Description of Work Vadose Drilling at the 1301-N and 1325-N Facilities, 100-NR-1 Operable Unit

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Richland, Washington 99352

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<table>
<thead>
<tr>
<th>ACRONYMS</th>
<th>Definition</th>
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<tr>
<td>ALARA</td>
<td>as low as reasonably achievable</td>
</tr>
<tr>
<td>ASTM</td>
<td>American Society for Testing and Materials</td>
</tr>
<tr>
<td>bcs</td>
<td>below crib/trench surface</td>
</tr>
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<td>CERCLA</td>
<td>Comprehensive Environmental Response Compensation and Liability Act of 1980</td>
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<td>CLP</td>
<td>Contract Laboratory Program</td>
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<td>EIIs</td>
<td>Environmental Investigation Instructions</td>
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<td>GEL</td>
<td>Geotechnical Engineering Laboratory</td>
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<td>HEIS</td>
<td>Hanford Environmental Information System</td>
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<tr>
<td>HPT</td>
<td>health physics technician</td>
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<tr>
<td>ICP</td>
<td>inductively coupled plasma</td>
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<td>IRM</td>
<td>interim remedial measure</td>
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<td>RWP</td>
<td>radiation work permit</td>
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<td>SAFER</td>
<td>Streamlined Approach to Environmental Restoration</td>
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<tr>
<td>semi-VOLs</td>
<td>semi-volatile organic compounds</td>
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<td>TAL</td>
<td>Target Analyte List</td>
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<td>TCL</td>
<td>Target Compound List</td>
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<td>volatile organic compounds</td>
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<td>WAC</td>
<td>Washington Administrative Code</td>
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1.0 SCOPE OF WORK

This description of work (DOW) details the field activities associated with the sampling of the vadose zone soils beneath the 1301-N and 1325-N cribs and trenches and will serve as a field guide for those performing the work. These activities are undertaken pursuant to the Hanford Federal Facility Agreement and Consent Order (Ecology et al., 1994a) Milestone M-16-94-01H-T1 and the June 30, 1994 Milestone Change Request M-16-94-02 (Ecology et al., 1994b). The scope of these activities were defined during a Streamlined Approach to Environmental Restoration (SAFER) workshop where data quality objectives (DQOs) for the activity were developed. The DQOs for the limited field investigation of the 1301-N/1325-N cribs and trenches are presented in Appendix A. Other supporting documents to be used in conjunction with this DOW include: the RCRA Facility Investigation/Corrective Measures Study Work Plan for the 100-NR-1 Operable Unit, Hanford Site, Richland, Washington (DOE-RL 1994a) for OU-scale investigation strategy, and with Environmental Investigations and Site Characterization Manual (WHC 1988a) for specific procedures. The 1301-N and 1325-N cribs and trenches are identified as the 116-N-1 and 116-N-3 sites in the 100-NR-1 Operable Unit work plan (DOE-RL 1994a). The locations of the 1301-N and 1325-N cribs and trenches (116-N-1 and 116-N-3) are shown in Figure 1.

Three vadose zone borings, 1301-N-1, 1301-N-2, and 1325-N-1, will be constructed to investigate the vertical and horizontal distribution of radionuclide contamination in sediments beneath the cribs and trenches. The boreholes are also intended to intersect subsurface areas that may have been contaminated by dangerous wastes, i.e., metals, in effluent disposed during past operation of the facilities. This limited field investigation will provide data for the evaluation of remedial alternatives. Data from the investigation are expected to confirm that the cribs and trenches are high priority sites in the 100-NR-1 operable unit. Data from the investigation will be used to evaluate alternatives for closure of the 1301-N and 1325-N sites. The contaminants of potential concern (COPCs) for the 1301-N/1325-N limited field investigation are presented in Table 1. The COPC list is based on data presented in the 100-NR-1 LFI report (DOE-RL 1994b)

Locations of the boreholes are shown on Figure 1. The general strategy for locating the boreholes was developed in the SAFER workshop (Appendix A) where it was noted that the heaviest contaminant concentrations in the soil column are expected where the effluent entered the disposal facilities and that concentrations of contaminants are expected to decrease toward the end of the trench. This strategy is supported by data from the 116-C-1 trench where radionuclide contamination is significantly greater at in samples from the inlet end of the trench relative to samples collected at a midlength location (DOE-RL 1994c). Borehole 1301-N-1 is located to intercept the expected maximum contaminant inventory in the 1301-N crib, whereas borehole 1301-N-2 is expected to encounter a smaller contaminant inventory (Figure 2). Borehole 1325-N-1 is located to intercept the maximum contaminant inventory in the 1325-N crib (Figure 3). Only one borehole was sited at 1325-N because only the crib and the first 228 m of the trench received effluent, and because the 1325-N facility operated for a much shorter time than the 1301-N facility. It is expected that the horizontal and vertical distribution of contaminants found in boreholes 1301-N-1 and
Figure 1. Locations of 1301-N and 1325-N Crib and Trenches and Proposed Boreholes 1301-N-1, 1301-N-2, and 1325-N-1

Note: For clarity, only those wells used to construct the cross sections have been shown. The purpose of the illustration is not to show all the groundwater monitoring wells in the 100 N area, but to show the locations of the 1301-N and 1325-N facilities, proposed drilling locations, cross section lines, and boreholes used for cross sections.
Figure 2. Geologic Cross Section A-A' for 1301-N Crib and Trench
Figure 3. Geologic Cross Section B-B' for 1325-N Crib and Trench
Table 1. Contaminants of Potential Concern, Analytical Techniques, and Analytical Methods

<table>
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<tr>
<th>Contaminants of Potential Concern</th>
<th>General Analytical Technique</th>
<th>Analysis Method</th>
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<tr>
<td>Potassium-40</td>
<td>Gamma spectrometry</td>
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<td>Manganese-54</td>
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<td>Cobalt-60</td>
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<td>Beta counting</td>
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<td>Ruthenium-106</td>
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<td>Inductively coupled plasma (ICP) analysis</td>
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<td>Chromium</td>
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<td>Note that ICP analysis will also provide concentrations of Ag, Ba, Be, Bo, Fe, Mn, Ti, V, Zn</td>
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<td>Nickel</td>
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<tr>
<td>Mercury</td>
<td>Atomic absorption</td>
<td>CLP-Metals</td>
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Analytical methods for radionuclide analysis are laboratory-specific and by contract with BHI, must meet analytical requirements for level IV.
1301-N-2 will provide sufficient information to predict the distribution of contaminants for
the entire length of the 1301-N and 1325-N trenches. The 100-NR-1 LFI report (DOE-RL
1994b) presents the data used to select locations of boreholes 1301-N-1, 1301-N-2, and
1325-N-1.

Boreholes 1301-N-1, 1301-N-2, and 1325-N-1 are located in radiological controlled areas.
Reinforced concrete panels of uncertain structural integrity cover the 1325-N crib and the
1301-N and 1325-N trenches. The 1301-N crib is not covered. Radiation levels at the two
facilities are too high to allow drilling without reduction of these levels. Placement of fill
over the 1301-N crib will reduce the radiation dose and allow construction of safe and
suitable drilling location. The panels that cover the 1301-N trench and the 1325-N crib and
trench may have to be removed to place fill and to construct drilling locations for 1301-N-2
and 1325-N-1 because personnel are not allowed on the panels and the panels are of
insufficient strength to support a drilling rig. Also, the panels may not be strong enough to
support the fill needed to reduce the radiation dose to acceptable levels. These actions taken
for health and safety reasons are not intended to constitute the interim remedial measure
(IRM) selected for abatement of skyshine; the skyshine IRM may include other actions or
alternatives.

1.1 SITE BACKGROUND AND GENERAL SUBSURFACE CONDITIONS

The hydrogeologic setting of the 100 N area is described in the Hydrogeology of the 100-N
Area (Hartman and Lindsey 1993).

1.1.1 1301-N Crib and Trench (116-N-1)

The 1301-N crib and trench are located about 300 m (1000 ft) east of the N Reactor building
(Figure 1). The crib and trench were used from 1964 until September 1985 as the primary
liquid waste disposal system for N Reactor. The crib is an 88 m (290 ft) long by 38 m (125
ft) wide rectangular basin with a 16 m (52 ft) by 3.7 m (12 ft) concrete weir box. The crib
was constructed by excavating the existing soil, surrounding the excavation with a soil and
gravel embankment, and then placing a 1 m (3 ft) layer of large stones on the excavation
floor. The walls of the crib are a sloped soil and gravel embankment and the depth is about
3.7 m (12 ft) from the floor to ground surface. A zigzag extension trench 15 m (50 ft) wide
and 3.7 m (12 ft) deep extends 490 m (1600 ft) from the crib. The trench was built in 1965.
Precast concrete cover panels were placed over the trench in 1982. The panels are grouted
together and shotcrete was placed on the trench embankments. The cover panels are
intended to minimize wildlife intrusion and airborne contamination.

Boreholes 1301-N-1 and 1301-N-2 will be drilled to penetrate no more than 5 ft into the
saturated zone, and are expected to have total depths of 65 to 75 ft based on a surface
elevation of 457 ft (139.5 m) and a water table elevation of 385 ft (DOE-RL 1994d).
The sediments of the Hanford formation and Ringold Formation that are expected to be
encountered in boreholes 1301-N-1 and 1301-N-2 consist of gravelly sand, sandy gravel, and
boulders as shown by Figure 2.
1.1.2 1325-N Crib and Trench (116-N-3)

The 1325-N crib and trench are located about 300 m (1000 ft) east of the 1301-N facility (Figure 1). The 1325-N crib and trench were used from 1983 until August 1993, although the major releases occurred prior to 1987. The 1325-N crib and trench became the primary liquid waste disposal system for N Reactor in 1985. The crib is an 76 m (250 ft) long by 73 m (240 ft) wide rectangular basin that is covered with precast, prestressed concrete panels that are sealed with grout. The concrete cover is about 10 feet lower than the surrounding grade. The percolation surface is less than 5 feet below the cover. Rock was placed on the slopes adjacent to the crib to minimize wind erosion. A straight extension trench 16.8 m (55 ft) wide and 2.1 m (7 ft) deep extends 914 m (3000 ft) from the crib, although only the first 228 m (750 ft) of the trench received effluent. The extension trench is covered with precast concrete panels. The trench cover panels are not grouted or shotcreted, and have lifting lugs to facilitate removal. The trench cover is intended to minimize wildlife intrusion and airborne contamination.

Borehole 1325-N-1 will be drilled to penetrate no more than 5 ft into the saturated zone, and is expected to have total depth of 60 to 65 ft based on a water table elevation of 388 ft (DOE-RL 1994d) and the 448 ft elevation of the concrete crib cover. The 1325-N-1 borehole may encounter sandy gravel, gravelly sand, muddy sandy gravel, muddy gravelly sand, boulders, and sand of the Hanford formation and Ringold Formation as shown by Figure 3.

2.0 GENERAL REQUIREMENTS

2.1 HEALTH AND SAFETY

All personnel working to this DOW will have completed the 40-Hour Hazardous Waste Site Worker Training Program and Radiation Worker II training and will perform all work in accordance with the following:

- WHC-CM-4-11, *ALARA Program* (WHC 1988b)
2.2 PREREQUISITES

The requirements and procedures applicable to the 100-NR-1 operable unit field activities are specified in the *Environmental Investigations and Site Characterization Manual* (WHC 1988a). The environmental investigation instructions (EIIs) that are applicable include:

- EII 1.1 "Hazardous Waste Site Entrance Requirements"
- EII 1.5 "Field Logbooks"
- EII 1.13 "Environmental Readiness Review"
- EII 2.1 "Preparation of Site-Specific Health and Safety Plans"
- EII 3.2 "Calibration and Control of Monitoring Instruments"
- EII 4.3 "Control of CERCLA and Other Past-Practice Investigation Derived Waste"
- EII 5.1 "Chain of Custody"
- EII 5.2 "Soil and Sediment Sampling App. B Split-Spoon Sampling Method"
- EII 5.4 "Field Cleaning and/or Decontamination of RCRA/CERCLA Equipment"
- EII 5.5 "1706 KE Laboratory Decontamination of RCRA/CERCLA Sampling Equipment"
- EII 5.7A "Hanford Geotechnical Sample Library Control"
- EII 5.10 "Obtaining Sample Identification Numbers and Accessing HEIS Data"
- EII 5.11 "Sample Packaging and Shipping"
- EII 6.6 "Resource Protection Well Characterization and Evaluation"
- EII 6.7 "Documentation of Well Drilling and Completion Operations"
- EII 9.1 "Geologic Logging"
- EII 11.1 "Geophysical Logging"

Each item on the Drilling Planning Form will be signed and dated by the cognizant engineer or field team leader (FTL) in accordance with EII 6.7, "Documentation of Well Drilling and Completion Operations" (WHC 1988a) prior to start of work. Each item on the checklist for tasks requiring no readiness review per EII 1.13, "Environmental Readiness Review" (WHC 1988a) will be signed and dated by the cognizant engineer or FTL prior to start of work.

3.0 FIELD ACTIVITIES

3.1 SOIL SCREENING

The field screening of radioactivity and volatile organic compounds (VOCs) associated with drill cuttings and samples removed from the 1301-N (116-N-3) and 1325-N (116-N-3) boreholes will assist in selection of sample intervals. All samples and cuttings from the borings will be field screened using a portable scintillation counter for radionuclide screening and either a photoionization-type or flame ionization-type organic vapor monitor (OVM) for VOCs screening. The field screening instruments will be used, maintained, and calibrated
consistent with EII 3.2, "Calibration and Control of Monitoring Instruments" (WHC 1988a). The field geologist will record field screening results in the borehole log.

Site background for field screening purposes will be established at each borehole after setting up a portable shielding enclosure. Site background levels of radiation and VOCs inside the portable shielding will be measured using the scintillation counter and OVM before drilling begins and on a daily basis, at minimum. The field geologist will record the site background levels in the borehole log per EII 9.1, "Geologic Logging" (WHC 1988a) prior to the start of drilling. The field screening action levels from radionuclides is twice background and for VOCs is 5 ppm above background.

Borehole sediment will be collected, placed in the portable shielding enclosure, field screened by measuring the radioactivity and VOC concentration using the portable scintillation counter and OVM. The measured radioactivity and VOC concentration will be compared to the site (shielded) background to determine if the site field screening action level has been exceeded. If the field screening action levels are exceeded a sample should be collected.

Volatile organic compounds, semi-volatile organic compounds (semi-VOLs), pesticides, and polychlorinated biphenyls (PCBs) are not contaminants of potential concern at the 1301-N and 1325-N facilities, however, if VOCs are detected by field screening in concentrations greater than 5 ppm above background, samples will be collected for VOCs, semi-VOLs, pesticides, and PCB analysis. These additional samples will be included in the suite of analytes until field screening indicates VOC levels less than 5 ppm above background. Wellsite background and all field screening data will be recorded on the borehole log.

3.2 GENERAL DRILLING ACTIVITIES

The following sections describe the general drilling activities that will be conducted at each drill site. All boreholes will be drilled using guidance of the As Low as Reasonably Achievable (ALARA) program (WHC 1988b). All drilling will be conducted utilizing the specifications and guidance presented in the Washington Administrative Code (WAC) 173-160 Part Three--"Resource Protection Wells," the "Generic Well Specification," WHC-S-014, and the "Drilling Geotechnical Test Borings Specification," WHC-S-0105, and the Environmental Investigation procedures (WHC 1988a). Detailed construction design of each borehole will be contained in data sheets attached to the Letter of Instruction to the drilling contractor.

The borings will be drilled using the cable-tool method. The drilling operations will be conducted according to EII 6.7, "Documentation of Well Drilling and Completion Operations", and EII 5.4, "Field Cleaning/Decontamination of Equipment" (WHC 1988a). At least two strings of casing will be used to downsize the borehole diameter at each borehole to minimize slough in the borehole and limit vertical downward transport of contaminants in the vadose zone during drilling operations. The approximate casing sizes 30.5 and 25.4 cm (12 and 10 in.) diameter. The first string of casing will be installed at least 1 m (3.3 ft) below the bottom of the cribs and trench. The casings will be downsized ("telescoped") as contamination concentrations decrease. An additional string of casing may
be required if perched groundwater conditions are encountered beneath the cribs or trench. Should perched groundwater conditions be encountered, drilling will be discontinued and the Washington State Department of Ecology (Ecology) will be informed as to the plan of action to be taken by DOE.

All waste generated as a result of the soil boring investigation activities will be handled as a special case in accordance with EII 4.3, "Control of CERCLA and other Past-Practice Investigation Derived Waste" (WHC 1988a). All drill cuttings will be collected in appropriate plastic bags or containers that identify the borehole number and footage interval, and placed in drums labeled with the borehole location, footage intervals, and drum surface activity levels. Drill cuttings with surface radiation readings greater than 25 mrem will be placed in appropriate plastic bags or containers that identify the borehole number and footage interval, and placed in drums labeled with the borehole location, footage intervals, and drum surface activity levels. Drums containing cuttings that had surface radiation readings greater than 25 mrem will be placed into a radiological controlled area. Chain of custody documentation and procedures per EII 5.1, "Chain of Custody" (WHC 1988a) will be applied to the cuttings stored on site until the materials are consumed during analyses or tests, or dealt with in accordance with EII 4.3, "Control of CERCLA and other Past-Practice Investigation Derived Waste" (WHC 1988a) with concurrence of Ecology.

Chemical/radionuclide and discrete physical properties samples will be collected from each borehole using a split spoon sampler in accordance with EII 5.2, "Soil and Sediment Sampling" (WHC 1988a). Geological archive samples and material for composite samples will be collected using the split spoon sampler or drive barrel sampler at each sampling interval after the chemical/radionuclide and discrete physical properties samples are collected in accordance with EII 5.2, "Soil and Sediment Sampling" (WHC 1988a).

The containerized cuttings that are stored in drums on site will be considered as potential chemical/radionuclide archival sample materials. Soil cuttings will be continuously screened along the entire borehole column per the criteria in Section 3.1 from the surface to the final borehole depth.

All boreholes will be logged according to EII 9.1, "Geologic Logging" (WHC 1988a). The geologic log will include the lithologic description, sample code, and depth; Hanford Environmental Information System (HEIS) numbers for each sample interval; borehole construction characteristics; screening results; and any general information the site geologist believes is pertinent to the characterization of the subsurface lithology. Each log sheet should contain no more than 20 ft of stratigraphic information.

All boreholes will be logged using the spectral-gamma logging tool per Section 5.1.1.5.5 of the 100-NR-1 Operable Unit work plan (DOE-RL 1994a) and EII 11.1, "Geophysical Logging" (WHC 1988a). The geophysical survey will be run in the boring whenever the casing is to be telescoped to a smaller diameter and after the borehole reaches final total depth.
Boreholes will be abandoned per EII 6.7, "Documentation of Well Drilling and Completion Operations" (WHC 1988a).

3.3 SOIL SAMPLING

3.3.1 General Sampling Requirements

Chemical/radionuclide and physical properties samples will be collected from each borehole using the split-spoon sampler in accordance with EII 5.2, "Soil and Sediment Sampling, Appendix B Split-Spoon Sampling Method" (WHC 1988a) and analyzed for the constituents and parameters listed in Table 2. If insufficient samples are obtained to satisfy the required analysis, the split spoon will be redriven. The chemical/radionuclide portion of the sample will take precedence over physical properties samples, which take precedence over composite and geological archive samples. The drive barrel can be used to obtain physical properties samples when insufficient samples are obtained with the split spoon, although use of the split spoon sampler is recommended. Geological archive samples and materials for the composite samples may be collected from the split spoon sampler or the drive barrel. An entry will be made in the borehole log identifying the sampling method using codes presented in Table 3.

3.3.2 Analytical Soil Sampling

Soil samples for chemical, physical, and radiological analysis will be collected as specified as described below, following guidance provided by the 100-NR-1 work plan (DOE-RL 1994a), and per EII 5.2, Appendix B, "Soil and Sediment Sampling" (WHC 1988a). Chain of Custody documentation will be prepared by the site geologist for each day's sampling. HEIS numbers will be assigned to the samples at the beginning of borehole activities. Packaging and shipping requirements for samples transported offsite shall be selected on the basis of total activity values and the preservation requirements applicable to the parameters of interest, as described in EII 5.11, "Sample Packaging and Shipping" (WHC 1988a).

This DOW presents guidance for obtaining samples. The proposed sampling depths for each borehole are presented on Table 4. Note that the interval from 0 ft to 12 ft below the crib/trench surface (bcs) in all borings will be sampled continuously, and that "0 ft" corresponds to the current surface of material in the cribs and trenches. Fill that may be placed over the 1301-N and 1325-N facilities to abate skyshine and the concrete panels that cover the 1301-N trench and the 1325-N crib and trench are not scheduled for sampling. However, the site geologist will need to use professional judgment and field screening data to determine the appropriate intervals for obtaining samples at depths greater than 12 ft bcs.

Field screening will be used to ensure that the most contaminated material from each sampling interval is submitted for analysis. This will involve screening the ends of the split spoon after the drive head and shoe are removed. If radiological contamination does not exceed the criteria established in the Radiation Work Permit (RWP) for placement in the glove box, the split spoon will be opened and the liners surveyed. If an interval is identified that is more contaminated than surrounding material, it will be separated from adjacent liners and a sample will be obtained. If insufficient material is present to satisfy all the bottle
Table 2. List of Analytes, Methods, Holding Times, Containers and Volumes

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<th>Method</th>
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<td>Gross alpha</td>
<td>Gas proportional counter</td>
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<td>Glass or plastic, 750 ml</td>
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</tr>
<tr>
<td>Thorium-232</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uranium-233/234</td>
<td>Alpha spectrometry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uranium-238</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plutonium-238</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plutonium-239/240</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cadmium</td>
<td>ICP - Metals - 200.7 CLP-M</td>
<td>6 months</td>
<td>Glass, 500 ml</td>
</tr>
<tr>
<td>Chromium</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lead</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nickel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mercury</td>
<td>AA - 245.1 CLP-M</td>
<td>28 days</td>
<td>Glass, 125 ml</td>
</tr>
<tr>
<td>Volatile organic compounds</td>
<td>CLP-TCL volatile organics</td>
<td>14 days</td>
<td>Glass, 250 ml</td>
</tr>
<tr>
<td>Semi-volatile organic compounds (semi-VOLs), pesticides, and PCBs¹</td>
<td>CLP-TCL semi-volatile organics, Pesticides/Aroclors</td>
<td>14 days</td>
<td>Glass, 500 ml</td>
</tr>
<tr>
<td>Fluoride</td>
<td>IC - EPA 300⁰</td>
<td>28 days</td>
<td>Glass, 125 ml</td>
</tr>
<tr>
<td>Nitrate/Nitrite</td>
<td>IC - EPA 353.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sulfate</td>
<td>IC - EPA 300⁰</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total carbonate</td>
<td>EPA 310.1</td>
<td>14 days</td>
<td>Glass, 125 ml</td>
</tr>
<tr>
<td>Total organic carbon</td>
<td>EPA 415.2</td>
<td>28 days</td>
<td>Glass, 125 ml</td>
</tr>
<tr>
<td>Cation exchange capacity</td>
<td>EPA SW-846 9081 A</td>
<td>None</td>
<td>Glass, 125 ml</td>
</tr>
<tr>
<td>Grain size distribution and contaminant concentration</td>
<td>See methods listed herein for grain size, radionuclides and metals.</td>
<td>28 days</td>
<td>Glass or Plastic, 3 x 1 ft</td>
</tr>
</tbody>
</table>

¹ See methods listed herein for grain size, radionuclides and metals.
Table 2. List of Analytes, Methods, Holding Times, Containers and Volumes
(continued)

<table>
<thead>
<tr>
<th>Analyte</th>
<th>Method</th>
<th>Holding Time</th>
<th>Container/Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grain size distribution</td>
<td>GEL-07d or ASTM D422-67</td>
<td>None</td>
<td>Glass or plastic, 1 l</td>
</tr>
<tr>
<td>Bulk density</td>
<td>GEL-14, or ASTM C127-83</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moisture content</td>
<td>GEL-14, or ASTM D2216-80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total activity</td>
<td>LA-548-111 and LA-508-121</td>
<td>6 months</td>
<td>Plastic or glass 10 ml (&gt; 1 g)</td>
</tr>
</tbody>
</table>

AA = atomic absorption
ASTM = American Society for Materials and Testing (1994)
CLP - TCL = EPA Contract Laboratory Program Target Compound List
IC = ion chromatography
ICP = inductively coupled plasma
None = There are no sample holding time restrictions or requirements
a = Modified for Contract Laboratory Program (CLP)
b = Samples will only be collected and submitted for analyses if field screening for volatile organic compounds (VOCs) indicates VOC concentration is 5 ppm above background.
c = Modified (Lindahl 1984)
d = Westinghouse Hanford Company Geotechnical Engineering Lab method procedure number (GEL-#)

NOTE: Cool samples collected for VOC and semi-VOL analyses to 4°C. There are no chemical or temperature preservation requirements for other soil samples.
Table 3. Sampling Codes

<table>
<thead>
<tr>
<th>Sample Type</th>
<th>Sample Type Designation</th>
<th>Purpose of Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical</td>
<td>CH</td>
<td>Provide material for chemical and radiochemical analysis of soil and sediment.</td>
</tr>
<tr>
<td>Physical</td>
<td>PH</td>
<td>Provide material for determination of physical characteristics of soil and sediment.</td>
</tr>
<tr>
<td>Composite Chemical/</td>
<td>CO</td>
<td>Provide material for composite sample to determine distribution of chemical and radionuclide contaminants relative to grain size.</td>
</tr>
<tr>
<td>Physical</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geological Archive</td>
<td>GA</td>
<td>Provide materials that are unconditionally released material for storage in the Hanford Geotechnical Sample Library to provide a representative physical record of the lithologies encountered during drilling activities.</td>
</tr>
<tr>
<td>Chemical Archive</td>
<td>CA</td>
<td>Provide material for future data needs such as chemical and radiochemical analysis, physical property testing, or treatability testing. Material shall be stored on site since it may exceed unconditional release criteria.</td>
</tr>
</tbody>
</table>
Table 4. Proposed Sampling Intervals for Boreholes 1301-N-1, 1301-N-2, and 1325-N-1

<table>
<thead>
<tr>
<th>Sample Interval Below Crib Surface (ft)&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Chemical/ Radionuclide Sample</th>
<th>Discrete Physical Sample</th>
<th>Composite Sample&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Geological Archive Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 2</td>
<td>0 - 2</td>
<td>0 - 10</td>
<td></td>
<td>Every 5 ft&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>2 - 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 - 6</td>
<td>4 - 6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 - 8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 - 10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 - 12</td>
<td>10 - 12</td>
<td>10 - 20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 - 17</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 - 22</td>
<td>20 - 22</td>
<td>20 - 30</td>
<td></td>
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</tr>
<tr>
<td>30 - 32</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40 - 42</td>
<td>40 - 42</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 - 52</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60 - 62</td>
<td>60 - 62</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>70 - 72&lt;sup&gt;d&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total per borehole: 13  Total per borehole: 6  Total per borehole: 3  Total per borehole: 14

<sup>a</sup> - Depth corresponding to base of crib will be defined at each site using radiation field screening.

<sup>b</sup> - Collect material for composite sample for grain size and chemical/radionuclide analysis. Preparation of composite sample will occur in laboratory.

<sup>c</sup> - Collect geological archive samples at 5 ft intervals and at changes in lithology, if material receives "unconditional release" classification from the health physics technician (HPT). Material in 0 to 15 ft interval is expected to be too radioactive for "unconditional release."

<sup>d</sup> - Total depth of boreholes is expected to range from 60 ft to 75 ft depending on depth of saturated zone in each borehole.
requirements for analysis, a composite sample will be obtained by mixing material from the liners above and below the most contaminated liner interval. If radiological contamination exceeds the criteria established in the RWP, the split spoon will be opened in the glove box. Accurate screening of the sample cannot be performed outside the glovebox because of shielding.

Field screening will also be used to monitor drill cuttings obtained with the drive barrel and to identify alternate sampling points not presented in this DOW. For example, if a contaminated zone occurs before a designated sampling point, a sample will be obtained. When the designated sampling point is encountered, if screening indicates lower contamination than at the previous sampling point, no sample will be obtained. If screening indicates contamination is greater than the previous sampling point, a sample will be obtained. If VOCs are detected in concentrations greater than 5 ppm above background samples will also be collected for VOC, semi-VOL, pesticide, and PCB analysis. These additional samples will be included in the suite of analytes until field screening indicates VOC levels less than 5 ppm above background.

All samples shall have a representative portion submitted to the 222-S Laboratory or to the EAL lab at 100-N for total activity analysis. This will be utilized for sample pre-shipment characterization. Chemical and radiological samples with a total activity of less than the 10 mR will be analyzed at an offsite laboratory. Those samples exceeding 10 mR will be routed to a designated onsite laboratory for analysis. Onsite and offsite laboratories will be identified prior to initiating field activities.

Samples collected for physical analysis and unconditionally released by the health physics technician (HPT) as nonradioactive will be submitted to the Geotechnical Engineering Cold Laboratory. Radioactive physical samples that do not exceed 25 mrem will be submitted to the Geotechnical Engineering Hot Laboratory. Samples exceeding 25 mrem will be stored at a temporary radioactive storage area until a determination is made if they will be analyzed. Physical samples not tested will be stored on site in drums as described in Section 3.2 until dealt with in accordance with ELF 4.3. "Control of CERCLA and other Past-Practice Investigation Derived Waste" (WHC 1988a) with concurrence of Ecology. All sample containers will be labeled with applicable borehole number, sampling date, time, depth interval to the nearest foot (physical samples only), HEIS number, requested analysis, and the sampler's initials.

Splits of sample intervals may be obtained for Ecology from each boring identified before the start of drilling. Ecology may be present and work in conjunction with the field team leader and the samplers to obtain sample splits. Drill cuttings stored on site as described in Section 3.1 will be available for sampling by Ecology. Ecology will assume responsibility that the samples are properly collected. Shipping requirements will be determined based on the total activities (i.e. if the samples are <50 pCi/g total activity, Ecology will ship; if >50 Pci/g, Bechtel Hanford Incorporated (BHI) will ship.

3.3.2.1 Chemical and Radionuclide Analysis. Soil samples for characterizing chemical and radionuclide contaminants will be collected from each boring at the intervals presented in
Table 4. Chain of custody documentation will be prepared by the sampling scientist. Container and volume requirements for chemical and radiological samples are presented in Table 2. The laboratory will use existing Level IV CLP methods. Level III methods for anions and other chemical parameters, and Level V methods approved under their contract for radionuclide analyses. Samples will be analyzed for the constituents as specified in Table 2.

If full sample volume requirements cannot be met, the volume obtained will be recorded in the sampling scientist's logbook per EII 1.5, "Field Logbooks" (WHC 1988a) and analyzed in the following order:

1. Radionuclides
2. Metals (CLP-Target Analyte List (TAL))
3. Total Organic Carbon
4. Cation exchange capacity
5. Anions
6. Total Carbonate.

If field screening indicates that VOC concentrations are 5 ppm greater than background, samples will be collected for analysis of organic compounds as indicated in Table 2. The priority of sample container filling and analyses in this case are as follows:

1. Volatile organic compounds (CLP-Target Compound List(TCL))
2. Semi-volatile organic compounds (CLP-TCL), pesticides, and PCBs
3. Radionuclides
4. Metals (CLP-TAL)
5. Total Organic Carbon
6. Cation exchange capacity
7. Anions
8. Total Carbonate

3.3.2.2 Physical Property Analysis. Samples for determining the physical parameters of crib material and the underlying sediments will be collected at each boring at the intervals presented in Table 4. Sample volume and container recommendations for physical properties analyses are presented in Table 2. Material larger than 7.62 cm (3 in.) will be removed from cuttings collected with the drive barrel before placing in the sample container. Samples submitted to the WHC Geotechnical Engineering Laboratory (GEL) for analysis will be marked with the WHC GEL method number corresponding to the analysis requested on the sampling and analysis request form, e.g., GEL-07. The physical property samples will be analyzed using American Society for Testing and Materials (ASTM) methods to determine the following parameters:

- Particle size distribution per ASTM D422-63 (GEL-07)
- Bulk Density per ASTM C 127-83 (GEL-14)
- Moisture content per ASTM D2216 (GEL-14)
3.3.2.3 Composite Chemical/Physical Analysis. Sediment will be collected to prepare composite samples to determine the contaminant distribution in specific grain size fractions. Sediments for composite samples will be collected at each boring in three 10 ft intervals: 0 ft to 10 ft, 10 ft to 20 ft, and 20 to 30 ft, as listed in Table 4. A total volume of 3 t of sediment is requested for each composite sample. Either the split spoon sampler or drive barrel may be used to collect the sediment. Preparation of the composite sample will occur in the laboratory.

3.3.3 Geological Archive Sampling

All material removed from a borehole will be identified and described by the geologist and summarized on the borehole log. Geologic samples for archive will be collected and described every 5 ft, at significant changes of lithology as determined by the field geologist, and from all other sampling points. Only geologic materials that have received an unconditional release status from the HPT shall be selected by the field geologist for archive purposes.

The geological archive samples are intended to provide the geotechnical library with material from sampling intervals and to supply a representative physical record of the lithologies encountered during excavation activities. The field geologist will submit geological archive samples per EII 5.7A, "Hanford Geotechnical Sample Library Control" (WHC 1988a). Each geological archive sample will be labeled with the appropriate sample depth interval (to the nearest foot), date, and time the sample was obtained. Chain of Custody documentation as detailed in EII 5.1, "Chain of Custody" (WHC 1988a) will be prepared by the site geologist. Splits of samples will be labeled, placed in a plastic bag, and given to the HPT for survey and release evaluation. Each geological archive interval will be logged in the field logbook and the borehole log. Container recommendations for geological archive samples are presented in Table 5.

<table>
<thead>
<tr>
<th>Sample Categories</th>
<th>Drive Barrel</th>
<th>Split Spoon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geological Archive</td>
<td>2 wide mouth 1 t glass jars or 1 bag+</td>
<td>1-2 (5 in. diameter) liners</td>
</tr>
<tr>
<td>Health Physics Technician (HPT) radiation release</td>
<td>1 plastic bag</td>
<td>1 plastic bag</td>
</tr>
</tbody>
</table>

+ = Container type dependent upon size of material sampled.

Table 5. Container Recommendations for Geological Archive Samples
4.0 QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS

Internal quality control (QC) samples shall be collected as specified in Appendix A, Quality Assurance Project Plan (DOE-RL 1994a) with the revisions as outlined below. The sampling shall be documented in the sampling logbook per EII 1.5, "Field Logbooks" (WHC 1988a).

1. Collect one duplicate per borehole or every 20 samples, which ever is greater.

2. Collect split samples at the same frequency as duplicates.

3. Field blanks are not required.

4. Collect equipment blanks at the same frequency as duplicates and analyze for constituents listed in Table 2. The media shall be silica sand.

5. Submit Volatile Organic Analysis (VOA) trip blanks, only if samples are submitted for analysis of organic compounds, i.e., VOCs, semi-VOCs, pesticides, and PCBs. Samples will be submitted for analyses of organic compounds only if field screening indicates VOC concentrations are greater than 5 ppm above background. The VOA trip blanks consist of silica sand added to clean sample containers that accompanying each batch of coolers shipped to the analytical facility. Trip blanks shall be returned unopened to the laboratory and are used to assess possible contamination originating from container preparation methods, shipment, handling, storage, or site conditions. The trip blank shall be analyzed for EPA target compound list VOCs.

5.0 SCHEDULE

The three boreholes at the 1301-N (116-N-1) and 1325-N (116-N-3) cribs and trenches in the 100-NR-1 Operable Unit are scheduled to be drilled between May 1995 and September 1995 as follows:

- January 2, 1995 through April 30, 1995 - Predrilling planning
- May 1995 - Mobilization and set up of drill rig at first borehole location
- June 1995 - Drill first borehole and move drill rig to second location
- July 1995 - Drill second borehole and move drill rig to third location
- August 1995 - Drill third borehole
- September 1995 - Remove drill rig from third location and demobilize.

This schedule assumes that abatement of radiation levels at the drilling location occurs prior to drilling, i.e., before May 1995. It also assumes that safe and suitable locations for siting the drill rig are provided. The abatement of skyshine may also be necessary before siting the drilling rig. This schedule is subject to change and the DOE-RL operable unit manager should be contacted for current status. An Agreement Activity Notification form will be issued at least 5 days before the start of field work.
6.0 CHANGES TO DESCRIPTION OF WORK

Unforeseeable major changes to this DOW, such as analyzing different parameters, using different analytical methods, or changing the sampling interval will be submitted using the Engineering Change Notice form (Attachment 1). Foreseeable changes will be submitted to the lead regulatory agency for approval or review prior to deviating from the DOW. Copies will be submitted to the lead regulatory agency and appropriate field personnel within 10 working days of the change.
7.0 REFERENCES


DOE/RL-94-104
Draft A

ATTACHMENT 1

1301-N/1325-N Description of Work

PROJECT CHANGE FORM

Date:

Person Initiating Change:

Change:

Reason for Change:

APPROVAL:

Field Team Leader:

Operable Unit Coordinator:

Quality Assurance:

At-1
APPENDIX A

Scope of Work Agreement for 1301/1325-N Cribs
June 29, 1994

Mr. K. M. Thompson, Acting Director
Environmental Remediation Division
U.S. Department of Energy
Richland Operations Office
Richland, Washington 99352

Dear Mr. Thompson:

TRANSMITTAL OF SCOPE OF WORK AGREEMENT FOR 1301/1325-N CRIBS

Transmitted herewith is the scope of work agreement for conducting a limited field investigation at 1301-N and 1325-N Cribs in the 100-NR-1 Operable Unit. This draft is being transmitted to you for review in advance of the June 30, 1994, submittal date. Unless you have corrections, this transmittal is intended for your use in meeting the N Area Pilot Project H-16-01H-T1 Milestone for submittal to the State of Washington Department of Ecology (Ecology) and the U.S. Environmental Protection Agency (EPA).

The document is substantially the same as the draft you received at the end of the meeting on June 16, 1994. A sketch of the conceptual model for each facility and a signature block for the U.S. Department of Energy, Richland Operations Office, Ecology, and EPA signatures have been added.

If you have any questions, please contact me on 372-2314, or Mr. J. K. Patterson of my staff on 376-0902.

Very truly yours,

T. M. Wintczak, Manager
Environmental Restoration Program

cctf

Attachments (2)

RL - B. L. Foley,
    R. D. Freecerg
    R. A. Holten
    R. O. Puthoff (no attachments)
    R. P. Saget
TRANSMITTAL LETTER
Mr. David C. Nylander
Kennwick Manager
State of Washington
Department of Ecology
7601 West Clearwater, Suite 102
Kennwick, Washington  99336

Mr. Douglas R. Sherwood
Hanford Project Manager
U.S. Environmental Protection Agency
712 Swift Boulevard, Suite 5
Richland, Washington  99352

Dear Messrs. Nylander and Sherwood:

TRANSMITTAL OF SCOPE OF WORK AGREEMENT FOR 1301/1325-N CRIBS

Transmitted herewith is the scope of work agreement for conducting a limited field investigation at 1301-N and 1325-N Cribs in the 100-NR-1 Operable Unit. This transmittal is intended for your use in meeting the N Area Pilot Project M-16-01H-T1 Milestone for submittal to the State of Washington Department of Ecology (Ecology) and the U.S. Environmental Protection Agency (EPA).

A sketch of the conceptual model for each facility and a signature block for the Ecology and EPA signatures have been added.

Sincerely,

Patrick W. Willison
Acting Hanford Project Manager

Enclosure

cc w/o encl.:
L. D. Arnold, WHC
A. L. Langstaff, WHC
T. M. Hintczak, WHC
The enclosures are the same as external letter #94544040
HANFORD 1301-N AND 1325-N CRIBS LIMITED FIELD INVESTIGATION
SCOPE OF WORK AGREEMENT
DOE/RL-94-104
Draft A

Hanford 1301-N and 1325-N Crib Limited Field Investigation
Scope of Work Agreement

Purpose

Pursuant to the TPA Milestone Change Request M-16-94-02, the purpose of this work scope is to define the data quality objectives for the limited field investigation (LFI) to provide contaminant investigations of the 1301-N/1325-N cribs. This scope was developed using the SAFER process.

This Scope of Work (SOW) agreement satisfies Milestone M-16-01HT1.

Overall Information Use

The LFI for the 1301-N/1325-N cribs is being conducted to obtain data necessary to make decisions listed below:

- To confirm the 1301-N/1325-N cribs are high priority sites in the 100-NR-1 Operable Unit (OU) based on a qualitative risk assessment and contamination levels
- To support the evaluation of remedial technologies in terms of effectiveness, implementability, cost, and consistency with the final remedy for the 100-NR-1 OU

The information developed from this LFI will support the evaluation of remedial technologies. This data will also be used in a separate work effort to support development of the source term for the 100-NR-2 OU. However, additional information may be required at a future time to support other 1301-N/1325-N crib activities including, but not limited to conducting treatability testing, certifying closure, and completing remedial design.

Work Scope Definition Process

To more clearly define the project work scope and arrive at a consensus the U.S. Department of Energy, Richland Operations Office (DOE-RL), the U.S. Environmental Protection Agency (EPA) and the State of Washington Department of Ecology (Ecology) have elected to use the Streamlined Approach For Environmental Restoration (SAFER). SAFER is a new Department of Energy (DOE) initiative based on both the Data Quality Objective (DQO) process and the Observational Approach. Both EPA and Ecology have endorsed the trial application of this approach at Hanford in an effort to increase involvement of the extended project team (three parties) in order to promote the linkage of data collection to decision making, to optimize the management of uncertainty during data collection and to achieve participation and consensus among the stakeholders during
development of the work scope. To achieve these goals a series of SAFER meetings were held. Based on these meetings a refined scope of work has been defined.

SAFER Scoping Discussions

Three scoping meetings were held between June 13 and June 16, 1994, to define decisions that will be made and to define the data needs required to make the decisions. This process emphasized the DQO attributes of SAFER. Consensus for the work to be conducted in order to comply with M-16-94-02 was achieved by the extended project team. This consensus is summarized in tabular form and appended as Attachment 1. Definitions for terms in this SOW are also appended as Attachment 2.

Schedule

The schedule will be finalized pursuant to resolution of M-16-94-02.

Assumptions

This section details extended project team assumptions and agreements on regulatory, funding, and logistical issues. This section defines and identifies those issues essential for all parties to understand and agree on which are fundamental to implementing the LFI.

The assumptions are:

- Resource Conservation and Recovery Act (RCRA) closure certification decisions will not be based on this characterization effort.

- No remedial technology is presupposed.

- Selected samples as specified in the Description of Work (DOW) will be archived by depth interval and boring location.

- The preliminary list of potential contaminants of concern is based on process information and historical data. This list will be finalized after Ecology and EPA review the Draft LFI Reports of previously collected data for 100-NR-1 OU and the Draft 1301-N/1325-N Closure Plan. It is assumed that these documents will be transmitted to Ecology and EPA by the end of June 1994.

- This work scope only considers the vadose zone contamination of 1301-N/1325-N cribs in 100-NR-1 OU. Skyshine will be addressed in a separate work scope.

- This SOW was developed assuming funding is available to complete the work.
This SOW will not change without appropriate review of schedule and cost.

This SOW was developed assuming the soil column could be safely accessed, e.g., close is As Low as Reasonably Achievable (ALARA).

Conceptual Model

A conceptual model of each crib and trench extension was developed based on information available to the project team. Sketches of 1301-N and 1325-N facilities are provided in Attachments 3 and 4, respectively. In both cases, the contamination is expected to match the footprint of the facility vertically to some depth. Mounding of the water table near the groundwater table interface is expected to have caused horizontal spreading of the contamination zone.

Contamination is known to have spread the entire length of 1301-N trench, however the effluent to 1325-N trench was confined to the first one-third of the length.

By signature herein, DOE-RL, EPA and Ecology agree that this scope of work agreement represents the basis for developing the description of work for a limited field investigation at 1301-N and 1325-N cribs and trenches.

<table>
<thead>
<tr>
<th>DOE Unit Manager</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bryan Foley</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ecology Unit Manager</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phillip Staats</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EPA Unit Manager</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pam Innis</td>
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</tbody>
</table>
## Attachment 1

### DATA QUALITY OBJECTIVES

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<tr>
<th>DECISION</th>
<th>DATA REQUIREMENT</th>
<th>DATA TYPE</th>
<th>PROBABLE CONDITION</th>
<th>DETERMINATION</th>
<th>CRITERIA</th>
<th>MEASUREMENT BASIS</th>
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</thead>
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<tr>
<td>1.</td>
<td>Determine whether or not the 1301-N and 1325-N cells are high priority sites in 100 NRI 1</td>
<td>Nature and extent</td>
<td>Concentration of potential contaminant of concern (PCC)</td>
<td>Is it a PCC based on process knowledge and historical data?</td>
<td>Applicable or relevant and appropriate requirements</td>
<td>Any sample that exceeds criteria using field or laboratory methods.</td>
</tr>
<tr>
<td>2.</td>
<td>To support the evaluation of remedial technologies in terms of effectiveness, implementability, cost, and consistency with the final NRI remedy</td>
<td>Vertical distribution</td>
<td>Depth of contamination in new borings</td>
<td>Same as above</td>
<td>As measured by lab analysis of samples in new borings correlated to RLS. At 1301-N, one boring will be located in the vicinity of the crib for evaluation of the heaviest loaded area, and one boring will be located at some distance from the crib along the trench to evaluate loading of the trench. At 1325-N, one boring would be located near the crib. The concentration profile derived from 1301-N borings will be the assumed profile for 1325-N.</td>
<td></td>
</tr>
<tr>
<td>DECISION</td>
<td>DATA REQUIREMENT</td>
<td>DATA TYPE</td>
<td>PROBABLE CONDITION</td>
<td>DETERMINATION</td>
<td>CRITERIA</td>
<td>MEASUREMENT BASIS</td>
</tr>
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<td></td>
<td></td>
<td>Contamination expected vertically to match footprint of crib and trench with horizontal flare at GWT interface.</td>
<td>Depth of contamination in existing borings (wells)</td>
<td>Same as above</td>
<td>RLS to mitigate contamination developed from correlation in new borings.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Horizontal Distribution</td>
<td>Contamination is equivalent to footprint of crib and trench, but assumed to be flared near GWT interface.</td>
<td>To estimate volume and areal extent with depth</td>
<td>Same as above</td>
<td>Same as above</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Near surface contamination is equivalent to footprint of crib and trench. Existing information for surface conditions include historical surveys, data, and other crib LPs.</td>
<td>To estimate volume and areal extent at near surface</td>
<td>Same as above</td>
<td>None required</td>
<td></td>
</tr>
<tr>
<td>2. To support the evaluation of remedial technologies in terms of effectiveness, implementability, cost, and consistency with the final NR1 remedy</td>
<td>Soil characterization</td>
<td>Physical parameters</td>
<td>Existing information from nearby borings will be used for most physical parameters. Concentration vs. particle size distribution will be collected during this investigation.</td>
<td></td>
<td>Particle size distribution, moisture content, concentration by particle size (composite sample), bulk density.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chemical parameters</td>
<td>Existing information from nearby borings will be used when possible. Chemical data of contaminated soil will be analyzed as deemed appropriate in the work plan.</td>
<td></td>
<td>Cation exchange capacity, total carbonate, amon distribution, cation distribution, total organic carbon.</td>
<td></td>
</tr>
</tbody>
</table>
Criteria (DQO Table)
The evaluation basis for which the determination is made after the sampling event.

HSRAM
Hamford Site Risk Assessment Methodology

GWT
The existing mean groundwater table.

PCOC
Potential Contaminant of Concern.

QRA
Qualitative Risk Assessment

RLS
Radionuclide Logging System. An instrument that surveys the levels of gamma ray-emitting radionuclides in a boring.

SAFER
Streamlined Approach for Environmental Restoration, this is a DOE initiative that provides a framework for environmental restoration.

Stakeholder
For this limited characterization, DOE, EPA and Ecology are the groups interested in or affected by the project conducted. These are the decision makers with signature authority for the ROD.

Vadose Zone
The unsaturated soil column including the ground surface and facility structure to the existing mean groundwater table.
1325-N Liquid Waste Disposal Facility

- **Ground Surface**
- **1325-N Trench**
  
  \[3000' \times 55' \times 7'\]
- **1325-N Crib**
  
  \[230' \times 240' \times 7'\]
- **Present Groundwater Surface**
- **Former Groundwater Mound Surface**
- **Vadose Zone Contamination**
  
  [To Groundwater, Approximately 75 Feet Below Ground Surface]