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Date Prepared: 10/30/95

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Transmittal Number: BHI-OP-00056-TR93

Document Number: BHI-OP-00056

Title: SITE SPECIFIC PROCEDURE ANALYTICAL DRILLING AND SAMPLING ADJACENT TO 1301-N TRENCH: BOREHOLE B2537

Instructions: (1) Remove and/or insert indicated procedure/section into manual as shown.
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Approved by:

 10/23/95
R. C. Havenor
Field Superintendent

 10/23/95
J. C. Plastino
Quality Assurance

 10/23/95
D. L. Hill
Radiation Control Supervisor

 10/23/95
B. G. Tuttle
Safety

1.0 PURPOSE AND SCOPE

This borehole specific procedure provides instructions for controlling work to ensure contamination control while drilling and sampling borehole B2537 which is in a radiological contaminated area. This instruction is also sufficient in the event chemical contamination is found.

This procedure applies to all Environmental Restoration Contractors (ERC) and subcontractor personnel drilling and sampling borehole B2537 where contamination has been detected above background levels on the downhole drilling and sampling equipment or loose spoils during drilling and sampling operations. This procedure addresses work performed in the drilling and sampling area and split-spoon breakdown area continuing up to the point which the sample is received by the sample technician.

2.0 REQUIREMENTS

1. Drilling requirements in radiological contaminated soil shall conform to applicable safety plans and radiation work permits (RWP).

Applicable RWPs are as follows:

PS-455/0	Drilling and associated activities with well B2537
PS-437/2	Drilling and associated activities with well B2537
PS-382/2	Drilling and associated activities with well B2537
PS-384/2	Drilling and associated activities with well B2537
PS-383/2	Breakdown and preparation of samples for B2537
PS-456/0	Breakdown and preparation of samples for B2537

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The applicable safety plan is the Site-Specific Health and Safety Plan (SSHSP) 1301N-SH-S0001, Rev 0; 100-NR-1-OU formerly BHI-0105-95, Rev. 1; and BHI-0845, Rev. 0.

2. Documentation of field activities shall be in accordance with BHI-EE-01, Environmental Restoration Procedures (EIP) 6.0 "Documentation of Well Drilling and Completion Operations."
3. Any event that may adversely affect worker safety, the environment, or the quality of the project shall be immediately brought to the attention of the field superintendent. Each worker has the responsibility to **STOP WORK** in an imminent danger situation. Events encountered during the drilling and sampling operation that are not covered by this procedure shall be recorded in the field activity report (FAR).
4. Conduct of radiological controls will be in accordance with BHI-SH-04. "Radiological Control Work Instructions" and the Hanford Site Radiological Control Manual (HSRCM).

2.1 Responsibilities

Field Superintendent (FS) - The FS is in charge on the site. Responsibilities include, but are not limited to, the health and safety of personnel, compliance with procedures and requirements, and insuring that support is sufficient to meet data quality objectives (DQO).

Field Coordinator (FC) - The FC's responsibilities include, but are not limited to, coordinating craft in a manner that is efficient, inventorying critical supplies, and tracking waste.

ES&E Team Lead - The ES&E team lead is responsible for ensuring sample collection and lab analyses meet DQOs and the project activities meet the requirements of the description of work DOW.

Technical Leads (TL) - The TL is responsible for communicating all precision points (i.e., sample intervals, sample priorities) to the appropriate site personnel. All questions involving technical implementation of the characterization will be answered by the TL.

Site Safety Officer (SSO) - The SSO visits the site on a regular basis to determine compliance with the health and safety plan (HASP) and other safety requirements. The

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SSO provides guidance to the FS on safety matters and provides interpretations on health and safety issues.

Industrial Hygiene Technician (IHT) - The IHT is responsible for collecting and analyzing air samples for volatile constituents, recording samples, and notifying the FS of all sample results.

Geologist - The geologist is responsible for recording all activities on the FAR, completing the geologic log, and verifying that all wastes are labeled in accordance with the waste control plan.

Samplers - The samplers are responsible for collecting, packaging, and shipping all samples in accordance with the DOW and applicable procedures, including but not limited to, BHI-EE-01 EIPs 4.0 and 4.3.

Drillers - The drillers are responsible for advancing the borehole in accordance with this procedure, Washington Administrative Code (WAC) 173-160, and the subcontract scope of work.

Laborers - The laborers are responsible for assisting the operation, breaking down samplers, preparing materials, decontaminating tools and samplers, and cleanliness of the site.

Teamsters - The teamsters are responsible for moving equipment and supplies.

Radiological Control Technicians (RCTs) - The RCT is responsible for implementing all radiological controls.

3.0 EQUIPMENT

1. U.S. Department of Energy (DOE) owned regulated drill rig and drill tools, including split-spoon samplers.
2. Associated site equipment for movement, storage and usage of materials and equipment.
3. All safety equipment required by the SSHSP.
4. Anti-contamination clothing.

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5. Duct tape.
6. Shielded waste drum.
7. Portable shielding.
8. Plastic sleeving/bagging material.
9. Radiological detection instrumentation.
10. Miscellaneous hand tools.
11. Sample breakdown table and containment.
12. Decontamination materials.

4.0 PROCEDURE

1. Follow the steps in this procedure when drilling or sampling where contamination levels have been detected above background levels.
2. During soil retrieval, (Section 4.6) the steps marked **HP** are hold points. The RCT shall perform the required survey(s) and document results in the survey report.

4.1 Work Control

Work control is implemented through stringent schedule management and tracking with daily planning efforts focusing on accomplishing necessary tasks. A base schedule (level 3) will be tracked for utilization by the stakeholders and project management. A more detailed schedule (level 4, 1 week rolling) will be utilized by field personnel for tracking progress and anticipating tasks. A level 5 (1 day) schedule will be created daily and issued as the Plan of the Day (POD).

The FS or FC conducts a pre-job meeting and daily tailgate meeting for all personnel:

1. The FS will lead discussion and critique the previous work day activities.

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2. The lead RCT will brief personnel on applicable RWPs and inform them of any changes to the RWPs.
3. Review any unusual drilling conditions as applicable.
4. Present the POD and identify:
 - a. Key personnel.
 - b. Group interactions and timing.
 - c. Drilling and sampling intervals.
 - d. Alternatives and contingencies.
5. Receive worker input and incorporate into the POD as necessary.
6. Brief personnel on safety aspects relative to the POD and any lessons learned from previous work.
7. Discuss best as low as reasonably achievable (ALARA) practices.
8. Review the line of authority and offsite communications.

The POD will be placed in the procedure binder located at the site for easy reference to site workers.

4.2 Limiting Conditions

When a work site is established as (1) surrounded by contamination areas (CA) or (2) adjacent to (within 100 feet) and downwind from a CA, stop work in the following circumstances:

1. Visible migration of surface soils (i.e., blowing dust) or materials (e.g., tumbleweeds, trash) from the adjacent CA occurs.
2. Contamination control is not possible or the potential exists for uncontrolled contamination spread. The safety basis limits this project to 15 mph winds across an open container of drilled/sampled soil. Sleeving, glove bags, and glove boxes function as weather protection.

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NOTE: Work may not resume without concurrence from line management and the RCT supervisor.

4.3 Initial Survey

The RCT shall perform an initial survey prior to other workers entering the CAs of the work site. The FC shall coordinate this effort to ensure that requirements in the SSHSP are also considered.

4.4 Intermittent and In-progress Surveys

1. Volatile organic compounds are not expected to be encountered during this investigation. However, intermittent precautionary sampling will be conducted per the safety plan to confirm the absence of volatiles.
 - a. Tygon or Teflon (a trademark of E. I. du Pont de Nemours & Company) tubing (approximately 20 feet) will be placed from the drill area to the RBA. This will allow the IHT to draw the sample without entering a higher radiation area (ALARA).
 - b. Upon arrival of the IHT the drill crew will temporarily suspend drilling operations and place tubing approximately 5 feet into the borehole.
 - c. The IHT will draw the sample. IF sample results are elevated to 1 ppm or greater the IHT will direct the drill crew to place the inlet end of the tubing into the breathing zone and another sample will be pulled.

IF breathing zone sample results are **1 ppm** or greater for 1 minute, then **STOP WORK** and exit zone immediately. Contact the FS and SSO.
 - d. The IHT sample results shall be recorded in the FAR and the IHT survey log.
2. Air sampling shall be conducted in accordance with the project air sampling plan and BHI-SH-04. At a minimum, the plan consists of a continuous sample in the drill area, an AM/PM sample near the drill area, an in-progress sample during breakdown table operations, and an in-progress sample during glove box operations. Other samples may be taken at the discretion of the lead RCT.

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4.5 Site Setup

The site will be set up and equipment staged in a manner similar to the mock-up site. A sketch of the site attached in the work package reflects the general orientation of equipment. Some modifications to the setup are anticipated. The FS or FC will coordinate movement of equipment and materials. The FS will inspect the site for usability and safety prior to start of work. This will be documented on the FAR.

4.6 Soil Retrieval Process

NOTE: The RCT shall perform routine surveys around the borehole during Steps 1 through 10 to monitor radiological conditions.

1. A length of sleeving necessary to contain the soil retrieval equipment shall be prepared and placed around the casing.
 2. Pull plastic sleeving down around the casing in anticipation for containment of the soil retrieval equipment as it is withdrawn from the casing.
 3. Advance the borehole below the casing, or overdrive the casing and clean out the borehole.
- HP** 4. Slowly remove the soil retrieval equipment from the borehole while the RCT surveys the equipment. Radiological Stop Work and action levels are as shown in the following table. Upon meeting Stop Work levels, stop work and contact the RC supervisor and the FS. Upon meeting action levels, contact the RC supervisor and the FS, but do not stop work.

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RWP No.	Operating Range Contamination Level (per 100 cm ²)	Respiratory Protection / PC's	Action Levels & STOP WORK (per 100 cm ²)
PS-437 Rev. 2	<1,000 dpm βγ	None / None	STOP WORK: 1000 dpm βγ or 20 dpm α probe area or per 100 cm ²
PS-455 Rev. 0	1,000 dpm βγ to <20,000 βγ	None / Single Set	STOP WORK: 20,000 dpm βγ 2,000 dpm α 100 mR/hr whole body Action Level: 10,000 dpm βγ 1,000 dpm α
PS-382 Rev. 2	20,000 dpm βγ to <100,000 dpm βγ	APR / Single Set	STOP WORK: 100,000 dpm βγ 2,000 dpm α 100 mR/hr whole body Action Level: 50,000 dpm βγ 1,000 dpm α
PS-384 Rev. 1	100,000 dpm βγ to <500,000 dpm βγ	APR / Double Set	STOP WORK: 500,000 dpm βγ 20,000 dpm α 100 mR/hr whole body Action Level: 200,000 dpm βγ 2,000 dpm α 25 mRem/hr contact

5. If radiation/contamination levels detected by this survey are below Stop Work levels then proceed to step 6; if not,
 - a. Lower the soil retrieval equipment back into the casing.

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- b. Contain equipment in the well and wellhead; tape installed plastic sleeving to the cable or as directed by the RCT to ensure area is radiologically safe.
 - c. Notify the FS and the RCT field supervisor.
6. Pull sleeving up over the soil retrieval equipment and continue to remove equipment. When the bottom of the equipment has cleared the top of the borehole, horsetail the bottom of the sleeving.
7. If drilling, proceed to Step 8; if sampling,
- a. Inspect glove boxes and document inspections in RCT survey report prior to use.
 - b. Remove the sampler and tape the top of the sleeving; perform a smear survey on sleeving to verify less than detectable smearable contamination.
 - c. Turn on High-Efficiency Particulate Air filter (HEPA) vacuum to create negative pressure in breakdown box.
 - d. **WARNING - DO NOT STAND UNDER SUSPENDED LOAD**
Transfer the contained sample equipment from the drill area to the breakdown area with the boom truck.
 - e. Open door (SLOWLY) on breakdown table to prevent excessive turbulence from negative pressure air flow.
 - f. Lay split-spoon sampler on clamps and unhook sling.
 - g. Close doors (SLOWLY) on box.
 - h. Lock doors on box.
 - i. The RCT may take readings to estimate extremity exposure dose rate.
 - j. The RCT shall smear survey the inside of the gloves after each use. If contamination is found inside the glove **STOP WORK**, and contact the FS and RCT field supervisor.
 - k. Split plastic sleeving around sampler.

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- l. Shield as necessary with lead blanket.
- m. Tighten clamps on sampler.
- n. Remove drive head.
- o. Remove drive shoe.
- p. Bag out splits containing sample per ALARA good practices.
- q. Place bagged sample on cart and shield as necessary with lead blanket and transfer sample to the sample technician. The technician will work in accordance with WHC-IP-1127, 5.6; "Sample Extraction."
- r. Bag out drive head, drive shoe, and miscellaneous material.
- s. Clean table and box to less than 20,000 dpm per 100 cm² removable $\beta\gamma$.
- t. Turn off HEPA vacuum.
- HP u. Wait for sample technician or geologist to confirm sufficient sample is present and whether another sample is required before advancing borehole past sampled interval.

8. If drilling,

- a. Tape sleeving before hitting drive barrel with sledge hammer.
- b. Transfer the contained drive barrel to the waste drum or shielded waste drum; dislodge soils in drive barrel into sleeving.
- c. Repair the sleeving with tape if it is damaged while emptying the drive barrel. Wipe drive barrel down with wet rag as sleeving is removed.
- d. Deposit sleeved soil in the drum's inner liner by removing the upper tape seal on the drive barrel.

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- HP e. Survey drive barrel for smearable contamination. Radiological Stop Work and action levels are as shown in the following table. Upon meeting Stop Work levels, stop work and contact the RC supervisor and the FS. Upon meeting action levels, contact the RC supervisor and the FS but do not stop work.

RWP No.	Operating Range Contamination Level (per 100 cm ²)	Respiratory Protection / PC's	Action Levels & STOP WORK (per 100 cm ²)
PS-437 Rev. 2	<1,000 dpm βγ	None / None	STOP WORK: 1,000 dpm βγ or 20 dpm α probe area or per 100 cm ²
PS-455 Rev. 0	1,000 dpm βγ to <20,000 βγ	None / Single Set	STOP WORK: 20,000 dpm βγ 2,000 dpm α 100 mR/hr whole body Action Level: 10,000 dpm βγ 1,000 dpm α
PS-382 Rev. 2	20,000 dpm βγ to <100,000 dpm βγ	APR / Single Set	STOP WORK: 100,000 dpm βγ 2,000 dpm α 100 mR/hr whole body Action Level: 50,000 dpm βγ 1,000 dpm α
PS-384 Rev. 1	100,000 dpm βγ to <500,000 dpm βγ	APR / Double Set	STOP WORK: 500,000 dpm βγ 20,000 dpm α 100 mR/hr whole body Action Level: 200,000 dpm βγ 2,000 dpm α 25 mRem/hr contact

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- f. Fold the top of the sleeving in the waste drum (1) to minimize contamination spread and (2) so the RCT may access the deposited soil for direct survey if necessary. Use separate sleeves for each drill interval.
 - g. Double bag grab samples and smear survey to verify external contamination level is less than detectable before transporting to the sample trailer glove box.
 - h. Transfer sample to the sample technician. The sample technician will work in accordance with WHC-IP-1127, 5.6; "Sample Extraction."
9. Repeat steps 1 through 8 for further sampling or until the waste drum is full.
 10. Replace full or partially full waste container.
- HP**
- a. If a shielded drum was used, remove (soils) drum from the shielded drum using appropriate hoisting equipment. Replace the waste drum when it is full or it causes the general area to have a dose rate of 10 mR/hr. The RCT shall smear survey the outside of the drum for loose surface contamination and verify levels are less than 1,000 dpm $\beta\gamma$ per 100 cm² removable .
 - b. Package soils in double 10-mil nylon reinforced plastic bags with an outer nylon duffel-type bag. Place waste label on nylon bag. Several packages may be handled in a drum.
- HP**
- c. If the dose rate at 12 inches exceeds 100 mR/hr, the RCT shall escort the drum/package to the storage area and verify that the radiological boundaries are in compliance with the HSRCM.
- NOTE:** Any drum or waste shall be shielded to <100 mR/hr at 12 inches, or locked or guarded.
- d. Transfer the waste to a clean drum pallet, and secure by using standard load securing straps.
 - e. Transfer the waste to a radioactive material storage area.

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- f. Drilling spoil waste will be lowered beneath the trench panels on an intermittent basis (e.g., once-a-week). Details of sample location will be addressed during presentation of the POD.
11. Repeat steps 1 through 10 as necessary to advance the borehole to total depth.

4.7 Drilling Completion

1. Demobilize equipment and materials. All material shall be surveyed and released or controlled in accordance with BHI-SH-04 or the Waste Control Plan.
2. All drilling equipment shall be decontaminated in accordance with BHI-EE-01, EIP 6.3 "Equipment Decontamination." Rinsate shall be contained, sampled for total activity, and released if less than detectable.
3. An abandonment plan will be generated after data has been examined and regulatory input has been gained. A variance to WAC 173-160 may be required.
4. All forms generated in conducting, drilling, and sampling in radiological contamination shall be sent to the Document Control Group.

5.0 REFERENCES

BHI-EE-01, *Environmental Investigations Procedures*,
EIP 3.0, "Chain of Custody"
EIP 3.1, "Sample Packaging and Shipping"
EIP 4.0, "Soil and Sediment Sampling"
EIP 4.2, "Sample Storage and Shipping Facility"
EIP 4.3, "Biotic Surveying and Sampling"
EIP 6.0, "Documentation of Well Drilling and Completion Operations,"
EIP 6.2, "Field Cleaning and/or Decontamination of Drilling Equipment"
EIP 6.3, "Equipment Decontamination"
EIP 6.4, "Control and Storage of Radioactive Materials and Equipment"
EIP 7.0, "Geologic Logging"

BHI-SH-04, *Radiological Control Work Instructions*.

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DOE/RL-94-104 Rev. 0, *Description of Work for Vadose Zone Characterization of the 1301-N and 1325-N Liquid Waste Disposal Facilities.*

Hanford Site Radiological Control Manual, Rev. 2.

WAC 173-160, *Minimum Standards for Construction and Maintenance of Wells.*

10 CFR 835, *Occupational Radiation Protection; Final Rule.*

1301N-SH-S0001, Rev. 0, 100-NR-1-OU, *Site Health and Safety Plan.*

6.0 FORMS

Radiological Survey Record (BHI-TM-R006)

Radiological Survey Record Continuation Sheet (BHI-TM-R007)

Field Activity Report and Continuation Page (BHI-EE-017)

Plan of the Day