Attachment 14

183-H Solar Evaporation Basins Vadose Zone Sampling Plan
June 25, 1991

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7. Abstract

This document describes the methods and procedures to drill and sample the soil in the Vadose Zone beneath the 183-H Solar Evaporation Basins.

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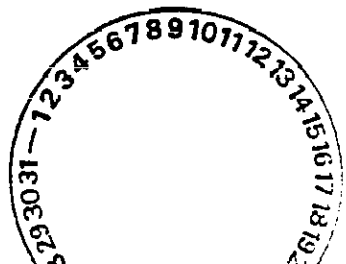

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183-H SOLAR EVAPORATION BASINS VADOSE ZONE SAMPLING PLAN

ENVIRONMENTAL ENGINEERING

TECHNICAL BASELINE SECTION

June 25, 1991

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FIGURE

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183-H SOLAR EVAPORATION BASINS VADOSE ZONE SAMPLING PLAN

1. SCOPE

The scope of this vadose zone sampling plan is to collect soil samples from the vadose zone beneath and surrounding the 183-H Solar Evaporation Basins. Samples will be analyzed for a number of potentially hazardous constituents. Data will be used, in conjunction with shallow soil data collected in Phase I (DOE-RL 1988), to assess the extent and distribution of contamination. Soil sampling and analysis supports the closure of the 183-H Solar Evaporation Basins as outlined in the closure plan for that facility (DOE-RL 1988).

This document supports the planned sampling activities specified in the closure/postclosure plan for the 183-H Solar Evaporation Basins [Phase II (Deep) Soil Sampling, pp I-132 through I-133] (DOE-RL 1988). This sampling plan contains supplemental information to guide field activities during Phase II. This plan modifies the closure/postclosure plan concerning the types of field blanks to be collected. Because volatile organic aromatics (VOA) are being analyzed, no trip blanks will be taken, according to SW-846 *Test Methods for Evaluating Solid Waste, Physical Chemical Methods*, Section 3.4.1 (EPA 1986). As specified, field work will be accomplished in accordance with the closure/postclosure plan, this document, and procedures outlined in WHC-CM-7-7, *Environmental Investigations and Site Characterization Manual* (WHC 1989).

2. DATA OBJECTIVES

2.1. DATA NEEDS

Data collected during this sampling will be used to assess contamination beneath and around the 183-H Solar Evaporation Basins in support of closure of the facility under the *Resource Conservation and Recovery Act of 1976* (RCRA). Laboratory analysis of samples will be performed in accordance with *Test Methods for Evaluating Solid Waste - Physical/Chemical Methods* (EPA 1986).

2.2. CONTAMINANTS OF CONCERN

The *183-H Solar Evaporation Basins Closure/Post-Closure Plan* (DOE-RL 1988) enumerates the constituents listed in Table 1 as the contaminants of concern for analysis in the soils around the basin.

Table 1. Analytical Methods for Soil Sampling Analysis.

Constituent	Analytical method
Arsenic	SW-846, 7060[1]
Barium	SW-846, 6010[1]
Beryllium	SW-846, 6010[1]
Cadmium	SW-846, 6010[1]
Chromium	SW-846, 6010[1]
Copper	SW-846, 6010[1]
Lead	SW-846, 7421[1]
Manganese	SW-846, 6010[1]
Mercury	SW-846, 7471[1]
Nickel	SW-846, 6010[1]
Selenium	SW-846, 7740[1]
Silver	SW-846, 6010[1]
Sodium	SW-846, 6010[1]
Vanadium	SW-846, 6010[1]
Zinc	SW-846, 6010[1]
Fluoride	EPA 300[2]
Nitrate	EPA 300[2]
Nitrite	EPA 300[2]
Sulfate	EPA 300[2]
Uranium (total)	EPA 908[2]
Technetium-99	TC-01[3]
Gross alpha	SW-846, 9310[1]
Gross beta	SW-846, 9310[1]
Gamma scan	EPA 901.1[4]

[1]EPA, 1986, *Test Methods for Evaluating Solid Waste - Physical/Chemical Methods*, SW-846, 3rd Edition, U.S. Environmental Protection Agency, Washington, D.C.

[2]EPA, 1983, *Methods for Chemical Analysis of Water and Wastes*, EPA-600/4-79-020, U.S. Environmental Protection Agency, Cincinnati, Ohio.

[3]DOE, 1982, *Environmental Measurements Laboratory Procedures Manual*, HASL-300-Ed. 25, U.S. Department of Energy, New York, New York.

[4]EPA, 1980, *Prescribed Procedures for Measurement of Radioactivity in Drinking Water*, EPA-600/4-80-032, U.S. Environmental Protection Agency, Cincinnati, Ohio.

NOTE: Although Vanadium is listed as a waste, it has never been found in any waste designation sampling.

2.3. ANALYTICAL LEVELS

The U.S. Environmental Protection Agency (EPA) guidance (EPA 1987) provides five analytical levels for environmental characterization. These definitions describe categories of analysis and are used for reference in this document. The following are summaries of the analytical levels:

- Level I, Field Screening--generally using hand-held equipment
- Level II, Field Analyses--using portable analytical instruments, usually in a mobile laboratory
- Level III, Laboratory Analysis--quantitative analysis using standard, documented laboratory procedures
- Level IV, Laboratory Analysis--quantitative analysis using procedures that follow stringent quality assurance and quality control protocols and documentation
- Level V, Laboratory Analysis--nonstandard methods or special analytical services.

All on-site personnel health and safety screening will be conducted at the Level I category, in accordance with a hazardous waste operations permit (HWOP). Level II analyses may be used to determine acceptable radionuclide values to meet shipping requirements. All laboratory analysis for samples shall be performed to Level III requirements. The procedures will follow the chemical analysis methods and protocols established by EPA manual SW-846, *Test Methods for Evaluating Solid Waste -- Physical/Chemical Methods* (EPA 1986), except where noted in Table 1.

3. FIELD SAMPLING METHODOLOGY

3.1. BOREHOLE LOCATIONS

The objective of the Phase II soil sampling is to determine the extent and distribution of contamination in the vadose zone soils beneath and surrounding the 183-H Solar Evaporation Basins. Samples will be collected from boreholes within each basin, and at four locations near the perimeter of the basin facility (Figure 1). Location of boreholes may be influenced by data from Phase I sampling. Precise borehole locations will be identified by the field team leader before initiation of fieldwork.

3.2. GENERAL PROCEDURES

Westinghouse Hanford Company (Westinghouse Hanford) and Environmental Engineering, Geotechnology, and Permitting (EEG&P) procedures will be followed throughout the sampling. Personnel in the field will be required to be

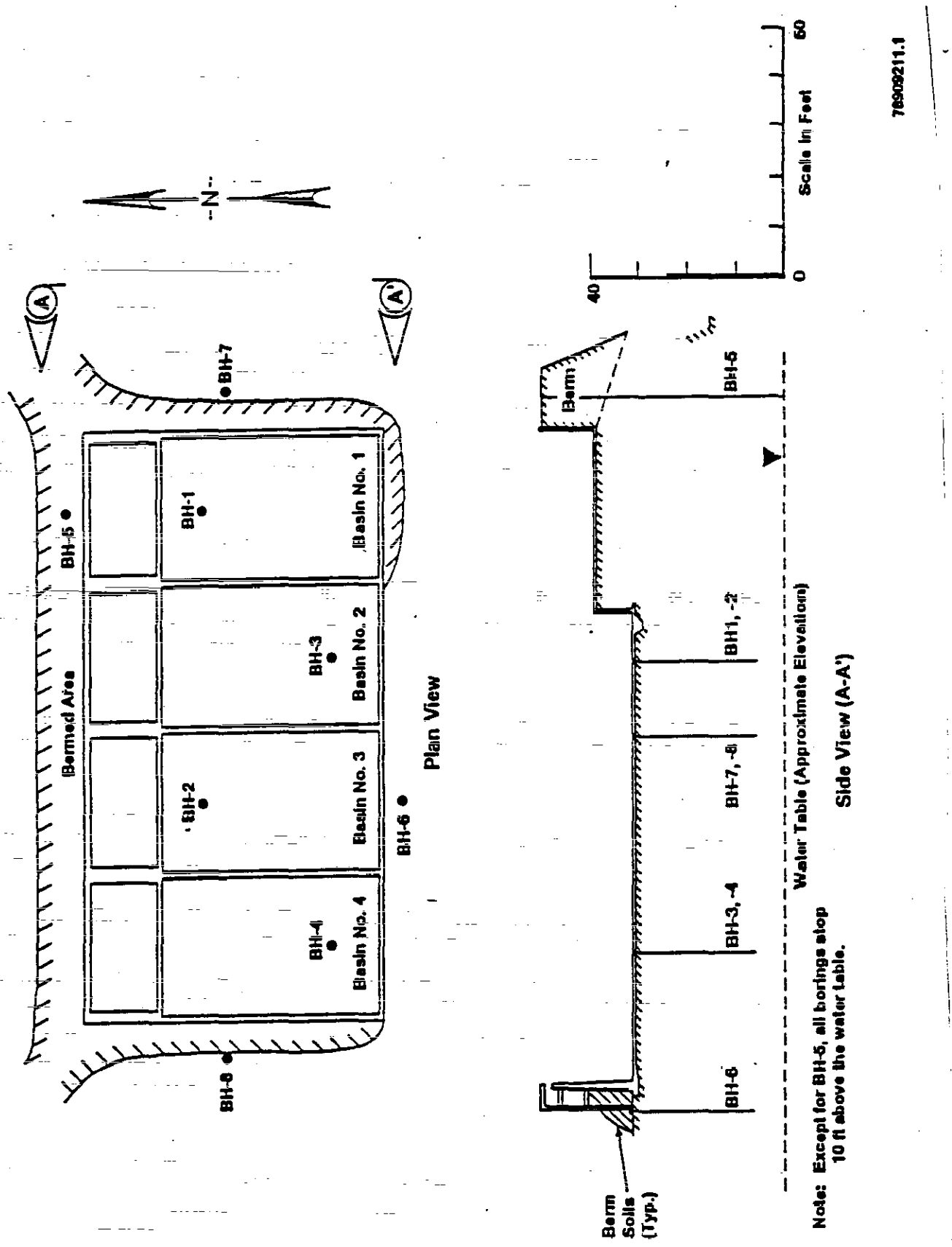

Figure 1. The 183-H Solar Evaporation Basins.

familiar with procedures before performing work in the field. The EEG&P specific procedures applicable to this project are listed in Table 2.

Table 2. Environmental Engineering, Geotechnology, and Permitting Procedures.

Subject	Environmental Investigation Instruction (WHC-CM-7-7)*
Sampling procedures	Sections 5.2, 5.13
Drilling procedures	Sections 6.7, 6.10
Sample handling and shipping	Sections 5.2, 5.11
Project documentation	Sections 1.5, 1.6, 1.11, 5.1, 5.10, 6.1
Equipment decontamination	Sections 5.4, 5.5
Waste handling and disposal	WHC-IP-0728 (Decontamination procedures Manual)
Site entry requirements	Section 1.1
Deviation from procedures (EIIs)	Section 1.4
Personnel requirements	Sections 1.1, 1.7, 3.1
Health and safety requirements	Sections 1.1, 1.7, 2.1, 2.2, 2.3, 3.1, 3.2, 3.3

*WHC, 1989, *Environmental Investigations and Site Characterization Manual*, WHC-CM-7-7, Westinghouse Hanford Company, Richland, Washington.

Additional procedures that may be applicable to specific field situations are contained in WHC-CM-7-7 (WHC 1989). However, procedures listed here should cover the majority of work. Copies of all project documentation will be forwarded to Decommissioning Engineering for filing in the HRO record files. Wastes will be packaged and stored in accordance with WHC-IP-0728.

3.3. EQUIPMENT AND SUPPLIES

The following equipment and supplies may be used for field activities:

- Auger or cable tool drill rig
- Auger sections and/or casings
- Equipment trailers for drilling equipment
- Work tables
- Stainless steel split tube sampler
- Shovel
- Stainless steel sampling devices
  - trowel
  - spoons
  - auger
  - bailer

- Stainless steel mixing bowl(s)
- Sampling bottles with lids
- Measuring tape
- Sample bottle labels
- Sample bottle seals
- Silica sand
- HNU photoionization detector[1] or other organic vapor monitor
- Chest coolers
- Ice
- Blue Ice[2], frozen
- Evidence tape.

3.4. SAMPLE COLLECTION

An auger or cable tool rig will be used for drilling. Soil for samples will be collected in a stainless steel split tube sampler that has been decontaminated in accordance with EII 5.5 (WHC 1989). Samples will be collected from the split tube sampler according to procedures specified in EII 5.2 (WHC 1989). Table 3 provides information on sample container types and sizes. Sample types and containers will conform to EPA (1986b), but may vary from specifications in Table 3 depending on requirements of the analytical laboratories. Table 4 specifies the number and locations of samples at each borehole.

[1]HNU is a registered trademark of HNU Systems, Inc., Newton, Massachusetts.

[2]Blue Ice is a registered trademark of Gott Corporation, Winfield, Kansas.

Table 3. Analytical Requirements for 183-H Solar Evaporation Basins Soil.

Analysis	Method	Container	Holding time
Gross alpha	SW-846, 9310[1]	250 mL Glass	6 months
Gross beta	SW-846, 9310[1]	250 mL Glass	6 months
Gamma scan	EPA 901.1[2]	250 mL Glass	6 months
Total uranium	EPA 908[2]	250 mL Glass	6 months
Technetium-99	TC-01[3]	250 mL Glass	6 months
Mercury	SW-846, 7471[1]	120 mL Glass	28 days
Arsenic	SW-846, 7060[1]	120 mL Glass	6 months
Lead	SW-846, 7421[1]	120 mL Glass	6 months
Selenium	SW-846, 7740[1]	120 mL Glass	6 months
ICP/AA Metals	6010/7000 Series	120 mL Glass	6 months
Anions (nitrate, nitrite, fluoride, and sulfate), pH	EPA 300[4]	60 mL Plastic	28 days

[1]EPA, 1986, *Test Methods for Evaluating Solid Waste - Physical/Chemical Methods*, SW-846, 3rd Edition, U.S. Environmental Protection Agency, Washington, D.C.

[2]EPA, 1980, *Prescribed Procedures for Measurement of Radioactivity in Drinking Water*, EPA-600/4-80-032, U.S. Environmental Protection Agency, Cincinnati, Ohio.

[3]DOE, 1982, *Environmental Measurements Laboratory Procedures Manual*, HASL-300-Ed. 25, U.S. Department of Energy, New York, New York.

[4]EPA, 1983, *Methods for Chemical Analysis of Water and Wastes*, EPA-600/4-79-020, U.S. Environmental Protection Agency, Cincinnati, Ohio.

NOTES: Glass is preferred; however, plastic may be used if glass is unavailable. In addition, at least 5 grams of material shall be collected for radiological screening at a Hanford Site laboratory. This sample shall be labeled with the location so that corresponding samples can be identified later.

Table 4. Borehole Numbers.

DEPTH	1	2	3	4	5*	6	7	8	9*
-2ft	X	X	X	X	X	X	X	X	X
-5ft	X	X	X	X	X	X	X	X	X
-10ft	X	X	X	X	X	X	X	X	X
-15ft	X	X	X	X	X	X	X	X	X
-20ft	X	X	X	X	X	X	X	X	X
-25ft	X	X	X	X	X	X	X	X	X
-30ft					X	X	X	X	X
-35ft					X				X
-40ft					X				X
-45ft					X				
-50ft					X				
-55ft									

*These holes shall go to groundwater, sampling at 5-ft intervals. Borehole number 9 is the background hole discussed on p. I-133 of the *183-H Solar Evaporation Basins Closure/Post-Closure Plan* (DOE-RL 88-04, U.S. Department of Energy-Richland Operations Office, Richland, Washington).

3.5. FIELD RESPONSIBILITIES

3.5.1. Environmental Engineering/Environmental Field Services

Environmental Engineering and Environmental Field Services will assign responsibility for the following tasks based on availability of personnel:

- Providing field team leader
- Providing borehole geologist
- Coordinating overall effort
- Documenting field work
- Collecting samples

- Providing split tube samplers
- Shipping samples to laboratory.

3.5.2. Hanford Restoration Operations

Hanford Restoration Operations will assume responsibility for the drill cuttings and waste generated from drilling operations. Specific responsibilities include the following tasks:

- Labeling drums
- Transporting drums of drill cuttings to storage site
- Arranging disposal of cuttings.

3.5.3. Analytical Systems Laboratory

Chemical Processing will be responsible for the following tasks:

- Providing sampling personnel
- Providing sampling equipment
- Providing sample bottles
- Collecting samples.

3.5.4. Kaiser Engineers Hanford Company

Kaiser Engineers Hanford Company (KEH) will be responsible for the following tasks:

- Providing Site Safety Plan
- Providing drilling support
- Providing calibrated organic vapor monitors
- Monitoring site health and safety
- Providing all personal protective equipment
- Decontaminating all drill equipment
- Decontaminating samplers
- Drumming drill cuttings
- Providing drilling and related equipment.

3.5.5. Office of Sample Management

Office of Sample Management (OSM) will be responsible for coordinating laboratory support.

4. MODIFICATIONS TO SAMPLING PLAN

Under field conditions, the optimal aspects of the sample design may not be achievable (e.g., equipment malfunction or breakdown, weather conditions, soil conditions, physical barriers). Modifications to the planned activity may be necessary and will be decided by the Field Team Leader.

When field decisions are made by the Field Team Leader, necessary actions will be recorded in the field logbook along with circumstances requiring the action.

Circumstances or changing objectives may require major modifications of the basic sampling plan. In this situation, the Field Team Leader will submit the following information to the Cognizant Engineer for signature approval by the Cognizant Engineer and the Level 4 Manager:

- Sampling plan title
- Section and/or subsection to be modified (chapter, title, page number), quoting section as given in sampling plan
- Modifications or deviations, recording modified, deleted, or added statement
- Technical summary of change
- Approvals by original signatories of the document or appropriate replacement.

5. QUALITY ASSURANCE

Quality assurance will be achieved in compliance with *Environmental Engineering, Technology, and Permitting Function Quality Assurance Program Plan* (WHC 1990).

Quality control samples will be collected in accordance with EPA (1986) guidelines, where applicable. Sample blanks and sample splits will be taken at a minimum of 1 for every 20 samples, and once per borehole area (internal basin and external basin). Measures to be taken in association with sampling quality assurance are as follows.

- Duplicate samples--Two separate samples are taken from the same sampling point in the field and placed into separate containers to be analyzed separately.

- Split samples--Split samples are technically the same as duplicates, except that the two samples go to different laboratories.

- Equipment blank--An equipment blank will consist of clean silica sand or distilled water that is as free of analyte as possible and is transported to the site, opened in the field, poured over or through the sample collection device, collected in a sample container, and returned to the laboratory for analysis. In the case of soil blanks, clean silica sand will be used. Distilled water will be used when equipment blanks are taken in association with water samples. Equipment blanks will be analyzed for constituents listed in Table 3.

- Field blank--A field blank will consist of clean silica sand or distilled water that is as free as possible of analyte and is transported to the site, opened in the field for the duration of one sample collection time, collected in a sample container, and returned to the laboratory for analysis. For soil field blanks, clean silica sand will be used. Distilled water will be used when field blanks are taken in association with water samples. Field blanks will be analyzed for the constituents listed in Table 3.

6. JOB SAFETY REQUIREMENTS

The primary guidance for all site-safety-related concerns and requirements will be designated in the KEH-supplied HWOP. Job specific related activities will be delineated in the HWOP and will provide guidance for appropriate personnel protection equipment, site monitoring, chemical/radiological hazards and potential safety hazards associated with field work.

All safety-related documents and sampling plans will be reviewed by field personnel before starting work. A pre-job safety meeting and regular field-safety 'tailgate' meetings will be held to review all safety considerations and identify any potential hazards not noted previously. It will be the responsibility of the KEH Site Safety Officer and Field Team Leader to conduct these meetings. Field personnel shall attend the tailgate meeting.

7. REFERENCES

DOE, 1982, *Environmental Measurements Laboratory Procedures Manual*, HASL-300-Ed. 25, U.S. Department of Energy, New York, New York.

DOE-RL, 1988, *183-H Solar Evaporation Basins Closure/Post-Closure Plan*, DOE/RL 88-04, U.S. Department of Energy-Richland Operations Office, Richland, Washington.

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WHC, 1989, *Environmental Investigations and Site Characterization Manual*, WHC-CM-7-7, Westinghouse Hanford Company, Richland, Washington.

WHC, 1990, *Environmental Engineering, Technology, and Permitting Function Quality Assurance Program Plan*, WHC-EP-0383, Westinghouse Hanford Company, Richland, Washington.