work variances with all invoice submittals. Identify the approved changes on a cover sheet for review by the Unit PM.

CONTRACTOR INTERACTION WITH UNIT PM AND PROPERTY OWNERS

The Unit PM is the point of contact with the property owner(s). Whether at meetings on site or via telephone, the Unit PM will provide the property owner(s) with information associated with all activities. If approached by the property owner(s), the media or general public, the Contractor PM should limit responses and defer to the Unit PM for official communication regarding the site and all associated activities.

If a property owner becomes uncooperative or if the Contractor PM or their staff must leave a site due to safety concerns, immediately report the situation to the Unit PM. The Unit will work to resolve any property access concerns or safety issues with the Contractor PM, property owner(s) and any other impacted parties.

The Contractor PM must communicate with the Unit PM on a frequency established by the Unit and based on the type of field activities and work phase. There may be the need for daily communication via telephone, email and/or written reports. Communication between the Contractor PM and Unit PM is critical for maintaining a transparent record of completed RI and RA phase work activities.

REPORT SYMBOLS AND ABBREVIATIONS

Display symbols and abbreviations on all figures and maps according to the following:

Description	Abbreviation		Symbol
Temporary Monitoring Well (less than 7 days)	TW		
Monitoring Well (more than 7 days)	MW		
Boring (no soil sample collected)	B		
Soil Boring (soil sample collected)	SB		
Water Supply Well	House number		 or 
Surface Water/Sediment Sample	SW/SD		
Landfill Gas Probe	GP		

ATTACHMENT 3: PERSONNEL QUALIFICATIONS AND TASK DESCRIPTIONS

PERSONNEL AND QUALIFICATIONS	TASK DESCRIPTIONS
Principal Engineer/Geologist/Hydrogeologist/Scientist Administrative and/or professional head of the organization or primary contract. Responsible for conceiving and executing business functions of the organization. Directs the professional staff. Normally has a financial interest in the company as partial owner, major investor or stockholder, or officer. Charges an extremely limited number of hours per site as the Principal. This position should never bill field or field supervision hours.	- Expert testimony - Legal strategies - Depositions - Contract oversight (limited)
Senior Engineer/Geologist/Hydrogeologist/Scientist Typically requires professional registration when applicable to task, 8 years of experience in technical or managerial roles, and regulatory compliance. Serves as senior technical leader, provides contract oversight for environmental remediation projects of medium to large scope and /or complexity and has developed substantial expertise in their field of practice. Generally, supervises Project Managers and oversees several projects. Duties typically include reviewing reports, developing strategies, and attending client and/or associated project meetings. Responsible for approving designs, reports, plans, and specifications before submittal to the Pre-Regulatory Landfill Unit. If significantly involved in a highly technical project, should have substantial technical expertise directly related to the project. Ensures compliance of field service operations with OSHA safety standards. Addresses public health concerns.	- Expert testimony - Site strategy and planning - Contract oversight - Reviews technical reports - Reviews corrective action plans - Reviews engineering/remedial system design - Health and safety coordinator - Reviews site safety plans
Project Engineer/Geologist/Hydrogeologist/Scientist Typically possesses at a minimum, a bachelor of science degree in engineering, geology, hydrogeology, or a directly related field. Serves as manager for entire project and has at least 5 years of experience in the environmental field. Duties typically include preparing proposals, reviewing reports, developing strategies, and attending client and/or associated project meetings. Under general supervision, prepares environmental design and plan specifications for site remedial activities. Leads and supervises teams of staff and technician level personnel, but would have a limited number of hours charged to each site, and only a small percentage of total field hours. Serves as site technical expert or supervisor for hydrogeological site characterizations and remediation activities and tests, and assembly of reports, plans, and specifications.	- Project management - Site strategy and planning - Develop site health and safety plans - Engineering/remedial system design - Data review and analysis - Report review - Site meetings and reconnaissance - On-site supervision (periodic) - Work plan preparation/review - Site investigation planning/review - Field work planning/review - Site inspection (periodic)
Staff Engineer/Geologist/Hydrogeologist/Scientist Requires at a minimum, a bachelor's degree in engineering, geology, hydrogeology, or related science and 1 to 5 years of experience in the environmental field. Works under supervision of the project manager to perform routine tasks related to environmental investigation and remediation projects. Is the primary person responsible for gathering field data and is competent at data analysis. Must be able to conduct investigation and remedial activities including directing drilling and monitoring well installation, sampling, conducting site and geologic mapping, documenting field activities, and compiling data. Must have knowledge of QA/QC procedures and protocol. This position will normally be highest in the number of hours billed for on-site work. However, technicians (see below) would conduct routine or on-going monitoring.	- Report preparation - Field work preparation/planning - Supervises site investigation and remediation activities - Site reconnaissance and mapping - Engineering/remedial system design and installation - Limited data review and analysis - On-site health and safety supervisor
Technician Typically requires a high school diploma, certified or licensed trades-person, or an associate's degree at a minimum. Responsible for general supervision of the installation, maintenance, and repair of on- site equipment. Conducting routine monitoring, collecting samples, and preparing equipment maintenance/operating logs.	- Field work preparation - Operation and maintenance of equipment - Well developing and sampling - Soil sampling - Handling of investigation and remediation derived wastes - Remedial system installation, operation, and maintenance - Monitoring activities
Draftsperson/CAD Typically requires a high school diploma. Requires 2 to 8 years of experience or 2 years of related college and more than 1 year of experience. Generally requires a Technical Drawing Certificate, and advanced drafting skills such as Computer Aided Drafting (CAD) & Design (CADD) operations.	- Drafting - CAD/CADD work - Cartography - Plotting of GPS and standard survey data
Word Processor/Clerical Operates computer for work processing, spreadsheets, and statistical typing, correspondence report generation, general office work, typing, and filing.	- Spreadsheets - Report generation - Word processing - Typing - Filing - General secretarial - Document reproduction

ATTACHMENT 4: COST PROPOSAL AND INVOICE FORMAT SHEETS

The following formats must be used by both Contractors and Local Governments for developing cost proposals and invoice submittals.

COST PROPOSAL FORMAT SHEET

Cost Proposal

Site ID #: Task Order #: Work Phase Description: RI Delineation
State Contract #: Site Name:

Task Order # & Task Description (Work Plan and Field Services):

Subtask A - Subtask Description (Work Plan and Estimate):

Labor

Personnel Level	Unit Rate ($)	# Units	Total Cost
Project	$0	0	$0
Staff	$0	0	$0
Word Processor/Clerical	$0	0	$0
		Subtotal Subtask A	$0

Subtask B – Cover Soil Sampling:

Labor

Personnel Level	Unit Rate ($)	# Units	Total Cost
Staff	$0	0	$0
Technician	$0	0	$0

Expendables and Reimbursable:

GPS Unit	$0	0	$0
PID	$0	0	$0
Subcontractor drilling	$0	0	$0
Per diem	$0	0	$0
Mileage	$0	0	$0
		Subtotal Subtask B	$0
		Cost Proposal Task Total	$0

INVOICE FORMAT SHEET

Invoice

Site ID #: Task Order #: Work Phase Description: RI Delineation
State Contract #: Site Name:

Task Order # & Task Description (Work Plan and Field Services):

Subtask A - Subtask Description (Work Plan and Estimate):

Labor

Personnel Level	Unit Rate ($)	# Units	Total Cost
Project	$0	0	$0
Staff	$0	0	$0
Word Processor/Clerical	$0	0	$0
		Subtotal Subtask A	$0

Subtask B – Cover Soil Sampling:

Labor

Personnel Level	Unit Rate ($)	# Units	Total Cost
Staff	$0	0	$0
Technician	$0	0	$0

Expendables and Reimbursable:

GPS Unit	$0	0	$0
PID	$0	0	$0
Subcontractor drilling	$0	0	$0
Per diem	$0	0	$0
Mileage	$0	0	$0
		Subtotal Subtask B	$0
		Invoice Task Total	$0

(*Contractor PM Signature*)

_____

Name: Invoice # (Company Invoice #):

Title: Remit To: (Company Name)
(Company Address)

Company Name:

ATTACHMENT 5: PRLF INVOICING CHECK LIST FORM

PRLF INVOICING CHECK LIST

Contractor PM Initial: Task Order ID: PRLF PM Initial:

Date Invoice Submitted to PRLF: Date to PRLF Peer:

Contractor PM	Local Gov't PM	PRLF PM	PRLF PEER	
				Contractor Invoice
☐	☐	☐	☐	Is the approved cost proposal included at the end of the invoice package?
☐	☐	☐	☐	Was a work plan variance submitted that affected costs? (If so, explain in notes below)
☐	☐	☐	☐	Is the site name and ID # correct on the invoice and cost proposal?
☐	☐	☐	☐	Is the invoice date representative of the latest invoice submittal date?
☐	☐	☐	☐	Does the format of the invoice match the format of the cost proposal, including breakout of subtasks?
☐	☐	☐	☐	Are all line items from the cost proposal included in the invoice?
☐	☐	☐	☐	Is an explanation provided in the notes for **all** items that vary from the cost proposal to the invoice? Such as:
☐	☐	☐	☐	Invoiced line items not included in the cost proposal?
☐	☐	☐	☐	Equipment unit rates invoiced higher than proposed?
☐	☐	☐	☐	Large variances in proposed personnel hours and invoiced hours? (Reasonable variances are accepted)
☐	☐	☐	☐	Are the unit costs correct per the contract fee schedule?
☐	☐	☐	☐	Is tax for rented equipment and purchased supplies listed as a separate line item?
☐	☐	☐	☐	Are shipping costs listed as a separate line item?
☐	☐	☐	☐	Is an explanation provided in the notes if the invoice includes project or senior level hours for field work?
☐	☐	☐	☐	Is the math correct?
				Subcontractor Invoice(s)
☐	☐	☐	☐	Are all subcontractor invoices provided, and in the order they appear on the contractor's invoice?
☐	☐	☐	☐	Are all subcontractor bids provided with the cost proposal in the order they appear in the cost proposal?
☐	☐	☐	☐	Do the subcontractor's total costs match the consultant's invoice line items?
☐	☐	☐	☐	Is an explanation provided in the notes for sub line items not included in the cost proposal bid?
☐	☐	☐	☐	Is an explanation provided in the notes for sub rates invoiced higher than in the cost proposal bid?
☐	☐	☐	☐	If the sub invoice covers multiple tasks and/or cost adjustments, are the totals clearly broken out for each?
☐	☐	☐	☐	If a sub's proposed line items/unit hours were reduced, are the consultant's associated line items reduced?
☐	☐	☐	☐	Do all sub invoices and bids show a breakdown of costs in separate line items (no lump sum costs)?
☐	☐	☐	☐	Is the math correct on the subcontractor invoices?
				Additional Items for Remedy Invoices
☐	☐	☐	☐	Is the cost spreadsheet from the consultant/subcontractor contract included?
☐	☐	☐	☐	Are the line items relevant to this invoice highlighted on the contractor/subcontractor cost spreadsheet?
☐	☐	☐	☐	Does the invoice contain validation of units for invoiced subcontractor items?
				Such as: weight tickets, surveyor statements of volumes (SF, acres, etc.) field measurements collected by contractor, cut/fill reports, field observation reports documenting days, activities, etc.
☐	☐	☐	☐	If a sub hires a sub to complete a line item (i.e. surveyor, driller, etc) is there proof of services rendered?
				Such as: surveyor report, driller well abandonment records, field observation reports, etc.
				To be Completed by PRLF Staff Only
		☐	☐	Is the invoice and approved cost proposal separately secured (if more than 1 page each)?
		☐	☐	Is the task order on the database?
		☐	☐	Does the total cost of the cost proposal match the database?

Notes:

Notes Continued: